

# FOURTEENTH CENSUS OF THE UNITED STATES: 1920

## BULLETIN

DEPARTMENT  
OF COMMERCEBUREAU OF  
THE CENSUS

### IRRIGATION : ARIZONA

#### STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

#### CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 6     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 7     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 7     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 8     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 10    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 11    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 5     |  |       |
| Acreage, by drainage basin.....                        | 6     |  |       |

#### INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Arizona collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of

showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

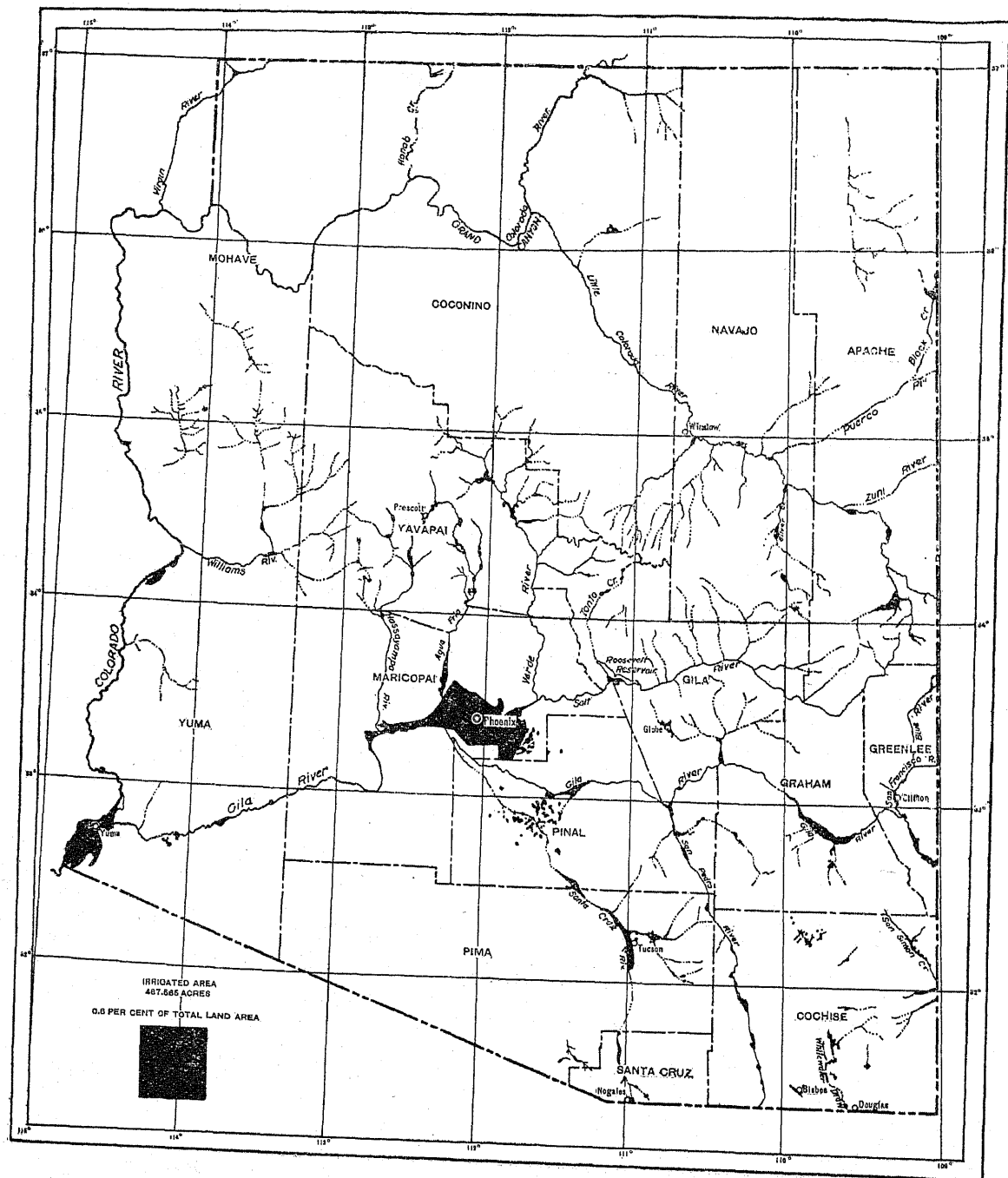
Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—   |                  | INCREASE, <sup>1</sup> |           |
|--|--------------|------------------|------------------------|-----------|
|  | 1920         | 1910             | Amount.                | Per cent. |
| Number of all farms.....   | 9,975        | 9,227            | 748                    | 8.1       |
| Approximate land area of state..... acres..  | 72,838,400   | 72,838,400       |                        |           |
| All land in farms..... acres..   | 5,802,126    | 1,246,613        | 4,555,513              | 365.4     |
| Improved land in farms..... acres..  | 712,803      | 350,173          | 362,630                | 103.6     |
| Number of farms irrigated.....   | 6,605        | 4,841            | 1,764                  | 36.4      |
| Area irrigated..... acres..  | 467,565      | 320,051          | 147,514                | 46.1      |
| Area enterprises were capable of irrigating..... acres..                               | 627,303      | 387,655          | 239,648                | 61.8      |
| Area included in enterprises..... acres..  | 813,153      | 944,090          | -130,937               | -13.9     |
| Per cent irrigated:  |              |                  |                        |           |
| Number of all farms.....   | 66.2         | 52.5             | 13.7                   |           |
| Approximate land area of state.....  | 0.6          | 0.4              | 0.2                    |           |
| Land in farms.....   | 8.1          | 25.7             | -17.6                  |           |
| Improved land in farms.....  | 65.6         | 91.4             | -25.8                  |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 159,738      | 67,604           | 92,134                 | 136.3     |
| Excess of area included in enterprises over area irrigated..... acres..                | 185,850      | 624,039          | -438,189               | -70.2     |
| Area of irrigated land reported as available for settlement..... acres..               | 24,341       | ( <sup>2</sup> ) |                        |           |
| Capital invested.....  | \$33,498,094 | \$17,677,066     | \$15,820,128           | 89.5      |
| Average per acre enterprises were capable of irrigating.....                           | \$53.40      | \$45.60          | \$7.80                 | 17.1      |
| Estimated final cost of existing enterprises.....                                      | \$34,615,064 | \$24,828,868     | \$9,786,196            | 39.4      |
| Average per acre included in enterprises.....  | \$42.57      | \$26.30          | \$16.27                | 61.9      |
| Average cost of operation and maintenance per acre.....                                | \$3.27       | \$0.93           | \$2.34                 | 251.6     |

# ARIZONA

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.





## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

**CLIMATIC CONDITIONS.**

The whole of the state of Arizona may be classed as arid, although there are small parts of the state where some crops are grown without irrigation.

The central part of the state is mountainous, while the remainder of the state consists of extensive valleys or plateaus broken by isolated ranges of mountains and hills.

In the valley of the Colorado River, in the northwestern part of the state, the normal annual precipitation is about 10 inches, while in the mountains in the central part of the state it varies from 18 to 25 inches. In the northeastern part of the state, on the rolling plateau, the precipitation drops below 10 inches. On the lower Colorado and the Gila Rivers the average annual precipitation is below 5 inches, and to the east of this it increases, being about 7 inches at Phoenix, in the Salt River Valley; about 6 inches at Maricopa, in the Gila River Valley; and about 12 inches at Tucson. It is higher at many points which lie at higher elevations.

Throughout the state the larger part of the precipitation occurs in July, August, and early September, while the driest part of the year is April, May, and June.

Crops are grown without irrigation in the valleys of the Little Colorado, Hassayampa, and Agua Fria Rivers, and at many other points in the state that receive more than the average precipitation, but on the plateaus in northern Arizona and in the extensive valleys in southern Arizona, no crops can be grown in this way.

The rainfall varies greatly from year to year, much of it coming in very heavy torrential storms that may do neavy damage by washing out crops, irrigation structures, and bridges.

The heat in the arid valleys is intense, and evaporation is great, making large quantities of water necessary to maintain plant growth.

In 1919 the spring was cold and late, and precipitation for the first six months of the year was below normal, but conditions improved later in the season, and the report of the United States Weather Bureau for Arizona states that "1919 was perhaps the most favorable year on record for both agriculture and live stock," and "crops both in the dry farming sections and under the irrigation projects were rated better than 100 per cent."

**WATER SUPPLY FOR IRRIGATION.**

With the exception of Colorado River all of the streams in Arizona are torrential in character, because of the limited and variable precipitation. Colorado River has its sources in the high, snow-covered moun-

tains in Wyoming and Colorado, and maintains a good summer flow, although it is subject to heavy floods. Throughout its course in northern Arizona this stream flows through the Grand Canyon, and along most of the distance where it forms the boundary between Arizona and Nevada and Arizona and California there is very little land on which its water can be utilized. Near the southwest corner of the state water is diverted for use in both Arizona and California, and up to the present the normal low-water flow has been sufficient to meet the demands of both states. Extension of the areas irrigated will require storage, and plans that will provide for the largest use of the stream are being studied.

The Little Colorado rises in east central Arizona and flows in a northwesterly direction to its junction with Colorado River in the north central part of the state. The stream does not carry a large volume of water at any time, and gets very low or entirely dry at times during the summer. Consequently it is not a dependable source of water for irrigation. Plans for storage have been studied, but no large scheme has been carried out. The northeastern part of the state, north of the Little Colorado, consists of a high, rolling desert with almost no surface water supply.

Southern Arizona is drained by Gila and Salt Rivers. Gila River rises in western New Mexico and flows entirely across southern Arizona. It is a torrential stream, subject to heavy floods, and often entirely dry. It is little used for irrigation because of its uncertain flow. Storage of the flood waters would make it possible to irrigate large areas, and plans for such storage have been made but never carried out.

Salt River rises in east central Arizona and flows westward to its confluence with Gila River, slightly west of the center of the state. Salt River and its tributaries receive most of the drainage from the mountains of central Arizona and supply irrigation water to the Salt River Valley, which contains the largest irrigated area in the state. Like the other streams of the state, Salt River had a very variable flow until storage was provided by the construction of Roosevelt Reservoir. There is opportunity for additional storage on the tributaries.

South of Gila River there are extensive areas almost without surface water, and other valleys having drainage channels that carry water intermittently.

In some of the valleys in the southern part of the state there is a good supply of ground water, which can be made available by pumping. In the Salt River Valley irrigation has raised the ground water level so much that land has been injured. Both open drains and wells have been installed, primarily for the purpose of lowering the ground water, but affording, at the same time, an added supply of water for irrigation.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                        |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 6,605            | 36.4                   | 66.2                   | 467,565         | 46.1                   | 0.6                          | 8.1                        | 65.6                                 |
| 1910.....    | 4,841            | 62.4                   | 52.5                   | 320,051         | 72.6                   | 0.4                          | 25.7                       | 91.4                                 |
| 1900.....    | 2,981            | 177.3                  | 51.3                   | 185,396         | 181.7                  | 0.3                          | 9.6                        | 72.8                                 |
| 1890.....    | 1,075            | .....                  | 75.4                   | 65,821          | .....                  | 0.1                          | 5.1                        | 63.2                                 |

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area in-cluded in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                       | Area enter-prises were ca-pable of irrigating in 1920 (acres). |
|--------------------|--------------------------|---|-------------------------|---------------------------------------|--|
|                    |                          |   | Acres.                  | Per cent of acre-age in enter-prises. |  |
| Total.....         | 1,388                    | 813,153                                       | 467,565                 | 57.5                                  | 627,303  |
| Before 1860.....   | 10                       | 1,955   | 332                     | 17.0                                  | 690  |
| 1860-1869.....     | 10                       | 2,050   | 720                     | 35.1                                  | 776  |
| 1870-1879.....     | 61                       | 71,783  | 55,327                  | 77.1                                  | 62,077   |
| 1880-1889.....     | 85                       | 78,516  | 41,358                  | 52.7                                  | 55,332   |
| 1890-1899.....     | 78                       | 35,616  | 19,975                  | 56.1                                  | 23,930   |
| 1900-1904.....     | 67                       | 21,966  | 10,944                  | 49.8                                  | 11,270   |
| 1905-1909.....     | 153                      | 348,591                                       | 260,639                 | 74.8                                  | 285,462  |
| 1910-1914.....     | 226                      | 42,994  | 18,692                  | 43.5                                  | 27,738   |
| 1915-1919.....     | 486                      | 178,826                                       | 42,595                  | 23.8                                  | 138,571  |
| Not reported.....  | 207                      | 30,853  | 16,983                  | 55.0                                  | 21,487   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| AREA IRRIGATED (ACRES).                    |         |         |                        |           | Area enter-prises were ca-<br>pable of<br>irrigating<br>in 1920<br>(acres). | Area in-<br>cluded<br>in enter-<br>prises,<br>1920<br>(acres). |
|--|---------|---------|------------------------|-----------|---|--|
| CLASS.                                     | 1919    | 1909    | Increase. <sup>1</sup> |           |   |  |
|  |         |         | Amount.                | Per cent. |   |  |
| Total.....                                 | 467,565 | 320,051 | 147,514                | 46.1      | 627,303   | 813,153  |
| Stream, gravity.....                       | 189,782 | 300,067 | -110,285               | -36.8     | 299,122   | 398,591  |
| Stream, pumped.....                        | 6,671   | 7,711   | -1,040                 | -13.5     | 9,397   | 16,840   |
| Wells, pumped.....                         | 39,694  | 6,096   | 33,598                 | 551.1     | 59,783  | 99,331   |
| Wells, flowing.....                        | 1,558   | 1,489   | 69                     | 4.6       | 1,902   | 6,831  |
| Wells, flowing and<br>pumped.....          | 558     | (2)     | 558                    | -----     | 799   | 2,016  |
| Lake, gravity.....                         | -----   | 570     | -570                   | -----     | -----   | -----  |
| Lake, pumped.....                          | 5       | (2)     | 5                      | -----     | 5   | 130  |
| Springs.....                               | 2,578   | 3,631   | -1,053                 | -29.0     | 3,520   | 6,078  |
| Stored storm water.....                    | 510     | 487     | 23                     | 4.7       | 600   | 700  |
| Sewage.....                                | 195     | (2)     | 195                    | -----     | 200   | 270  |
| Stream, gravity, and<br>pumped wells.....  | 217,799 | (2)     | 217,799                | -----     | 240,640   | 258,104  |
| Stream, gravity, and<br>flowing wells..... | 525     | (2)     | 525                    | -----     | 645   | 1,317  |
| Other mixed.....                           | 7,690   | (2)     | 7,690                  | -----     | 10,690  | 22,945   |

<sup>1</sup> A minus sign (-) denotes decrease.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

Arizona, in common with other territory settled by the Spaniards, has many old irrigation enterprises, known as "community ditches" or "public acequias," which are operated in accordance with ancient laws and customs which have not been brought into a

definite code. These laws and customs were continued by the law of 1871, which recognized the "laws and customs of Sonora and the usage of the people of Arizona." Such enterprises are controlled by the water users and are classed as cooperative.

Arizona enacted an irrigation district law in 1912, but almost nothing has been done under that law. The state accepted the conditions of the Federal Carey Act (act of Congress, Aug. 18, 1894) in 1912, but nothing has been done under that act.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                 | CENSUS OF— |         | INCREASE. <sup>1</sup> |           |
|---|------------|---------|------------------------|-----------|
|   | 1920       | 1910    | Acres.                 | Per cent. |
| ACREAGE IRRIGATED.                              |            |         |                        |           |
| Total.....                                      | 467,565    | 320,051 | 147,514                | 46.1      |
| Individual and partnership.....                 | 80,511     | 61,196  | 19,315                 | 31.6      |
| Cooperative.....                                | 114,482    | 101,025 | 13,457                 | 13.3      |
| Irrigation district.....                        | 300        | (2)     | 300                    | .....     |
| Commercial.....                                 | 14,500     | 80      | 14,420                 | .....     |
| U. S. Reclamation Service.....                  | 248,814    | 138,364 | 110,450                | 79.8      |
| U. S. Indian Service.....                       | 8,733      | 19,388  | -10,653                | -55.0     |
| City.....                                       | 200        | (2)     | 200                    | .....     |
| Other and mixed.....                            | 25         | (2)     | 25                     | .....     |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |            |         |                        |           |
| Total.....                                      | 627,303    | 387,655 | 239,648                | 61.8      |
| Individual and partnership.....                 | 195,331    | 81,422  | 113,909                | 139.9     |
| Cooperative.....                                | 130,993    | 120,559 | 10,434                 | 8.6       |
| Irrigation district.....                        | 300        | (2)     | 300                    | .....     |
| Commercial.....                                 | 20,000     | 200     | 19,800                 | .....     |
| U. S. Reclamation Service.....                  | 269,691    | 164,500 | 105,191                | 63.9      |
| U. S. Indian Service.....                       | 10,833     | 20,974  | -10,141                | -48.4     |
| City.....                                       | 220        | (2)     | 220                    | .....     |
| Other and mixed.....                            | 25         | (2)     | 25                     | .....     |
| ACREAGE INCLUDED IN ENTERPRISES.                |            |         |                        |           |
| Total.....                                      | 813,153    | 944,090 | -130,937               | -13.9     |
| Individual and partnership.....                 | 288,510    | 175,834 | 112,676                | 64.1      |
| Cooperative.....                                | 157,849    | 360,639 | -202,790               | -56.2     |
| Irrigation district.....                        | 450        | (2)     | 450                    | .....     |
| Commercial.....                                 | 31,000     | 1,600   | 29,400                 | .....     |
| U. S. Reclamation Service.....                  | 314,691    | 370,000 | -55,309                | -14.9     |
| U. S. Indian Service.....                       | 20,058     | 36,017  | -15,959                | -44.3     |
| City.....                                       | 300        | (2)     | 300                    | .....     |
| Other and mixed.....                            | 295        | (2)     | 295                    | .....     |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when base is less than 100, or when per cent is more than 1,000.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Arizona relating to water rights are summarized in the following paragraphs:

The bill of rights of the territory of Arizona, approved October 4, 1864, contained the following declaration regarding water rights:

"All streams, lakes, and ponds of water capable of being used for purposes of navigation or irrigation are hereby declared to be public property; and no individual or corporation shall have the right to appropriate them exclusively to their own private use, except under such equitable regulations and restrictions as the legislature shall provide for that purpose."—Art. 22.

The law of 1871 declared all rivers, creeks, and streams of running water to be public and applicable to the purposes of irrigation and mining. This law provided that the appropriator should post a notice at the point of diversion and file a copy of the notice with the county recorder.

A law enacted in 1887 declared that the common law doctrine of riparian rights should not be in force in the territory, and the state constitution, adopted in 1910, contained a similar declaration (Art. 17).

## IRRIGATION—ARIZONA.

In 1919 the state of Arizona adopted for the first time a comprehensive code of water laws. The code declares that "The water of all natural streams, or flowing in any canyon, ravine or other natural channel, and of springs and lakes, belongs to the public and is subject to beneficial use as herein provided." The office of state water commissioner is created; any party intending to acquire the right to use any water of the state is required to make application to the water commissioner for a permit, and upon an appropriation being perfected in accordance with a permit, the commissioner is to issue a certificate setting forth the rights acquired.

Until the enactment of the water code in 1919 there was no special procedure in the courts for hearing controversies regarding water rights. This code provides that the commissioner, on his own initiative or upon petition of one or more water users from any source, is to take testimony regarding rights to water from the source in question, examine the source of water supply and the works taking water therefrom, make findings of fact and an order defining all rights to water, and submit all testimony and his reports and findings to the superior court of the county in which reside the greatest number of the water users interested. The court reviews the whole record, and after proper hearings issues a decree defining rights. Pending the decision of the court the order of the commissioner is binding.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                       | 1919    |                       | 1909,<br>per cent<br>of total. |
|------------------------------|---------|-----------------------|--------------------------------|
|                              | Acres.  | Per cent<br>of total. |                                |
| Total.....                   | 467,565 | 100.0                 | 100.0                          |
| Appropriation and use.....   | 226,846 | 48.5                  | 76.7                           |
| Notice filed and posted..... | 97,130  | 20.8                  | 14.7                           |
| Adjudicated by court.....    | 84,978  | 18.2                  | 8.4                            |
| Permit from state.....       | 10      | (1)                   | .....                          |
| Riparian rights.....         | .....   | .....                 | 0.2                            |
| Underground.....             | 41,624  | 8.9                   | (2)                            |
| Other and mixed.....         | 525     | 0.1                   | (2)                            |
| Not reported.....            | 16,452  | 3.5                   | (2)                            |

<sup>1</sup> Less than one-tenth of 1 per cent.

<sup>2</sup> This class was not included in the tabulation in 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

## ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.                                 | AREA IRRIGATED (ACRES). |                    |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|---|-------------------------|--------------------|------------------------------------|---|--|
|   | 1919                    | 1902               | Per cent of increase. <sup>1</sup> |   |  |
| Total.....                                      | 467,565                 | 247,250            | 89.1                               | 813,153                                     | 627,303  |
| Colorado River and tributaries.....             | 461,694                 | 246,866            | 87.0                               | 796,530                                     | 617,353  |
| Colorado River direct.....                      | 48,326                  | 7,823              | 517.7                              | 107,311                                     | 56,531   |
| Kanab Wash.....                                 | 450                     | 700                | —35.7                              | 710   | 610  |
| Virgin River.....                               | 379                     | 820                | —53.8                              | 533   | 512  |
| Williams River.....                             | 1,653                   | 1,256              | 31.6                               | 3,232                                       | 1,809  |
| Little Colorado River and tributaries.....      | 17,036                  | 11,855             | 43.7                               | 35,358                                      | 21,880   |
| Little Colorado River direct.....               | 10,260                  | 7,270              | 41.1                               | 20,821                                      | 14,131   |
| Nutriso Creek.....                              | 636                     | 320                | 98.8                               | 1,224                                       | 952  |
| Concho Creek.....                               | 244                     | 163                | 49.7                               | 500   | 250  |
| Other tributaries of Little Colorado River..... | 5,896                   | <sup>2</sup> 4,102 | 43.7                               | 12,813                                      | 6,547  |
| Gila River and tributaries.....                 | 391,417                 | 223,771            | 74.9                               | 643,480                                     | 533,521  |
| Gila River direct.....                          | 76,982                  | 55,973             | 37.5                               | 203,504                                     | 167,642  |
| San Francisco River.....                        | 429                     | 239                | 79.5                               | 4,148                                       | 476  |
| San Pedro River.....                            | 7,773                   | 10,912             | —28.8                              | 18,959                                      | 10,861   |
| Santa Cruz River.....                           | 33,019                  | 10,606             | 211.3                              | 76,617                                      | 45,115   |
| Salt River and tributaries.....                 | 247,260                 | 140,642            | 75.8                               | 277,034                                     | 263,644  |
| Salt River direct.....                          | 235,825                 | 125,007            | 88.0                               | 253,603                                     | 253,308  |
| Tonto Creek.....                                | 502                     | 1,829              | —72.6                              | 2,628                                       | 720  |
| Rio Verde.....                                  | 6,564                   | 11,502             | —42.9                              | 9,978                                       | 7,470  |
| Other tributaries of Salt River.....            | 4,369                   | <sup>2</sup> 2,304 | 89.6                               | 10,525                                      | 7,146  |
| Agua Fria River.....                            | 18,824                  | 884                | .....                              | 38,699                                      | 30,000   |
| Hassayampa River.....                           | 956                     | 1,091              | —12.4                              | 3,657                                       | 1,773  |
| Other tributaries of Gila River.....            | 6,174                   | <sup>2</sup> 3,424 | 80.3                               | 20,862                                      | 9,010  |
| Other tributaries of Colorado River.....        | 2,433                   | <sup>2</sup> 641   | 279.6                              | 5,906                                       | 2,490  |
| Whitewater Draw and tributaries.....            | 5,871                   | 384                | .....                              | 16,623                                      | 9,950  |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.

<sup>2</sup> Includes springs and wells.

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                       |
|--------------|--------------|-----------------------|-------------------|-----------------------|
|              |              |                       | Amount.           | Per cent of increase. |
| 1920.....    | \$33,498,094 | 89.5                  | \$53.40           | 17.1                  |
| 1910.....    | 17,677,966   | 298.3                 | 45.60             | 90.5                  |
| 1900.....    | 4,438,352    | 854.5                 | 23.94             | 238.6                 |
| 1890.....    | 465,000      | .....                 | 7.07              | .....                 |

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$33,498,094 | 100.0              | \$53.40           |
| Before 1860.....   | 2,058        | (1)                | 3.12              |
| 1860-1869.....     | 9,770        | (1)                | 12.59             |
| 1870-1879.....     | 1,881,284    | 5.6                | 30.31             |
| 1880-1889.....     | 921,806      | 2.8                | 16.66             |
| 1890-1899.....     | 645,369      | 1.9                | 26.97             |
| 1900-1904.....     | 437,719      | 1.3                | 38.84             |
| 1905-1909.....     | 20,951,874   | 62.5               | 73.40             |
| 1910-1914.....     | 3,778,003    | 11.3               | 136.20            |
| 1915-1919.....     | 4,419,044    | 13.2               | 31.89             |
| Not reported.....  | 451,167      | 1.4                | 21.00             |

<sup>1</sup> Less than one-tenth of 1 per cent.

# IRRIGATION—ARIZONA.

7

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$33,498,094            | 100.0              | \$53.40           | 362,828                                  | \$3.27                              |
| Stream, gravity.....                    | 11,587,884              | 34.6               | 38.74             | 111,223                                  | 2.27                                |
| Stream, pumped.....                     | 521,852                 | 1.6                | 55.53             | 6,082                                    | 8.12                                |
| Stream, pumped and gravity.....         | 3,417,339               | 10.2               | 57.16             | 18,733                                   | 13.15                               |
| Wells, flowing.....                     | 115,936                 | 0.3                | 60.95             | 734                                      | 3.64                                |
| Wells, flowing and pumped.....          | 54,700                  | 0.2                | 68.46             | 558                                      | 13.64                               |
| Lake, pumped.....                       | 400                     | (2)                | 80.00             | 5  | 10.00                               |
| Lake, gravity.....                      | 271,358                 | 0.8                | 77.09             | 1,525                                    | 3.88                                |
| Springs.....                            | 11,600                  | (2)                | 19.23             |  |                                     |
| Stored storm water.....                 | 63,408                  | 0.2                | 317.04            | 90                                       | 1.89                                |
| Sewage.....                             | 17,092,890              | 51.0               | 71.03             | 216,397                                  | 2.70                                |
| Stream, gravity, and pumped wells.....  | 27,500                  | 0.1                | 42.64             | 495                                      | 2.40                                |
| Stream, gravity, and flowing wells..... | 333,227                 | 1.0                | 31.17             | 6,986                                    | 4.99                                |
| Other mixed.....                        |                         |                    |                   |  |                                     |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                                 | 1920         | 1902                | INCREASE. <sup>1</sup> |           |
|---|--------------|---------------------|------------------------|-----------|
|   |              |                     | Amount.                | Per cent. |
| Total.....                                      | \$33,498,094 | \$4,688,298         | \$28,809,796           | 614.5     |
| Colorado River and tributaries.....             | 33,198,726   | 4,681,563           | 28,517,163             | 609.1     |
| Colorado River direct.....                      | 7,381,691    | 250,873             | 7,130,818              | 336.2     |
| Kanab Wash.....                                 | 20,500       | 4,700               | 15,800                 | 118.2     |
| Virgin River.....                               | 7,474        | 3,425               | 4,049                  | 255.0     |
| Williams River.....                             | 55,504       | 15,630              | 39,868                 | 255.0     |
| Little Colorado River and tributaries.....      | 460,206      | 205,701             | 194,505                | 73.2      |
| Little Colorado River direct.....               | 145,913      | 218,900             | -71,987                | -32.9     |
| Nutrioso Creek.....                             | 16,500       | 2,000               | 13,900                 | 534.6     |
| Concho Creek.....                               | 49,228       | 850                 | 48,378                 | .....     |
| Other tributaries of Little Colorado River..... | 247,565      | <sup>2</sup> 43,351 | 204,214                | 471.1     |
| Gila River and tributaries.....                 | 25,165,814   | 4,131,850           | 21,033,964             | 509.1     |
| Gila River direct.....                          | 2,841,526    | 1,203,882           | 1,637,644              | 136.0     |
| San Francisco River.....                        | 15,415       | 13,585              | 1,830                  | 13.5      |
| San Pedro River.....                            | 359,153      | 40,135              | 319,018                | 749.9     |
| Santa Cruz River.....                           | 5,168,524    | 79,686              | 5,088,838              | 453.2     |
| Salt River and tributaries.....                 | 14,939,034   | 2,697,189           | 12,241,845             | 496.7     |
| Salt River direct.....                          | 14,339,874   | 2,404,160           | 11,935,714             | 496.7     |
| Tonto Creek.....                                | 9,468        | 15,085              | -5,617                 | -37.2     |
| Rio Verde.....                                  | 209,482      | 250,813             | -41,331                | -16.5     |
| Other tributaries of Salt River.....            | 380,210      | <sup>2</sup> 27,131 | 353,079                | .....     |
| Agua Fria River.....                            | 1,428,077    | 20,998              | 1,407,079              | .....     |
| Hassayampa River.....                           | 51,299       | 11,160              | 40,139                 | 359.7     |
| Other tributaries of Gila River.....            | 362,786      | <sup>2</sup> 65,215 | 297,571                | 456.3     |
| Other tributaries of Colorado River.....        | 107,337      | <sup>2</sup> 9,278  | 98,059                 | .....     |
| Whitewater Draw and tributaries.....            | 299,368      | 6,735               | 292,633                | .....     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells.

In classifying capital invested by type of enterprise (Table 12) the average capital invested per acre is not presented, for the reason that it is not possible to compute this correctly. The United States Reclamation Service supplies stored water to enterprises controlled by agencies of most of the other classes shown in the table and a part of its expenditure is properly chargeable to those lands; but it is not possible to tell how much should be so charged or how it should be distributed among the various classes.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$33,498,094            | 100.0              | 362,828                                  | \$3.27                              |
| Individual and partnership..... | 5,598,025               | 16.7               | 43,378                                   | 7.53                                |
| Cooperative.....                | 3,171,406               | 9.5                | 93,444                                   | 2.44                                |
| Irrigation district.....        | 100,000                 | 0.3                | 300                                      | 6.67                                |
| Commercial.....                 | 3,038,400               | 11.0               | 14,500                                   | 4.86                                |
| U. S. Reclamation Service.....  | 20,277,019              | 60.5               | 205,064                                  | 2.44                                |
| U. S. Indian Service.....       | 585,029                 | 1.8                | 5,977                                    | 9.51                                |
| City.....                       | 71,500                  | 0.2                | 140                                      | 1.93                                |
| Not reported.....               | 215                     | (2)                | 25                                       | 5.00                                |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |         |
|--|---------|
| Number of enterprises reporting land drained or needing drainage.....  | 31      |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 382,928 |
| Acreage for which drains have been installed.....  | 25,173  |
| Additional acreage needing drainage.....   | 71,357  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 6.6     |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 3.1     |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 11.9    |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.    | Measured. | Not measured. |
|---|-----------|-----------|---------------|
| Average volume of water entering canals, second-foot..... | 4,199     | 2,967     | 1,232         |
| Area irrigated in 1919.....acres.....                     | 386,393   | 258,260   | 78,133        |
| Average number of acres per second-foot.....              | 80        | 87        | 63            |
| Total quantity of water entering canals, acre-foot.....   | 1,839,689 | 1,402,101 | 437,588       |
| Area irrigated in 1919.....acres.....                     | 358,383   | 283,376   | 75,007        |
| Average quantity per acre.....acre-foot.....              | 5.1       | 4.9       | 5.8           |
| Total quantity of water delivered.....acre-foot.....      | 876,016   | 690,083   | 185,933       |
| Area irrigated in 1919.....acres.....                     | 291,637   | 233,469   | 58,168        |
| Average quantity per acre.....acre-foot.....              | 3.0       | 3.0       | 3.2           |

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

[illegible]



# IRRIGATION—ARIZONA.

9

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                                 | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|   |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                                      | 248                       | 99                      | 1,295         | 11,707                  | 1,769           | 1,174            | 1,599           | 339         | 1,563,856             |
| Colorado River and tributaries.....             | 212                       | 48                      | 1,120         | 11,154                  | 1,618           | 1,082            | 1,592           | 283         | 1,418,785             |
| Colorado River direct.....                      | 2                         | .....                   | 6             | 713                     | 52              | 174              | 221             | .....       | .....                 |
| Kanab Wash.....                                 | 1                         | .....                   | 1             | 1                       | .....           | 4                | 4               | 4           | 258                   |
| Virgin River.....                               | 10                        | 1                       | 10            | 9                       | 9               | 9                | 2               | .....       | .....                 |
| Williams River.....                             | 5                         | .....                   | 37            | 40                      | 31              | 1                | 1               | 1           | 4                     |
| Little Colorado River and tributaries.....      | 32                        | 14                      | 82            | 341                     | 156             | 43               | 43              | 45          | 37,098                |
| Little Colorado River direct.....               | 19                        | 9                       | 36            | 208                     | 78              | 15               | 22              | 18          | 30,823                |
| Nutrioso Creek.....                             | 4                         | 1                       | 7             | 17                      | 8               | .....            | .....           | 4           | 1,050                 |
| Concho Creek.....                               | .....                     | .....                   | 2             | 3                       | 2               | 1                | 1               | 2           | 625                   |
| Other tributaries of Little Colorado River..... | 9                         | 4                       | 37            | 113                     | 68              | 27               | 20              | 21          | 4,600                 |
| Gila River and tributaries.....                 | 199                       | 33                      | 950           | 10,032                  | 1,385           | 836              | 1,316           | 299         | 1,370,406             |
| Gila River direct.....                          | 27                        | 1                       | 91            | 2,520                   | 370             | 219              | 293             | 2           | 210                   |
| San Francisco River.....                        | 28                        | 1                       | 38            | 22                      | 12              | .....            | .....           | .....       | .....                 |
| San Pedro River.....                            | 30                        | 9                       | 114           | 270                     | 162             | 31               | 15              | 45          | 894                   |
| Santa Cruz River.....                           | 31                        | 5                       | 237           | 1,106                   | 260             | 147              | 75              | 26          | 392                   |
| Salt River and tributaries.....                 | 44                        | 3                       | 174           | 5,084                   | 200             | 313              | 911             | 11          | 1,367,367             |
| Salt River direct.....                          | 8                         | 1                       | 18            | 4,447                   | 111             | 271              | 898             | 2           | 1,367,300             |
| Tonto Creek.....                                | 9                         | 1                       | 31            | 58                      | 26              | .....            | .....           | 1           | 1                     |
| Rio Verde.....                                  | 22                        | .....                   | 75            | 359                     | 107             | 29               | 7               | 5           | 1                     |
| Other tributaries of Salt River.....            | 5                         | 1                       | 47            | 220                     | 46              | 13               | 6               | 3           | 5                     |
| Agua Fria River.....                            | 12                        | 5                       | 106           | 525                     | 107             | 105              | 101             | 16          | 24                    |
| Hassayampa River.....                           | 1                         | 1                       | 24            | 46                      | 18              | .....            | .....           | 1           | 180                   |
| Other tributaries of Gila River.....            | 26                        | 8                       | 196           | 369                     | 166             | 21               | 11              | 106         | 1,369                 |
| Other tributaries of Colorado River.....        | 3                         | .....                   | 34            | 18                      | 12              | 15               | 5               | 4           | 11,019                |
| Whitewater Draw and tributaries.....            | 6                         | 51                      | 175           | 553                     | 121             | 92               | 7               | 76          | 85,071                |

| DRAINAGE BASIN.                                 | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                      |
|---|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|----------------------|
|   |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Number. | Average lift (feet). |
| Total.....                                      | 104.5                       | 310            | 14,547                         | 999           | 1,012,590                      | 741             | 22,014                         | 1,001   | 1,018,030            |
| Colorado River and tributaries.....             | 99.4                        | 300            | 14,014                         | 790           | 969,863                        | 546             | 19,611                         | 792     | 974,054              |
| Colorado River direct.....                      | .....                       | .....          | .....                          | 3             | 750                            | 7               | 414                            | 10      | 80,200               |
| Kanab Wash.....                                 | 1.3                         | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                |
| Virgin River.....                               | .....                       | .....          | .....                          | 5             | 2,015                          | 6               | 39                             | 8       | 2,500                |
| Williams River.....                             | 10.1                        | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                |
| Little Colorado River and tributaries.....      | .....                       | 2              | .....                          | 2             | 1,000                          | 1               | 1                              | 2       | 1,000                |
| Little Colorado River direct.....               | .....                       | 2              | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                |
| Nutrioso Creek.....                             | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                |
| Concho Creek.....                               | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                |
| Other tributaries of Little Colorado River..... | .....                       | .....          | .....                          | 2             | 1,000                          | 1               | 1                              | 2       | 1,000                |
| Gila River and tributaries.....                 | 87.9                        | 298            | 14,044                         | 774           | 965,338                        | 525             | 19,087                         | 765     | 896,573              |
| Gila River direct.....                          | 1.0                         | .....          | .....                          | 78            | 78,531                         | 80              | 2,382                          | 84      | 92,581               |
| San Francisco River.....                        | 1.4                         | .....          | .....                          | 4             | 225                            | 11              | 70                             | 12      | 5,835                |
| San Pedro River.....                            | 5.1                         | 133            | 5,195                          | 25            | 11,474                         | 27              | 285                            | 20      | 12,949               |
| Santa Cruz River.....                           | 35.0                        | .....          | .....                          | 365           | 576,234                        | 241             | 8,073                          | 366     | 528,649              |
| Salt River and tributaries.....                 | 4.3                         | 1              | .....                          | 132           | 150,874                        | 75              | 2,653                          | 124     | 153,184              |
| Salt River direct.....                          | 1.5                         | .....          | .....                          | 72            | 75,319                         | 14              | 629                            | 60      | 75,719               |
| Tonto Creek.....                                | .....                       | .....          | .....                          | .....         | 500                            | 2               | 25                             | 2       | 1,500                |
| Rio Verde.....                                  | 1.8                         | 1              | .....                          | 3             | .....                          | 11              | 96                             | 11      | 1,070                |
| Other tributaries of Salt River.....            | 1.0                         | .....          | .....                          | 56            | 75,055                         | 48              | 1,903                          | 51      | 74,895               |
| Agua Fria River.....                            | 34.3                        | 1              | .....                          | 114           | 120,085                        | 41              | 4,749                          | 100     | 68,575               |
| Hassayampa River.....                           | 4.1                         | .....          | .....                          | 15            | 6,420                          | 13              | 204                            | 13      | 5,810                |
| Other tributaries of Gila River.....            | 2.7                         | 163            | 8,849                          | 41            | 29,895                         | 37              | 671                            | 37      | 21,990               |
| Other tributaries of Colorado River.....        | 0.1                         | .....          | .....                          | 6             | 700                            | 7               | 70                             | 7       | 700                  |
| Whitewater Draw and tributaries.....            | 5.1                         | 10             | 503                            | 209           | 72,787                         | 198             | 2,403                          | 209     | 73,967               |

## IRRIGATION—ARIZONA.

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP.                                    | AREA HARVESTED. |                              |        |                              |                                    | QUANTITY HARVESTED. |         |                              |           |                                    |
|--|-----------------|------------------------------|--------|------------------------------|------------------------------------|---------------------|---------|------------------------------|-----------|------------------------------------|
|  | 1919            |                              | 1909   |                              | Per cent of increase. <sup>1</sup> | Unit.               | 1919    |                              | 1909      | Per cent of increase. <sup>1</sup> |
|  | Acres.          | Per cent of total for state. | Acres. | Per cent of total for state. |                                    |                     | Amount. | Per cent of total for state. | Amount.   | Per cent of total for state.       |
| <b>Cereals:</b>                          |                 |                              |        |                              |                                    |                     |         |                              |           |                                    |
| 1 Corn.....                              | 8,612           | 38.9                         | 7,797  | 50.0                         | 10.5                               | Bu.....             | 205,909 | 46.1                         | 171,907   | 57.6                               |
| 2 Winter wheat.....                      | 28,895          | 93.0                         | 17,901 | 89.4                         | 79.6                               | Bu.....             | 682,332 | 94.5                         | 358,175   | 98.7                               |
| 3 Spring wheat.....                      | 3,250           | 53.7                         | 5,406  | 92.1                         | -17.7                              | Bu.....             | 65,378  | 58.6                         | 177,057   | 93.5                               |
| 4 Oats.....                              | 4,448           | 37.5                         | 32,208 | 98.1                         | -38.6                              | Bu.....             | 136,227 | 36.1                         | 1,001,611 | 99.3                               |
| 5 Barley.....                            | 19,811          | 91.1                         |        |                              |                                    | Bu.....             | 600,752 | 91.5                         |           |                                    |
| 6 Kafir and milo.....                    | 20,316          | 60.4                         |        |                              |                                    | Bu.....             | 609,333 | 71.7                         |           |                                    |
| <b>Hay and forage:</b>                   |                 |                              |        |                              |                                    |                     |         |                              |           |                                    |
| 7 Alfalfa.....                           | 97,094          | 88.6                         | 65,369 | 98.9                         | 48.5                               | Tons...             | 323,052 | 95.7                         | 194,171   | 99.8                               |
| 8 Other tame grasses.....                | 5,108           | 53.7                         | 437    | 20.0                         |                                    | Tons...             | 9,555   | 62.0                         | 438       | 14.7                               |
| 9 Annual legumes cut for hay.....        | 792             | 69.7                         | 15,266 | 80.1                         | -26.5                              | Tons...             | 1,081   | 72.6                         | 24,291    | 81.8                               |
| 10 Small grains cut for hay.....         | 10,424          | 45.1                         | 1,462  | 15.4                         | -28.2                              | Tons...             | 14,457  | 48.8                         | 1,756     | 21.5                               |
| 11 Wild, salt, or prairie grasses.....   | 1,050           | 12.6                         |        |                              |                                    | Tons...             | 1,096   | 14.0                         |           |                                    |
| 12 Silage crops.....                     | 5,634           | 77.7                         |        |                              |                                    | Tons...             | 36,130  | 84.1                         |           |                                    |
| 13 Corn cut for forage.....              | 3,074           | 35.4                         | (?)    |                              |                                    | Tons...             | 7,401   | 52.0                         | (?)       |                                    |
| 14 Kafir, sorghum, etc., for forage..... | 12,245          | 42.3                         | (?)    |                              |                                    | Tons...             | 23,183  | 52.6                         | (?)       |                                    |
| <b>Vegetables:</b>                       |                 |                              |        |                              |                                    |                     |         |                              |           |                                    |
| 15 Cantaloupes and muskmelons.....       | 3,123           | 94.6                         |        |                              |                                    |                     |         |                              |           |                                    |
| 16 Watermelons.....                      | 807             | 74.9                         |        |                              |                                    |                     |         |                              |           |                                    |
| 17 Potatoes.....                         | 1,011           | 40.4                         | 1,011  | 87.8                         |                                    | Bu.....             | 37,371  | 21.4                         | 66,351    | 68.3                               |
| <b>Miscellaneous:</b>                    |                 |                              |        |                              |                                    |                     |         |                              |           |                                    |
| 18 Clover and alfalfa seed *.....        | 4,217           | 87.2                         | 6,355  | 99.6                         | -33.6                              | Bu.....             | 28,193  | 90.0                         | 22,264    | 99.0                               |
| 19 Dry beans.....                        | 1,295           | 13.7                         | 759    | 33.0                         | 70.6                               | Bu.....             | 9,876   | 12.0                         | 6,863     | 37.2                               |
| 20 Cotton.....                           | 101,080         | 95.1                         |        |                              |                                    | Bales...            | 56,507  | 95.3                         |           |                                    |
| <b>Fruits:</b>                           |                 |                              |        |                              |                                    |                     |         |                              |           |                                    |
| 21 Grapes.....                           | 14,072          | 17.0                         | (?)    |                              |                                    | Lbs....             | 139,690 | 20.9                         | (?)       |                                    |
| 22 Apples.....                           | 30,749          | 43.8                         | (?)    |                              |                                    | Bu.....             | 54,643  | 45.2                         | (?)       |                                    |
| 23 Peaches.....                          | 32,880          | 32.3                         | (?)    |                              |                                    | Bu.....             | 49,942  | 36.1                         | (?)       |                                    |
| 24 Oranges.....                          | 32,196          | 69.0                         | (?)    |                              |                                    | Boxes...            | 48,764  | 61.2                         | (?)       |                                    |

| CROP.                                    | AVERAGE YIELD PER ACRE, 1919. |            |                       |                    |                                |  | VALUE.     |                              |           |                              |                       |
|--|-------------------------------|------------|-----------------------|--------------------|--------------------------------|--|------------|------------------------------|-----------|------------------------------|-----------------------|
|  | Unit.                         | For state. | On nonirrigated land. | On irrigated land. |                                |  | 1919       |                              | 1909      |                              | Per cent of increase. |
|  |                               |            |                       | Average.           | Per cent of average for state. | Per cent of average on non-irrigated land. | Amount.    | Per cent of total for state. | Amount.   | Per cent of total for state. |                       |
| <b>Cereals:</b>                          |                               |            |                       |                    |                                |  |            |                              |           |                              |                       |
| 1 Corn.....                              | Bu.....                       | 20.1       | 17.7                  | 23.9               | 118.9                          | 135.0                                      | \$401,523  | 46.1                         | \$158,993 | 54.1                         | 152.5                 |
| 2 Winter wheat.....                      | Bu.....                       | 28.2       | 18.2                  | 23.6               | 101.7                          | 129.7                                      | 1,508,364  | 94.5                         | 398,294   | 97.1                         | 332.4                 |
| 3 Spring wheat.....                      | Bu.....                       | 18.7       | 16.7                  | 20.4               | 109.1                          | 122.2                                      | 152,689    | 58.6                         |           |                              |                       |
| 4 Oats.....                              | Bu.....                       | 31.8       | 32.6                  | 30.6               | 96.2                           | 93.9                                       | 155,661    | 36.1                         | 127,003   | 97.4                         | 23.4                  |
| 5 Barley.....                            | Bu.....                       | 30.2       | 29.0                  | 30.3               | 100.3                          | 104.5                                      | 871,090    | 91.6                         | 711,251   | 99.5                         | 22.5                  |
| 6 Kafir and milo.....                    | Bu.....                       | 25.3       | 18.1                  | 30.0               | 118.6                          | 165.7                                      | 914,000    | 71.7                         |           |                              |                       |
| <b>Hay and forage:</b>                   |                               |            |                       |                    |                                |  |            |                              |           |                              |                       |
| 7 Alfalfa.....                           | Tons...                       | 3.08       | 1.16                  | 3.33               | 108.1                          | 287.1                                      | 7,914,774  | 95.7                         | 1,880,244 | 99.1                         | 320.9                 |
| 8 Other tame grasses.....                | Tons...                       | 1.62       | 1.33                  | 1.87               | 115.4                          | 140.6                                      | 181,545    | 62.0                         | 5,213     | 12.2                         |                       |
| 9 Annual legumes cut for hay.....        | Tons...                       | 1.31       | 1.13                  | 1.36               | 103.8                          | 115.3                                      | 21,620     | 72.6                         | 285,166   | 77.4                         | 26.7                  |
| 10 Small grains cut for hay.....         | Tons...                       | 1.28       | 1.20                  | 1.39               | 108.6                          | 115.8                                      | 339,740    | 48.8                         |           |                              |                       |
| 11 Wild, salt, or prairie grasses.....   | Tons...                       | 0.93       | 0.92                  | 1.04               | 111.8                          | 113.0                                      | 15,344     | 14.0                         | 13,459    | 16.4                         | 14.0                  |
| 12 Silage crops.....                     | Tons...                       | 5.92       | 4.22                  | 6.41               | 108.3                          | 151.9                                      | 343,235    | 84.1                         |           |                              |                       |
| 13 Corn cut for forage.....              | Tons...                       | 1.65       | 1.23                  | 2.43               | 147.3                          | 197.6                                      | 82,071     | 52.0                         | (?)       |                              |                       |
| 14 Kafir, sorghum, etc., for forage..... | Tons...                       | 1.52       | 1.25                  | 1.89               | 124.3                          | 151.2                                      | 347,745    | 52.6                         | (?)       |                              |                       |
| <b>Vegetables:</b>                       |                               |            |                       |                    |                                |  |            |                              |           |                              |                       |
| 15 Cantaloupes and muskmelons.....       |                               |            |                       |                    |                                |  | 428,855    | 92.1                         |           |                              |                       |
| 16 Watermelons.....                      |                               |            |                       |                    |                                |  | 80,501     | 73.4                         |           |                              |                       |
| 17 Potatoes.....                         | Bu.....                       | 69.6       | 91.7                  | 37.0               | 53.2                           | 40.3                                       | 93,428     | 21.4                         | 74,885    | 76.0                         | 24.8                  |
| <b>Miscellaneous:</b>                    |                               |            |                       |                    |                                |  |            |                              |           |                              |                       |
| 18 Clover and alfalfa seed *.....        | Bu.....                       | 6.5        | 5.1                   | 6.7                | 103.1                          | 131.4                                      | 592,053    | 90.0                         | 156,343   | 99.8                         | 278.7                 |
| 19 Dry beans.....                        | Bu.....                       | 8.7        | 8.9                   | 7.6                | 87.4                           | 85.4                                       | 46,417     | 12.0                         | 14,712    | 32.7                         | 215.5                 |
| 20 Cotton.....                           | Bales...                      | 0.56       | 0.54                  | 0.56               | 100.0                          | 103.7                                      | 19,176,213 | 95.3                         |           |                              |                       |
| <b>Fruits:</b>                           |                               |            |                       |                    |                                |  |            |                              |           |                              |                       |
| 21 Grapes.....                           | Lbs....                       | 8.1        | 7.7                   | 9.9                | 122.2                          | 128.6                                      | 8,381      | 20.9                         | (?)       |                              |                       |
| 22 Apples.....                           | Bu.....                       | 1.7        | 1.7                   | 1.8                | 105.9                          | 105.9                                      | 131,143    | 45.2                         | (?)       |                              |                       |
| 23 Peaches.....                          | Bu.....                       | 1.4        | 1.3                   | 1.5                | 107.1                          | 115.4                                      | 127,352    | 36.1                         | (?)       |                              |                       |
| 24 Oranges.....                          | Boxes...                      | 1.7        | 2.1                   | 1.5                | 88.2                           | 71.4                                       | 195,056    | 61.2                         | (?)       |                              |                       |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.<sup>2</sup> Not reported separately in 1909.<sup>3</sup> Not including red clover seed.<sup>4</sup> Number of vines of bearing age.<sup>5</sup> Number of trees of bearing age.<sup>6</sup> Yield per vine.<sup>7</sup> Yield per tree.



# IRRIGATION—ARIZONA.

11

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |   | THE STATE. | Apache.   | Cochise.  | Cocino.    | Gila.     | Graham, <sup>1</sup> | Greenlee, <sup>1</sup> |
|------------------------------|---|------------|-----------|-----------|------------|-----------|----------------------|------------------------|
| 1                            | Number of all farms in 1920.....  | 9,975      | 337       | 1,251     | 362        | 289       | 870                  | 262                    |
| 2                            | Number of farms irrigated in 1919.....  | 6,605      | 181       | 507       | 50         | 117       | 533                  | 199                    |
| 3                            | Per cent of all farms.....  | 66.2       | 53.7      | 40.5      | 13.8       | 40.5      | 61.3                 | 76.0                   |
| 4                            | Number of farms irrigated in 1909.....  | 4,841      | 181       | 293       | 38         | 251       | 705                  | .....                  |
| 5                            | Per cent of increase, 1909-1919.....  | 56.4       | — 1.6     | 73.0      | .....      | 53.4      | .....                | .....                  |
| <b>LAND AND FARM AREA.</b>   |   |            |           |           |            |           |                      |                        |
| 6                            | Approximate land area..... acres..  | 72,838,400 | 7,282,560 | 3,918,800 | 11,918,720 | 3,067,360 | 2,963,200            | 1,201,920              |
| 7                            | All land in farms..... acres..  | 5,862,126  | 717,898   | 998,212   | 164,669    | 35,752    | 165,691              | 24,383                 |
| 8                            | Improved land in farms..... acres..   | 712,803    | 27,452    | 120,229   | 19,827     | 8,909     | 38,632               | 7,990                  |
| 9                            | Area irrigated in 1919..... acres..   | 467,565    | 12,070    | 12,982    | 1,479      | 1,797     | 32,400               | 6,971                  |
| 10                           | Per cent of improved land in farms.....   | 65.6       | 44.0      | 10.8      | 7.5        | 24.2      | 83.9                 | 87.3                   |
| 11                           | Area irrigated in 1909..... acres..   | 320,651    | 8,853     | 4,900     | 901        | 2,778     | 38,824               | .....                  |
| 12                           | Per cent of increase, 1909-1919.....  | 46.1       | 36.3      | 161.9     | 64.2       | 53.3      | .....                | .....                  |
| 13                           | Area enterprises were capable of irrigating in 1920..... acres..  | 627,303    | 16,159    | 19,130    | 1,902      | 2,379     | 31,355               | 8,086                  |
| 14                           | Area enterprises were capable of irrigating in 1910..... acres..  | 387,655    | 9,330     | 6,488     | 1,183      | 3,272     | 41,223               | .....                  |
| 15                           | Per cent of increase, 1910-1920.....  | 61.8       | 73.2      | 194.9     | 60.8       | 27.3      | .....                | .....                  |
| 16                           | Area included in enterprises in 1920..... acres..   | 813,153    | 27,571    | 33,999    | 2,010      | 7,012     | 41,938               | 15,288                 |
| 17                           | Area included in enterprises in 1910..... acres..   | 911,090    | 34,807    | 14,141    | 3,223      | 4,233     | 52,143               | .....                  |
| 18                           | Per cent of increase, 1910-1920.....  | 13.9       | 20.8      | 140.4     | 36.7       | 65.7      | .....                | .....                  |
| 19                           | Area of irrigated land reported as available for settlement..... acres..                                    | 24,311     | .....     | 2,100     | .....      | .....     | 3,407                | .....                  |
| <b>IRRIGATION WORKS.</b>     |   |            |           |           |            |           |                      |                        |
| Independent enterprises:     |   |            |           |           |            |           |                      |                        |
| 20                           | Number, 1920.....   | 1,388      | 39        | 328       | 21         | 83        | 100                  | 69                     |
| 21                           | Number, 1910.....   | 1,269      | 64        | 214       | 20         | 117       | 100                  | .....                  |
| Main ditches:                |   |            |           |           |            |           |                      |                        |
| 22                           | Number, 1920.....   | 1,295      | 55        | 303       | 26         | 83        | 96                   | 72                     |
| 23                           | Number, 1910.....   | 891        | 67        | 71        | 20         | 102       | 124                  | .....                  |
| 24                           | Length, 1920..... miles..   | 1,769      | 97        | 266       | 24         | 93        | 180                  | 70                     |
| 25                           | Length, 1910..... miles..   | 1,727      | 112       | 94        | 17         | 90        | 216                  | .....                  |
| 26                           | Capacity, 1920..... second-feet..   | 11,707     | 249       | 837       | 49         | 162       | 881                  | 232                    |
| 27                           | Capacity, 1910..... second-feet..   | 17,200     | 577       | 310       | 49         | 453       | 1,075                | .....                  |
| Laterals:                    |   |            |           |           |            |           |                      |                        |
| 28                           | Number, 1920.....   | 1,174      | 24        | 124       | 20         | 3         | 208                  | .....                  |
| 29                           | Number, 1910.....   | 313        | 46        | 3         | 25         | 11        | 10                   | .....                  |
| 30                           | Length, 1920..... miles..   | 1,599      | 27        | 23        | 11         | 2         | 181                  | .....                  |
| 31                           | Length, 1910..... miles..   | 870        | 40        | 2         | 20         | 5         | 14                   | .....                  |
| Reservoirs:                  |   |            |           |           |            |           |                      |                        |
| 32                           | Number, 1920.....   | 339        | 36        | 165       | 4          | 2         | 56                   | 2                      |
| 33                           | Number, 1910.....   | 402        | 32        | 170       | 11         | 3         | 73                   | .....                  |
| 34                           | Capacity, 1920..... acre-feet..   | 1,503,856  | 45,614    | 86,017    | 13         | 1         | 1,471                | .....                  |
| 35                           | Capacity, 1910..... acre-feet..   | 1,319,938  | 39,456    | 68        | 5,428      | 1         | 2,950                | .....                  |
| Flowing wells:               |   |            |           |           |            |           |                      |                        |
| 36                           | Number, 1920.....   | 310        | .....     | 204       | .....      | .....     | 95                   | .....                  |
| 37                           | Number, 1910.....   | 214        | .....     | 90        | .....      | .....     | 117                  | .....                  |
| 38                           | Capacity, 1920..... gallons per minute..  | 14,547     | .....     | 9,643     | .....      | .....     | 4,054                | .....                  |
| 39                           | Capacity, 1910..... gallons per minute..  | 9,053      | .....     | 2,959     | .....      | .....     | 6,799                | .....                  |
| Pumped wells:                |   |            |           |           |            |           |                      |                        |
| 40                           | Number, 1920.....   | 999        | 2         | 255       | .....      | 18        | 4                    | 14                     |
| 41                           | Number, 1910.....   | 470        | 4         | 191       | .....      | 10        | 9                    | .....                  |
| 42                           | Capacity, 1920..... gallons per minute..  | 1,012,590  | 1,000     | 90,531    | .....      | 5,930     | 1,880                | 3,125                  |
| 43                           | Capacity, 1910..... gallons per minute..  | 765,921    | 65        | 27,185    | .....      | 2,858     | 4,002                | .....                  |
| Pumping plants:              |   |            |           |           |            |           |                      |                        |
| 44                           | Number, 1920.....   | 714        | 1         | 241       | 2          | 19        | 10                   | 21                     |
| 45                           | Number, 1910.....   | 429        | 4         | 191       | .....      | 11        | 19                   | .....                  |
| 46                           | Engine capacity, 1920..... horsepower..   | 22,014     | 15        | 2,909     | 50         | 146       | 104                  | 126                    |
| 47                           | Engine capacity, 1910..... horsepower..   | 37,258     | 7         | 4,330     | .....      | 43        | 1,248                | .....                  |
| 48                           | Pump capacity, 1920..... gallons per minute..   | 1,018,030  | 1,000     | 91,556    | 30         | 5,900     | 11,030               | 8,735                  |
| 49                           | Pump capacity, 1910..... gallons per minute..   | 851,873    | 65        | 27,185    | .....      | 2,908     | 8,517                | .....                  |
| 50                           | Average lift, 1920..... feet..  | 44         | 30        | 43        | 22         | 24        | 18                   | 40                     |
| <b>CAPITAL INVESTED.</b>     |   |            |           |           |            |           |                      |                        |
| 51                           | Capital invested to Jan. 1, 1920..... dollars..   | 33,498,094 | 275,010   | 611,883   | 72,317     | 59,749    | 915,403              | 75,158                 |
| 52                           | Capital invested to July 1, 1910..... dollars..   | 17,677,066 | 231,838   | 513,333   | 42,266     | 38,667    | 335,071              | .....                  |
| 53                           | Per cent of increase, 1910-1920.....  | 89.5       | 17.1      | 19.2      | 71.1       | 54.5      | .....                | .....                  |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 53.40      | 17.02     | 31.99     | 38.02      | 25.12     | 27.52                | 9.29                   |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 45.60      | 25.17     | 79.12     | 35.73      | 11.82     | 8.15                 | .....                  |
| <b>ESTIMATED FINAL COST.</b> |   |            |           |           |            |           |                      |                        |
| 56                           | Estimated final cost of existing enterprises in 1920..... dollars..   | 34,615,064 | 283,240   | 635,248   | 72,317     | 60,749    | 995,803              | 77,758                 |
| 57                           | Estimated final cost of existing enterprises in 1910..... dollars..   | 24,828,808 | 384,898   | 513,333   | 42,266     | 38,667    | 346,721              | .....                  |
| 58                           | Per cent of increase, 1910-1920.....  | 39.4       | 26.1      | 23.7      | 71.1       | 57.1      | .....                | .....                  |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 42.57      | 10.27     | 18.68     | 35.45      | 8.66      | 23.74                | 5.09                   |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 26.30      | 11.06     | 36.30     | 13.11      | 9.13      | 6.65                 | .....                  |

<sup>1</sup> Part of Graham County taken to form Greenlee County in 1911.

## IRRIGATION—ARIZONA.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |  | Maricopa.  | Mohave.   | Navajo.   | Pima.     | Pinal.    | Santa Cruz. | Yavapai.  | Yuma.     |
|------------------------------|--|------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|
| 1                            | Number of all farms in 1920.....   | 3,930      | 130       | 341       | 434       | 203       | 248         | 508       | 630       |
| 2                            | Number of farms irrigated in 1919.....   | 3,384      | 59        | 183       | 228       | 213       | 63          | 329       | 559       |
| 3                            | Per cent of all farms.....   | 80.1       | 45.4      | 53.7      | 52.5      | 72.7      | 25.4        | 55.0      | 88.7      |
| 4                            | Number of farms irrigated in 1909.....   | 1,720      | 44        | 181       | 188       | 570       | 75          | 297       | 229       |
| 5                            | Per cent of increase, 1909-1919.....   | 90.1       | .....     | 1.1       | 21.3      | -62.0     | .....       | 10.8      | 144.1     |
| <b>LAND AND FARM AREA.</b>   |  |            |           |           |           |           |             |           |           |
| 6                            | Approximate land area.....acres..  | 5,680,240  | 8,569,600 | 6,335,360 | 6,083,200 | 3,443,200 | 786,560     | 5,210,000 | 6,391,680 |
| 7                            | All land in farms.....acres..  | 802,390    | 31,022    | 1,213,020 | 413,278   | 152,643   | 150,593     | 874,490   | 57,440    |
| 8                            | Improved land in farms.....acres..   | 279,334    | 6,317     | 23,753    | 36,785    | 41,876    | 24,929      | 30,811    | 40,959    |
| 9                            | Area irrigated in 1919.....acres..   | 282,130    | 2,342     | 5,832     | 16,883    | 28,647    | 2,608       | 11,566    | 49,855    |
| 10                           | Per cent of improved land in farms.....  | 101.0      | 37.1      | 24.6      | 47.2      | 68.4      | 19.5        | 31.4      | 121.7     |
| 11                           | Area irrigated in 1909.....acres..   | 190,052    | 1,688     | 6,458     | 10,160    | 25,431    | 4,773       | 8,571     | 7,662     |
| 12                           | Per cent of increase, 1909-1919.....   | 41.7       | 38.7      | -9.7      | 66.2      | 12.6      | -45.4       | 34.9      | 550.7     |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 394,590    | 2,672     | 6,596     | 25,443    | 34,706    | 3,413       | 13,382    | 64,481    |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 236,061    | 8,720     | 8,276     | 11,870    | 31,100    | 4,895       | 9,538     | 15,687    |
| 15                           | Per cent of increase, 1910-1920.....   | 67.2       | -69.4     | -20.3     | 114.2     | 11.6      | -30.3       | 40.3      | 311.0     |
| 16                           | Area included in enterprises in 1920.....acres..   | 409,967    | 3,395     | 11,056    | 40,978    | 65,709    | 7,162       | 17,108    | 128,940   |
| 17                           | Area included in enterprises in 1910.....acres..   | 455,361    | 40,624    | 24,997    | 24,484    | 89,400    | 6,872       | 16,588    | 177,217   |
| 18                           | Per cent of increase, 1910-1920.....   | -10.0      | -91.6     | -52.2     | 67.4      | -26.4     | 4.2         | 3.1       | -27.2     |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | 5,980      | .....     | .....     | 5,134     | 7,720     | .....       | .....     | .....     |
| <b>IRRIGATION WORKS.</b>     |  |            |           |           |           |           |             |           |           |
| Independent enterprises:     |  |            |           |           |           |           |             |           |           |
| 20                           | Number, 1920.....  | 105        | 63        | 18        | 125       | 167       | 10          | 224       | 27        |
| 21                           | Number, 1910.....  | 88         | 57        | 17        | 110       | 77        | 66          | 196       | 23        |
| Main ditches:                |  |            |           |           |           |           |             |           |           |
| 22                           | Number, 1920.....  | 85         | 58        | 28        | 107       | 175       | 20          | 169       | 18        |
| 23                           | Number, 1910.....  | 64         | 57        | 28        | 53        | 67        | 45          | 176       | 17        |
| 24                           | Length, 1920.....miles..   | 305        | 34        | 50        | 129       | 229       | 28          | 159       | 86        |
| 25                           | Length, 1910.....miles..   | 433        | 61        | 87        | 70        | 179       | 64          | 211       | 93        |
| 26                           | Capacity, 1920.....second-feet..   | 6,371      | 46        | 94        | 449       | 940       | 102         | 492       | 801       |
| 27                           | Capacity, 1910.....second-feet..   | 7,468      | 336       | 98        | 698       | 2,353     | 170         | 752       | 2,822     |
| Laterals:                    |  |            |           |           |           |           |             |           |           |
| 28                           | Number, 1920.....  | 352        | 14        | 14        | 134       | 10        | .....       | 66        | 199       |
| 29                           | Number, 1910.....  | 29         | 46        | 50        | 9         | 36        | 12          | 24        | 12        |
| 30                           | Length, 1920.....miles..   | 1,019      | 2         | 14        | 61        | 15        | .....       | 11        | 233       |
| 31                           | Length, 1910.....miles..   | 525        | 7         | 40        | 4         | 57        | 12          | 9         | 135       |
| Reservoirs:                  |  |            |           |           |           |           |             |           |           |
| 32                           | Number, 1920.....  | 5          | 5         | 8         | 18        | 9         | 6           | 22        | 1         |
| 33                           | Number, 1910.....  | 17         | 9         | 11        | 27        | 5         | 10          | 31        | 3         |
| 34                           | Capacity, 1920.....acre-feet..   | 1,367,305  | 338       | 2,410     | 360       | 57        | 51          | 269       | 10        |
| 35                           | Capacity, 1910.....acre-feet..   | 1,284,013  | 3,124     | 3,428     | 135       | 9,061     | 135         | 1,235     | 4         |
| Flowing wells:               |  |            |           |           |           |           |             |           |           |
| 36                           | Number, 1920.....  | .....      | .....     | 2         | 6         | 1         | .....       | 2         | .....     |
| 37                           | Number, 1910.....  | .....      | .....     | 1         | .....     | .....     | .....       | 6         | .....     |
| 38                           | Capacity, 1920.....gallons per minute..  | .....      | .....     | .....     | 350       | 500       | .....       | .....     | .....     |
| 39                           | Capacity, 1910.....gallons per minute..  | .....      | .....     | 20        | .....     | .....     | .....       | 175       | .....     |
| Pumped wells:                |  |            |           |           |           |           |             |           |           |
| 40                           | Number, 1920.....  | 238        | 11        | 1         | 248       | 136       | 16          | 26        | 30        |
| 41                           | Number, 1910.....  | 95         | 3         | 1         | 68        | 25        | 21          | 25        | 15        |
| 42                           | Capacity, 1920.....gallons per minute..  | 288,339    | 1,515     | .....     | 454,765   | 149,090   | 15,600      | 5,460     | 23,345    |
| 43                           | Capacity, 1910.....gallons per minute..  | 617,790    | 2,170     | 700       | 38,820    | 48,875    | 17,242      | 3,047     | 3,158     |
| Pumping plants:              |  |            |           |           |           |           |             |           |           |
| 44                           | Number, 1920.....  | 95         | 11        | 1         | 136       | 124       | 14          | 36        | 33        |
| 45                           | Number, 1910.....  | 55         | 6         | 2         | 62        | 21        | 20          | 21        | 14        |
| 46                           | Engine capacity, 1920.....horsepower..   | 7,945      | 90        | .....     | 3,990     | 4,040     | 343         | 191       | 1,165     |
| 47                           | Engine capacity, 1910.....horsepower..   | 26,781     | 112       | 25        | 769       | 779       | 345         | 70        | 2,743     |
| 48                           | Pump capacity, 1920.....gallons per minute..   | 243,334    | 1,700     | .....     | 408,581   | 148,924   | 15,200      | 6,005     | 102,945   |
| 49                           | Pump capacity, 1910.....gallons per minute..   | 617,790    | 10,224    | 2,020     | 39,243    | 48,875    | 17,242      | 4,071     | 73,733    |
| 50                           | Average lift, 1920.....feet..  | 72         | 20        | .....     | 38        | 48        | 25          | 37        | 23        |
| <b>CAPITAL INVESTED.</b>     |  |            |           |           |           |           |             |           |           |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 17,491,021 | 86,612    | 246,783   | 4,549,400 | 801,345   | 116,050     | 523,638   | 7,553,725 |
| 52                           | Capital invested to July 1, 1910.....dollars..   | 10,759,817 | 85,948    | 258,803   | 427,077   | 631,934   | 58,061      | 219,770   | 4,071,401 |
| 53                           | Per cent of increase, 1910-1920.....   | 62.6       | 0.8       | -4.6      | 965.2     | 41.1      | 99.9        | 138.3     | 85.5      |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 44.33      | 32.41     | 37.41     | 178.81    | 25.68     | 34.00       | 39.13     | 117.15    |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 45.58      | 9.85      | 31.27     | 35.96     | 20.32     | 11.86       | 23.04     | 259.55    |
| <b>ESTIMATED FINAL COST.</b> |  |            |           |           |           |           |             |           |           |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 17,517,921 | 88,112    | 264,283   | 4,595,575 | 893,345   | 119,050     | 655,888   | 8,355,775 |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 13,418,557 | 320,248   | 299,615   | 427,077   | 631,934   | 58,061      | 224,770   | 8,122,491 |
| 58                           | Per cent of increase, 1910-1920.....   | 30.5       | -72.5     | -11.9     | 976.1     | 41.4      | 105.1       | 191.8     | 2.0       |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 42.73      | 25.95     | 22.10     | 112.15    | 13.58     | 16.62       | 38.34     | 64.80     |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 29.47      | 7.88      | 12.00     | 17.44     | 7.07      | 8.45        | 13.55     | 45.83     |

# FOURTEENTH CENSUS OF THE UNITED STATES: 1920

DEPARTMENT  
OF COMMERCE

## BULLETIN

BUREAU OF  
THE CENSUS

### IRRIGATION : ARKANSAS

#### STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

#### CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 4     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 5     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 5     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 6     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 7     |
| FARMS AND ACREAGE IRRIGATED:                           |       |  |       |
| Acreage, by character of enterprise.....               | 4     |  |       |
| Acreage, by drainage basin.....                        | 4     |  |       |

#### INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Arkansas collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

Rice is the only crop grown under irrigation in Arkansas, with the exception of a few small tracts in other crops, and practically all the rice grown in the state is irrigated. The area harvested in 1919 is reported as 143,211 acres, the quantity of rough rice produced 6,797,126 bushels, and the value \$18,352,240.

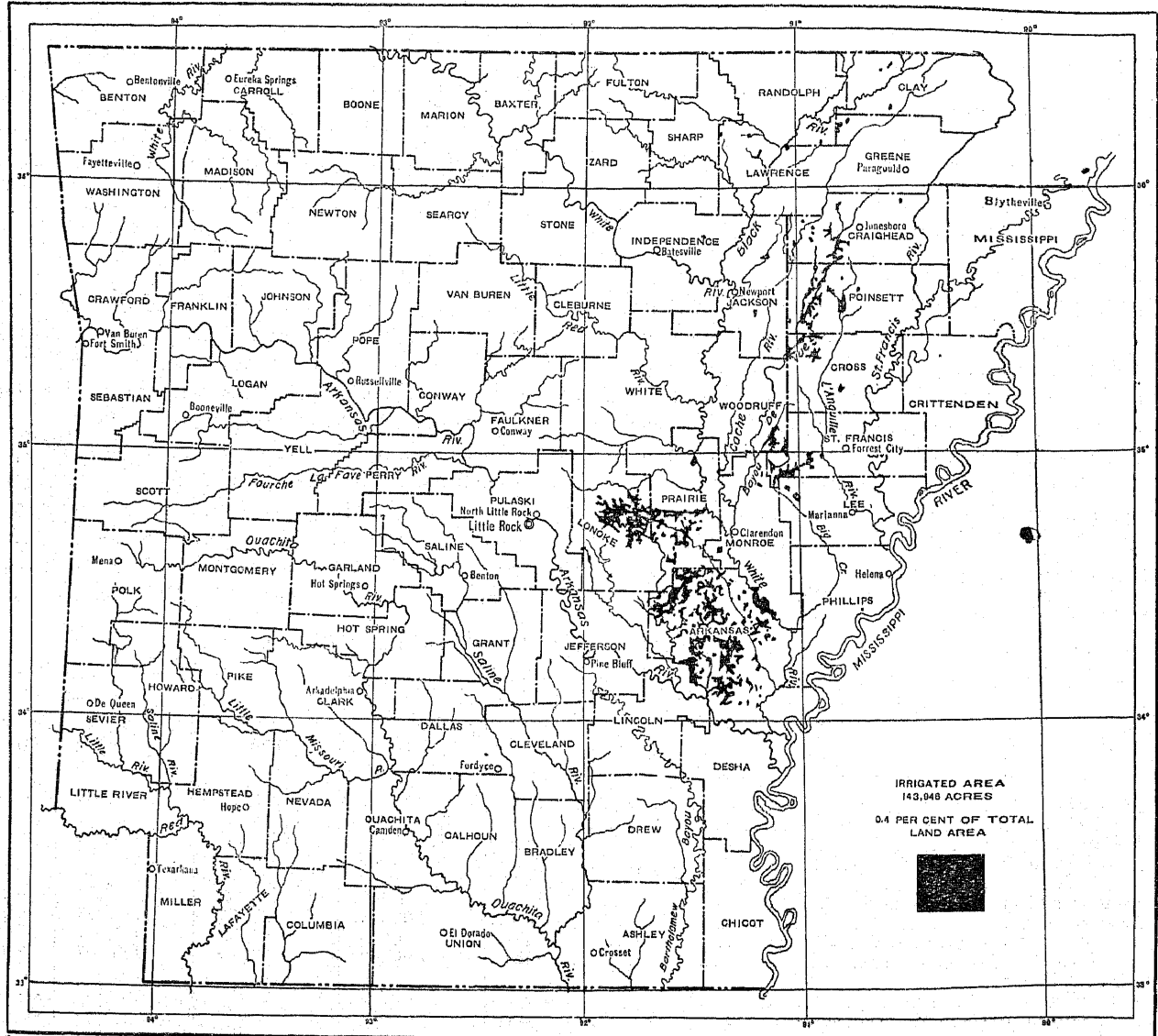
TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—    |              | INCREASE.     |                        |
|--|---------------|--------------|---------------|------------------------|
|  | 1920          | 1910         | Amount.       | Per cent. <sup>1</sup> |
| Number of all farms.....   | 232, 604      | 214, 678     | 17, 926       | 8. 4                   |
| Approximate land area of the state..... acres..  | 33, 616, 000  | 33, 616, 000 |               |                        |
| All land in farms..... acres..   | 17, 456, 750  | 17, 416, 075 | 40, 675       | 0. 2                   |
| Improved land in farms..... acres..  | 9, 210, 556   | 8, 076, 254  | 1, 134, 302   | 14. 0                  |
| Number of farms irrigated.....   | 1, 166        | 232          | 934           | 402. 6                 |
| Area irrigated..... acres..  | 143, 946      | 27, 753      | 116, 193      | 418. 7                 |
| Area enterprises were capable of irrigating..... acres..                               | 179, 013      | 47, 136      | 131, 877      | 279. 8                 |
| Area included in enterprises..... acres..  | 246, 480      | 52, 883      | 193, 597      | 366. 1                 |
| Per cent irrigated:  |               |              |               |                        |
| Number of all farms.....   | 0. 5          | 0. 1         | 0. 4          |                        |
| Approximate land area of state.....  | 0. 4          | 0. 1         | 0. 3          |                        |
| Land in farms.....   | 0. 8          | 0. 2         | 0. 6          |                        |
| Improved land in farms.....  | 1. 6          | 0. 3         | 1. 3          |                        |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 35, 067       | 19, 383      | 15, 684       | 80. 9                  |
| Excess of area included in enterprises over area irrigated..... acres..                | 102, 534      | 25, 130      | 77, 404       | 308. 0                 |
| Capital invested.....  | \$7, 183, 322 | \$587, 834   | \$6, 595, 488 |                        |
| Average per acre enterprises were capable of irrigating.....                           | \$40. 13      | \$12. 47     | \$27. 66      | 221. 8                 |
| Estimated final cost of existing enterprises.....                                      | \$7, 283, 522 | \$612, 834   | \$6, 670, 688 |                        |
| Average per acre included in enterprises.....  | \$29. 55      | \$11. 59     | \$17. 96      | 155. 0                 |
| Average cost of operation and maintenance per acre.....                                | \$13. 67      |              |               |                        |

<sup>1</sup> Per cent not shown when more than 1,000.

# ARKANSAS

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

The rainfall in Arkansas is sufficient for the growing of general crops without irrigation, the annual average being about 47 inches.

The rainfall for the year 1919 was about 7 inches above the normal, and rice was damaged to some extent by rain during harvest.

## WATER SUPPLY FOR IRRIGATION.

Arkansas is abundantly supplied with streams, but about 94 per cent of the rice is watered from wells, from which the water is pumped. The average lift is about 50 feet, and there seems to be sufficient water for all the land that the farmers care to irrigate.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED: 1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                                     |                        | AREA IRRIGATED. |                                     |                              |                            |                                      |
|--------------|------------------|-------------------------------------|------------------------|-----------------|-------------------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. <sup>1</sup> | Per cent of all farms. | Acres.          | Per cent of in-crease. <sup>1</sup> | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 1,166            | 402.6                               | 0.5                    | 143,946         | 418.7                               | 0.4                          | 0.8                        | 1.6                                  |
| 1910.....    | 232              | .....                               | 0.1                    | 27,753          | .....                               | 0.1                          | 0.2                        | 0.3                                  |
| 1900.....    | 20               | .....                               | ( <sup>2</sup> )       | 25              | .....                               | ( <sup>2</sup> )             | ( <sup>2</sup> )           | ( <sup>2</sup> )                     |
| 1890.....    | .....            | .....                               | .....                  | 9               | .....                               | ( <sup>2</sup> )             | ( <sup>2</sup> )           | ( <sup>2</sup> )                     |

<sup>1</sup> Per cent not shown when base is less than 100.

<sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area included in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                      | Area enter-prises were capable of irrigating in 1920 (acres). |
|--------------------|--------------------------|--|-------------------------|--------------------------------------|---|
|                    |                          |  | Acres.                  | Per cent of acreage in enter-prises. |   |
| Total.....         | 944                      | 246,480                                      | 143,946                 | 58.4                                 | 179,013   |
| 1890-1899.....     | 3                        | 2,400  | 1,640                   | 68.3                                 | 1,640   |
| 1900-1904.....     | 2                        | 700  | 470                     | 67.1                                 | 550   |
| 1905-1909.....     | 68                       | 19,230                                       | 11,840                  | 61.6                                 | 14,304  |
| 1910-1914.....     | 335                      | 92,862                                       | 49,100                  | 52.9                                 | 61,227  |
| 1915-1919.....     | 447                      | 105,869                                      | 64,474                  | 60.9                                 | 79,108  |
| Not reported.....  | 89                       | 25,419                                       | 16,422                  | 64.6                                 | 22,181  |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY: 1919 AND 1909.

| CLASS.                                    | AREA IRRIGATED (ACRES). |                  |                        |              | Area enter-prises were ca-<br>pable of<br>irrigating<br>in 1920<br>(acres). | Area<br>included<br>in enter-<br>prises,<br>1920<br>(acres). |
|---|-------------------------|------------------|------------------------|--------------|---|--|
|   | 1919                    | 1909             | Increase. <sup>1</sup> |              |   |  |
|   |                         |                  | Amount.                | Per<br>cent. |   |  |
| Total.....                                | 143,946                 | 27,733           | 116,193                | 418.7        | 179,013   | 246,480  |
| Stream, gravity.....                      | 120                     | 2,542            | -2,422                 | -95.3        | 220   | 220  |
| Stream, pumped.....                       | 6,009                   | 543              | 5,466                  | -----        | 6,585   | 6,825  |
| Wells, pumped.....                        | 135,260                 | 24,398           | 110,862                | 454.4        | 168,548   | 235,620  |
| Lake, pumped.....                         | 450                     | 270              | 180                    | 66.7         | 950   | 950  |
| Stored storm water....                    | 40                      | ( <sup>2</sup> ) | 40                     | -----        | 55  | 55   |
| Stream, gravity, and<br>pumped wells..... | 250                     | ( <sup>2</sup> ) | 250                    | -----        | 300   | 300  |
| Other mixed.....                          | 1,817                   | ( <sup>2</sup> ) | 1,817                  | -----        | 2,355   | 2,510  |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.

<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

The state of Arkansas has no legislation regarding the organization of enterprises for supplying water for irrigation, and, as shown by Table 5, almost the entire area irrigated is supplied with water by individual or partnership enterprises. With a very few exceptions, each rice grower has his own well and pumping plant.

Neither the Federal Carey Act (act of Aug. 18, 1894) nor the Federal reclamation act (act of June 17, 1902) applies to this state.

The acreage irrigated in 1909 was not reported in this way, but in that year, as in 1919, the irrigated land was practically all supplied with water from private wells.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| ITEM.   | Total acreage. | CHARACTER OF ENTERPRISE.     |               |              |
|---|----------------|------------------------------|---------------|--------------|
|   |                | Individual and part-nership. | Coopera-tive. | Com-mercial. |
| Acreage irrigated.....                              | 143,946        | 140,471                      | 1,075         | 2,400        |
| Acreage enterprises were capable of irrigating..... | 179,013        | 175,388                      | 1,275         | 2,400        |
| Acreage included in enterprises.....                | 246,480        | 242,380                      | 1,500         | 2,600        |

## ACREAGE, BY DRAINAGE BASIN.

In Table 6 the acreage figures are presented by the drainage basins in which the land lies. The figures for Arkansas have not been presented in this form in the report of any previous census, consequently no comparisons can be made. The rice-growing industry in Arkansas has been developed since 1902, when a special census was taken, for which the results were presented by drainage basins.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919.

| DRAINAGE BASIN.        | Area irri-gated in 1919 (acres). | Area includ-ed in enter-prises, 1920 (acres). | Area enter-prises were capable of irrigating in 1920 (acres). |
|------------------------|----------------------------------|---|---|
| Total.....             | 143,946                          | 246,480                                       | 179,013   |
| Red River.....         | 500                              | 500   | 500   |
| Ouachita River.....    | 42                               | 140   | 105   |
| White River.....       | 74,918                           | 131,346                                       | 95,709  |
| Arkansas River.....    | 63,521                           | 100,296                                       | 76,779  |
| St. Francis River..... | 4,965                            | 14,198  | 5,920   |

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 7.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1910 AND 1920.

| CENSUS YEAR. | Amount.     | AVERAGE PER ACRE. |                       |
|--------------|-------------|-------------------|-----------------------|
|              |             | Amount.           | Per cent of increase. |
| 1920.....    | \$7,183,322 | \$40.13           | 221.8                 |
| 1910.....    | 587,834     | 12.47             | .....                 |

TABLE 8.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.     | Per cent of total. | Average per acre. |
|--------------------|-------------|--------------------|-------------------|
| Total.....         | \$7,183,322 | 100.0              | \$40.13           |
| 1890-1899.....     | 93,111      | 1.3                | 56.78             |
| 1900-1904.....     | 25,026      | 0.3                | 45.50             |
| 1905-1909.....     | 459,542     | 6.4                | 32.13             |
| 1910-1914.....     | 2,276,584   | 31.7               | 37.18             |
| 1915-1919.....     | 3,302,492   | 46.0               | 41.75             |
| Not reported.....  | 1,026,597   | 14.3               | 46.28             |

TABLE 9.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                 | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|--|-------------------------|--------------------|-------------------|--|-------------------------------------|
|  | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                             | \$7,183,322             | 100.0              | \$40.13           | 99,255                                   | \$13.67                             |
| Stream, gravity.....                   | 3,874                   | 0.1                | 17.61             | .....                                    | .....                               |
| Stream, pumped.....                    | 96,450                  | 1.3                | 14.65             | 3,309                                    | 7.06                                |
| Wells, pumped.....                     | 7,028,773               | 97.8               | 41.70             | 93,471                                   | 14.06                               |
| Lake, pumped.....                      | 9,500                   | 0.1                | 10.00             | 450                                      | 11.78                               |
| Stored storm water.....                | 1,500                   | (?)                | 27.27             | 40                                       | 10.00                               |
| Stream, gravity, and pumped wells..... | 8,500                   | 0.1                | 28.33             | 170                                      | 30.15                               |
| Other mixed.....                       | 34,725                  | 0.5                | 14.75             | 1,815                                    | 4.16                                |

<sup>1</sup> Based on area irrigated in 1919.      \* Less than one-tenth of 1 per cent.

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$7,183,322             | 100.0              | 99,255                                   | \$13.67                             |
| Individual and partnership..... | 7,073,297               | 98.5               | 99,255                                   | 13.67                               |
| Cooperative.....                | 60,013                  | 0.8                | .....                                    | .....                               |
| Commercial.....                 | 50,012                  | 0.7                | .....                                    | .....                               |

<sup>1</sup> Based on area irrigated in 1919.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.        | 1920        |
|------------------------|-------------|
| Total.....             | \$7,183,322 |
| Red River.....         | 20,006      |
| Ouachita River.....    | 1,100       |
| White River.....       | 3,992,967   |
| Arkansas River.....    | 2,950,522   |
| St. Francis River..... | 218,727     |

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 12 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 12.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |        |
|--|--------|
| Number of enterprises reporting land drained or needing drainage.....  | 134    |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 37,574 |
| Acreage for which drains have been installed.....  | 27,350 |
| Additional acreage needing drainage.....   | 2,821  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 72.8   |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 11.1   |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 12.2   |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. None of the water used in 1919 was measured, and quantities are probably taken from the rated capacities of the pumps and the time the pumps were operated. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 13.—QUANTITY OF WATER USED IN 1919.

|   |        |
|---|--------|
| Average volume of water entering canals.....second-feet.. | 550    |
| Area irrigated in 1919.....acres..                        | 12,685 |
| Average number of acres per second-foot.....              | 23     |
| Total quantity of water entering canals.....acre-feet..   | 50,859 |
| Area irrigated in 1919.....acres..                        | 12,720 |
| Average quantity per acre.....acre-feet..                 | 4.0    |
| Total quantity of water delivered.....acre-feet..         | 13,089 |
| Area irrigated in 1919.....acres..                        | 5,189  |
| Average quantity per acre.....acre-feet..                 | 2.5    |



## IRRIGATION—ARKANSAS.

## IRRIGATION WORKS.

TABLE 14.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                    |                           |                         |               |                         |                 |                  |                 |             |                       |                             |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....         | 63                        | 17                      | 84            | 1,205                   | 68              | 50               | 18              | 16          | 20                    | 0.4                         | 1,089         | 1,470,147                      | 1,041           | 58,332                         | 1,121   | 1,654,097                      |
| 1890-1899.....     |                           |                         |               |                         |                 |                  |                 |             |                       |                             | 8             | 9,400                          | 7               | 460                            | 8       | 6,400                          |
| 1900-1904.....     |                           |                         |               |                         |                 |                  |                 |             |                       |                             | 3             | 4,200                          | 3               | 185                            | 3       | 4,200                          |
| 1905-1909.....     | 1                         | 1                       | 9             | 67                      | 15              | 1                | 2               | 3           |                       |                             | 80            | 106,050                        | 79              | 4,547                          | 80      | 144,450                        |
| 1910-1914.....     | 13                        | 4                       | 37            | 210                     | 29              | 20               | 10              | 6           |                       |                             | 389           | 499,100                        | 371             | 20,036                         | 398     | 591,200                        |
| 1915-1919.....     | 49                        | 12                      | 36            | 916                     | 21              | 29               | 6               | 6           |                       | 0.4                         | 459           | 633,655                        | 462             | 26,744                         | 476     | 632,005                        |
| Not reported.....  |                           |                         | 2             | 12                      | 3               |                  |                 | 1           | 20                    |                             | 150           | 217,742                        | 119             | 6,360                          | 156     | 215,842                        |

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                      | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|-----------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                             |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                             |                           |                         |               |                         |                 |                  |                 |             |                       |                             |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....                  | 63                        | 17                      | 84            | 1,205                   | 68              | 50               | 18              | 16          | 20                    | 0.4                         | 1,080         | 1,470,147                      | 1,041           | 58,332                         | 1,121   | 1,654,097                      |
| Individual and partnership. | 63                        | 17                      | 82            | 1,160                   | 59              | 50               | 18              | 16          | 20                    | 0.4                         | 1,081         | 1,455,617                      | 1,031           | 57,592                         | 1,111   | 1,620,097                      |
| Cooperative                 |                           |                         |               |                         |                 |                  |                 |             |                       |                             | 8             | 14,500                         | 8               | 530                            | 8       | 14,000                         |
| Commercial                  |                           |                         | 2             | 45                      | 0               |                  |                 |             |                       |                             |               |                                | 2               | 300                            | 2       | 20,000                         |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.        | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |                      |
|------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|----------------------|
|                        |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                | Average lift (feet). |
|                        |                           |                         |               |                         |                 |                  |                 |             |                       |                             |               |                                |                 |                                | Number. | Capacity (gallons per minute). |                      |
| Total.....             | 63                        | 17                      | 84            | 1,205                   | 68              | 50               | 18              | 16          | 20                    | 0.4                         | 1,089         | 1,470,147                      | 1,041           | 58,332                         | 1,121   | 1,654,097                      | 50                   |
| Red River.....         | 1                         |                         | 1             |                         |                 |                  |                 |             |                       |                             | 3             | 1,200                          | 1               |                                | 3       | 2,500                          | 35                   |
| Ouachita River.....    |                           |                         |               |                         |                 |                  |                 |             |                       | 0.4                         |               |                                |                 |                                |         |                                |                      |
| White River.....       | 62                        | 14                      | 58            | 1,067                   | 49              | 40               | 11              | 5           |                       |                             | 626           | 820,388                        | 584             | 30,537                         | 633     | 858,688                        | 50                   |
| Arkansas River.....    |                           | 3                       | 24            | 136                     | 19              | 10               | 7               | 11          | 20                    |                             | 404           | 575,500                        | 404             | 25,572                         | 421     | 714,459                        | 53                   |
| St. Francis River..... |                           |                         | 1             | 2                       |                 |                  |                 |             |                       |                             | 56            | 73,050                         | 52              | 2,223                          | 64      | 78,450                         | 31                   |



# IRRIGATION—ARKANSAS.

7

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |   | THE STATE. | Arkansas. | Clay. <sup>1</sup> | Craighead.       | Cross.           | Jackson. <sup>1</sup> | Lawrence. <sup>1</sup> |
|------------------------------|---|------------|-----------|--------------------|------------------|------------------|-----------------------|------------------------|
| 1                            | Number of all farms in 1920.....  | 232,604    | 2,121     | 3,335              | 3,549            | 2,507            | 3,227                 | 2,759                  |
| 2                            | Number of farms reporting irrigation for rice growing in 1919.....  | 1,166      | 609       | 4                  | 26               | 40               | 2                     | 11                     |
| 3                            | Per cent of all farms.....  | 0.5        | 28.7      | 0.1                | 0.7              | 1.6              | 0.1                   | 0.4                    |
| 4                            | Number of farms reporting irrigation for rice growing in 1909.....  | 232        | 102       |                    | ( <sup>2</sup> ) | ( <sup>2</sup> ) |                       |                        |
| 5                            | Per cent of increase, 1909-1919.....  | 402.6      | 497.1     |                    |                  |                  |                       |                        |
| <b>LAND AND FARM AREA.</b>   |   |            |           |                    |                  |                  |                       |                        |
| 6                            | Approximate land area..... acres..  | 33,616,000 | 640,000   | 418,560            | 439,680          | 396,160          | 405,760               | 378,880                |
| 7                            | All land in farms..... acres..  | 17,456,750 | 282,097   | 215,298            | 204,899          | 144,134          | 221,310               | 220,054                |
| 8                            | Improved land in farms..... acres..   | 9,210,556  | 195,910   | 156,989            | 141,450          | 82,529           | 129,382               | 126,953                |
| 9                            | Area irrigated for rice growing in 1919..... acres..  | 143,946    | 76,511    | 345                | 3,190            | 3,410            | 810                   | 889                    |
| 10                           | Per cent of improved land in farms.....   | 1.6        | 39.1      | 0.2                | 2.3              | 4.1              | 0.6                   | 0.7                    |
| 11                           | Area irrigated for rice growing in 1909..... acres..  | 27,753     | 13,250    |                    | 100              | 60               |                       |                        |
| 12                           | Per cent of increase, 1909-1919.....  | 418.7      | 477.4     |                    |                  |                  |                       |                        |
| 13                           | Area enterprises were capable of irrigating in 1920..... acres..  | 179,013    | 89,546    | 905                | 5,047            | 4,655            | 875                   | 2,145                  |
| 14                           | Area enterprises were capable of irrigating in 1910..... acres..  | 47,136     | 20,240    |                    | 200              | 120              |                       |                        |
| 15                           | Per cent of increase, 1910-1920.....  | 279.8      | 342.4     |                    |                  |                  |                       |                        |
| 16                           | Area included in enterprises in 1920..... acres..   | 246,480    | 117,822   | 1,040              | 6,869            | 11,830           | 900                   | 3,725                  |
| 17                           | Area included in enterprises in 1910..... acres..   | 52,883     | 22,485    |                    | 260              | 120              |                       |                        |
| 18                           | Per cent of increase, 1910-1920.....  | 366.1      | 424.0     |                    |                  |                  |                       |                        |
| <b>IRRIGATION WORKS.</b>     |   |            |           |                    |                  |                  |                       |                        |
| 19                           | Independent enterprises:  |            |           |                    |                  |                  |                       |                        |
| 20                           | Number, 1920.....   | 944        | 454       | 4                  | 44               | 35               | 2                     | 13                     |
| 21                           | Number, 1910.....   | 310        | 127       |                    | 2                | 1                |                       |                        |
| 22                           | Main ditches:   |            |           |                    |                  |                  |                       |                        |
| 23                           | Number, 1920.....   | 84         | 17        | 5                  | 12               |                  | 1                     | 17                     |
| 24                           | Number, 1910.....   | 217        | 170       |                    | 2                |                  |                       |                        |
| 25                           | Length, 1920..... miles..   | 68         | 22        | 7                  | 6                |                  | 1                     | 11                     |
| 26                           | Length, 1910..... miles..   | 131        | 73        |                    | 2                |                  |                       |                        |
| 27                           | Capacity, 1920..... second-feet..   | 1,205      | 160       | 15                 | 820              |                  | 5                     | 89                     |
| 28                           | Capacity, 1910..... second-feet..   |            |           |                    |                  |                  |                       |                        |
| 29                           | Laterals:   |            |           |                    |                  |                  |                       |                        |
| 30                           | Number, 1920.....   | 50         | 4         |                    |                  |                  |                       | 35                     |
| 31                           | Number, 1910.....   | 18         | 4         |                    |                  |                  |                       | 9                      |
| 32                           | Length, 1920..... miles..   |            |           |                    |                  |                  |                       |                        |
| 33                           | Length, 1910..... miles..   |            |           |                    |                  |                  |                       | 2                      |
| 34                           | Reservoirs:   |            |           |                    |                  |                  |                       |                        |
| 35                           | Number, 1920.....   | 16         | 7         |                    | 1                |                  |                       |                        |
| 36                           | Number, 1910.....   | 19         |           |                    |                  |                  |                       |                        |
| 37                           | Capacity, 1920..... acre-feet..   | 20         |           |                    | 1                |                  |                       |                        |
| 38                           | Capacity, 1910..... acre-feet..   | 3          |           |                    |                  |                  |                       |                        |
| 39                           | Pumped wells:   |            |           |                    |                  |                  |                       |                        |
| 40                           | Number, 1920.....   | 1,089      | 496       | 4                  | 63               | 41               | 3                     | 13                     |
| 41                           | Number, 1910.....   | 307        | 119       |                    | 2                | 1                |                       |                        |
| 42                           | Capacity, 1920..... gallons per minute..  | 1,470,147  | 573,524   | 9,700              | 66,000           | 63,650           | 8,250                 | 26,000                 |
| 43                           | Capacity, 1910..... gallons per minute..  | 268,829    | 22,835    |                    | 13,500           | 1,200            |                       |                        |
| 44                           | Pumping plants:   |            |           |                    |                  |                  |                       |                        |
| 45                           | Number, 1920.....   | 1,041      | 497       | 4                  | 51               | 36               | 3                     | 13                     |
| 46                           | Number, 1910.....   | 315        | 128       |                    | 2                | 1                |                       |                        |
| 47                           | Engine capacity, 1920..... horsepower..   | 58,332     | 29,299    | 180                | 1,987            | 2,013            | 220                   | 425                    |
| 48                           | Engine capacity, 1910..... horsepower..   | 12,440     | 5,298     |                    | 50               | 40               |                       |                        |
| 49                           | Pump capacity, 1920..... gallons per minute..   | 1,654,097  | 749,974   | 9,000              | 67,500           | 61,350           | 5,250                 | 25,200                 |
| 50                           | Pump capacity, 1910..... gallons per minute..   | 436,402    | 173,305   |                    | 13,500           | 1,200            |                       |                        |
| 51                           | Average lift, 1920..... feet..  | 50         | 61        | 20                 | 30               | 27               | 42                    | 20                     |
| <b>CAPITAL INVESTED.</b>     |   |            |           |                    |                  |                  |                       |                        |
| 52                           | Capital invested to Jan. 1, 1920..... dollars..   | 7,183,322  | 3,492,391 | 47,414             | 140,375          | 174,628          | 43,000                | 47,950                 |
| 53                           | Capital invested to Jan. 1, 1910..... dollars..   | 587,834    | 90,219    |                    | 5,950            | 1,500            |                       |                        |
| 54                           | Per cent of increase, 1910-1920.....  |            |           |                    |                  |                  |                       |                        |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 40.13      | 39.00     | 52.39              | 27.81            | 37.51            | 49.14                 | 22.35                  |
| 56                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 12.47      | 4.46      |                    | 29.75            | 12.50            |                       |                        |
| <b>ESTIMATED FINAL COST.</b> |   |            |           |                    |                  |                  |                       |                        |
| 57                           | Estimated final cost of existing enterprises in 1920..... dollars..   | 7,283,522  | 3,564,791 | 47,414             | 140,375          | 174,628          | 43,000                | 48,450                 |
| 58                           | Estimated final cost of existing enterprises in 1910..... dollars..   | 612,834    | 115,219   |                    | 5,950            | 1,500            |                       |                        |
| 59                           | Per cent of increase, 1910-1920.....  |            |           |                    |                  |                  |                       |                        |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 29.55      | 30.26     | 45.59              | 20.44            | 14.76            | 47.78                 | 13.01                  |
| 61                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 11.59      | 5.12      |                    | 22.88            | 12.50            |                       |                        |

<sup>1</sup> Not shown in report for 1910.

<sup>2</sup> No irrigation reported in 1909.

## IRRIGATION—ARKANSAS.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |  | Lonoke.   | Monroe. <sup>1</sup> | Poinsett. | Prairie. | St. Francis. | Woodruff. | Other counties.  |
|------------------------------|--|-----------|----------------------|-----------|----------|--------------|-----------|------------------|
| 1                            | Number of all farms in 1920.....   | 5,596     | 3,305                | 2,257     | 2,413    | 4,586        | 2,853     | 194,096          |
| 2                            | Number of farms reporting irrigation for rice growing in 1919.....   | 166       | 3                    | 77        | 165      | 26           | 18        | 19               |
| 3                            | Per cent of all farms.....   | 3.0       | 0.1                  | 3.4       | 6.8      | 0.6          | 0.6       | ( <sup>2</sup> ) |
| 4                            | Number of farms reporting irrigation for rice growing in 1909.....   | 58        |                      | 16        | 35       | 9            | 5         | 7                |
| 5                            | Per cent of increase, 1909-1919.....   |           |                      |           |          |              |           |                  |
| <b>LAND AND FARM AREA.</b>   |  |           |                      |           |          |              |           |                  |
| 6                            | Approximate land area..... acres.....  | 516,480   | 385,920              | 461,440   | 423,680  | 401,920      | 369,280   | 28,378,240       |
| 7                            | All land in farms..... acres.....  | 320,088   | 150,029              | 127,124   | 238,994  | 190,175      | 163,305   | 14,979,243       |
| 8                            | Improved land in farms..... acres.....   | 217,981   | 101,215              | 78,191    | 153,830  | 133,540      | 104,380   | 7,588,191        |
| 9                            | Area irrigated for rice growing in 1919..... acres.....  | 24,941    | 1,135                | 10,310    | 10,225   | 6,840        | 3,838     | 1,502            |
| 10                           | Per cent of improved land in farms.....  | 11.4      | 1.1                  | 13.2      | 6.6      | 5.1          | 3.7       | ( <sup>2</sup> ) |
| 11                           | Area irrigated for rice growing in 1909..... acres.....  | 7,223     |                      | 978       | 3,587    | 1,450        | 725       | 380              |
| 12                           | Per cent of increase, 1909-1919.....   | 245.3     |                      | 954.2     | 185.1    | 371.7        | 429.4     | 295.3            |
| 13                           | Area enterprises were capable of irrigating in 1920..... acres.....  | 30,788    | 1,565                | 12,850    | 13,216   | 9,355        | 5,245     | 2,821            |
| 14                           | Area enterprises were capable of irrigating in 1910..... acres.....  | 12,651    |                      | 1,975     | 6,045    | 2,720        | 1,230     | 1,955            |
| 15                           | Per cent of increase, 1910-1920.....   | 143.4     |                      | 550.6     | 118.6    | 243.9        | 326.4     | 44.3             |
| 16                           | Area included in enterprises in 1920..... acres.....   | 34,502    | 2,733                | 26,578    | 16,900   | 10,490       | 9,915     | 3,176            |
| 17                           | Area included in enterprises in 1910..... acres.....   | 14,335    |                      | 2,920     | 6,253    | 2,865        | 1,340     | 2,305            |
| 18                           | Per cent of increase, 1910-1920.....   | 140.7     |                      | 810.2     | 170.3    | 266.1        | 639.9     | 37.8             |
| <b>IRRIGATION WORKS.</b>     |  |           |                      |           |          |              |           |                  |
| Independent enterprises:     |  |           |                      |           |          |              |           |                  |
| 19                           | Number, 1920.....  | 145       | 6                    | 107       | 70       | 28           | 30        | 6                |
| 20                           | Number, 1910.....  | 88        |                      | 23        | 37       | 14           | 11        | 7                |
| Main ditches:                |  |           |                      |           |          |              |           |                  |
| 21                           | Number, 1920.....  | 24        | 2                    | 2         |          | 1            |           | 3                |
| 22                           | Number, 1910.....  | 19        |                      | 4         | 10       | 5            | 4         | 3                |
| 23                           | Length, 1920..... miles.....   | 16        |                      |           |          | 3            |           | 2                |
| 24                           | Length, 1910..... miles.....   | 13        |                      | 20        | 5        | 9            | 3         | 6                |
| 25                           | Capacity, 1920..... second-feet.....   | 81        | 8                    | 5         |          | 12           |           | 4                |
| 26                           | Capacity, 1910..... second-feet.....   |           |                      |           |          |              |           |                  |
| Laterals:                    |  |           |                      |           |          |              |           |                  |
| 27                           | Number, 1920.....  | 0         | 2                    |           |          |              |           |                  |
| 28                           | Number, 1910.....  |           |                      |           |          |              |           |                  |
| 29                           | Length, 1920..... miles.....   | 5         |                      |           |          |              |           |                  |
| 30                           | Length, 1910..... miles.....   |           |                      |           |          |              |           |                  |
| Reservoirs:                  |  |           |                      |           |          |              |           |                  |
| 31                           | Number, 1920.....  | 14        |                      |           |          |              |           |                  |
| 32                           | Number, 1910.....  | 8         |                      | 2         |          |              |           | 1                |
| 33                           | Capacity, 1920..... acre-feet.....   | 20        |                      |           |          |              |           |                  |
| 34                           | Capacity, 1910..... acre-feet.....   | 2         |                      |           |          |              |           |                  |
| Pumped wells:                |  |           |                      |           |          |              |           |                  |
| 35                           | Number, 1920.....  | 149       | 8                    | 128       | 79       | 58           | 38        | 9                |
| 36                           | Number, 1910.....  | 91        |                      | 24        | 39       | 15           | 12        | 4                |
| 37                           | Capacity, 1920..... gallons per minute.....  | 272,850   | 11,400               | 168,600   | 92,415   | 104,358      | 59,200    | 14,200           |
| 38                           | Capacity, 1910..... gallons per minute.....  | 121,745   |                      | 19,467    | 44,077   | 21,365       | 14,640    | 10,000           |
| Pumping plants:              |  |           |                      |           |          |              |           |                  |
| 39                           | Number, 1920.....  | 152       | 7                    | 117       | 77       | 46           | 31        | 7                |
| 40                           | Number, 1910.....  | 90        |                      | 24        | 38       | 13           | 12        | 7                |
| 41                           | Engine capacity, 1920..... horsepower.....   | 9,745     | 330                  | 4,697     | 4,431    | 3,175        | 1,445     | 385              |
| 42                           | Engine capacity, 1910..... horsepower.....   | 3,530     |                      | 561       | 1,504    | 615          | 342       | 500              |
| 43                           | Pump capacity, 1920..... gallons per minute.....   | 279,150   | 11,400               | 173,850   | 99,165   | 96,358       | 59,900    | 16,000           |
| 44                           | Pump capacity, 1910..... gallons per minute.....   | 128,685   |                      | 21,160    | 40,977   | 21,365       | 14,640    | 15,570           |
| 45                           | Average lift, 1920..... feet.....  | 43        | 73                   | 33        | 59       | 33           | 45        | 23               |
| <b>CAPITAL INVESTED.</b>     |  |           |                      |           |          |              |           |                  |
| 46                           | Capital invested to Jan. 1, 1920..... dollars.....   | 1,272,693 | 76,674               | 404,158   | 787,275  | 425,414      | 192,550   | 78,800           |
| 47                           | Capital invested to Jan. 1, 1910..... dollars.....   | 230,714   |                      | 31,600    | 128,682  | 51,552       | 22,715    | 24,902           |
| 48                           | Per cent of increase, 1910-1920.....   | 461.6     |                      |           | 511.8    | 725.2        | 747.7     | 216.4            |
| 49                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars..... | 41.34     | 48.99                | 31.45     | 59.57    | 45.47        | 36.71     | 27.93            |
| 50                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars..... | 18.24     |                      | 16.00     | 21.29    | 18.95        | 18.47     | 12.74            |
| <b>ESTIMATED FINAL COST.</b> |  |           |                      |           |          |              |           |                  |
| 51                           | Estimated final cost of existing enterprises in 1920..... dollars.....   | 1,297,493 | 76,674               | 404,158   | 789,275  | 425,414      | 192,550   | 79,300           |
| 52                           | Estimated final cost of existing enterprises in 1910..... dollars.....   | 230,714   |                      | 31,600    | 128,682  | 51,552       | 22,715    | 24,902           |
| 53                           | Per cent of increase, 1910-1920.....   | 462.4     |                      |           | 513.4    | 725.2        | 747.7     | 218.4            |
| 54                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars..... | 37.61     | 28.05                | 15.21     | 46.70    | 40.55        | 19.42     | 24.97            |
| 55                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars..... | 16.09     |                      | 10.82     | 20.58    | 17.99        | 16.95     | 10.80            |

<sup>1</sup> No irrigation reported in 1909.

<sup>2</sup> Less than one-tenth of 1 per cent.

## IRRIGATION : CALIFORNIA

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 7     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 8     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 8     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 9     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 12    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 14    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 6     |  |       |
| Acreage, by drainage basin.....                        | 7     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of California collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of

showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

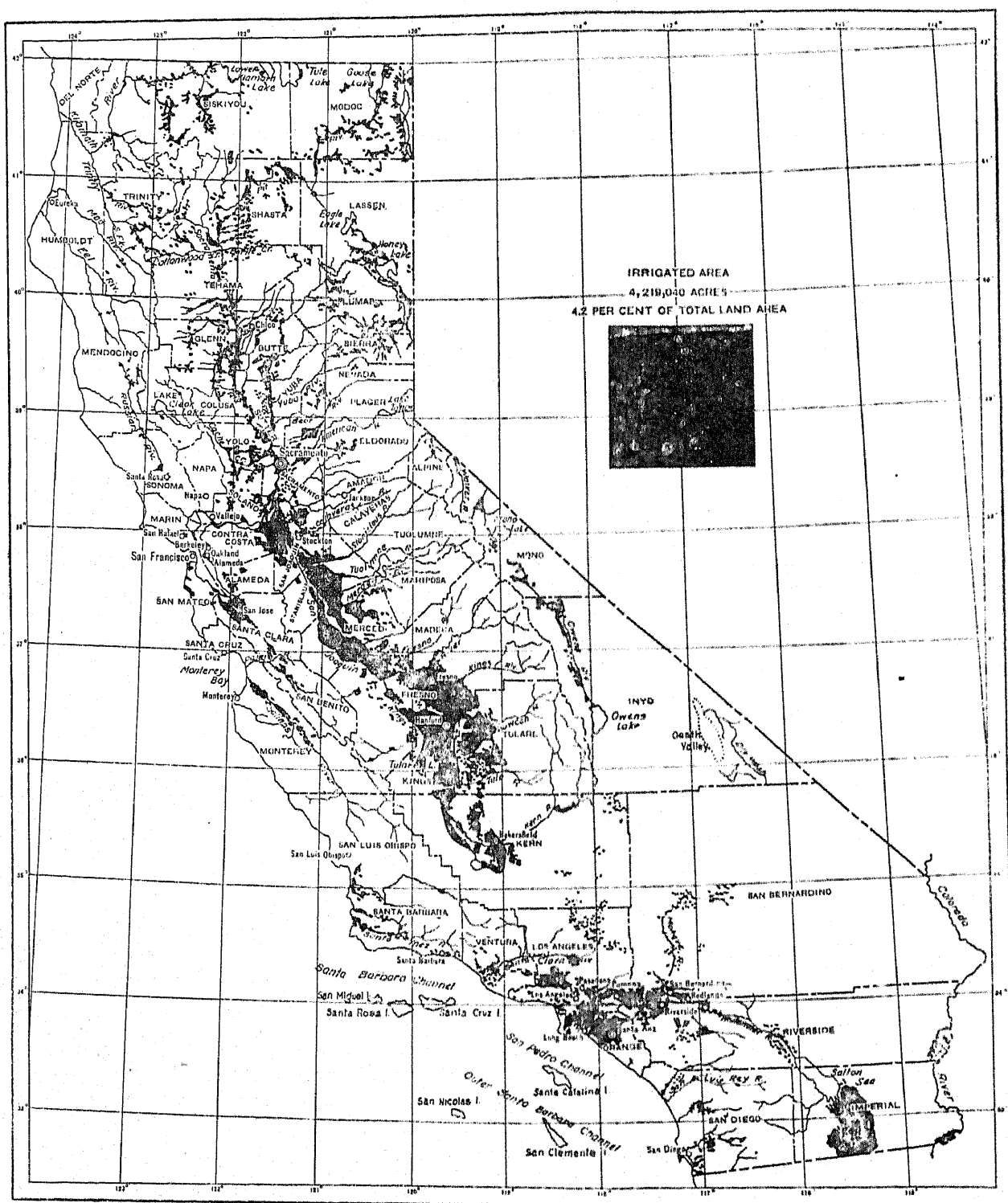
Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—    |                  | INCREASE.     |           |
|--|---------------|------------------|---------------|-----------|
|  | 1920          | 1910             | Amount.       | Per cent. |
| Number of all farms.....   | 117,670       | 88,197           | 29,473        | 33.4      |
| Approximate land area of the state..... acres..  | 99,617,280    | 99,617,280       |               |           |
| All land in farms..... acres..   | 29,365,667    | 27,931,444       | 1,434,223     | 5.1       |
| Improved land in farms..... acres..  | 11,878,339    | 11,389,894       | 488,445       | 4.3       |
| Number of farms irrigated.....   | 67,391        | 39,352           | 28,039        | 71.3      |
| Area irrigated..... acres..  | 4,219,040     | 2,664,104        | 1,554,936     | 58.4      |
| Area enterprises were capable of irrigating..... acres..                               | 5,894,466     | 3,619,378        | 2,275,088     | 62.9      |
| Area included in enterprises..... acres..  | 7,805,207     | 5,490,360        | 2,314,847     | 42.2      |
| Per cent irrigated:  |               |                  |               |           |
| Number of all farms.....   | 57.3          | 44.6             | 12.7          |           |
| Approximate land area of state.....  | 4.2           | 2.7              | 1.5           |           |
| Land in farms.....   | 14.4          | 9.5              | 4.9           |           |
| Improved land in farms.....  | 35.5          | 23.4             | 12.1          |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 1,675,426     | 955,274          | 720,152       | 75.4      |
| Excess of area included in enterprises over area irrigated..... acres..                | 3,586,167     | 2,826,256        | 759,911       | 26.9      |
| Area of irrigated land reported as available for settlement..... acres..               | 533,981       | ( <sup>1</sup> ) |               |           |
| Capital invested.....  | \$194,886,388 | \$72,580,030     | \$122,306,358 | 168.5     |
| Average per acre enterprises were capable of irrigating.....                           | \$33.06       | \$20.05          | \$13.01       | 64.9      |
| Estimated final cost of existing enterprises.....                                      | \$225,799,123 | \$84,392,344     | \$141,406,779 | 167.6     |
| Average per acre included in enterprises.....  | \$28.93       | \$15.37          | \$13.56       | 88.2      |
| Average cost of operation and maintenance per acre.....                                | \$4.40        | \$1.54           | \$2.86        | 185.7     |

<sup>1</sup> Not reported in 1910.

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

**CLIMATIC CONDITIONS.**

In California both the amount and the seasonal distribution of precipitation have an important influence on the necessity for irrigation. The state has a very wide range in amount of precipitation, the average annual amount reaching about 60 inches in the northwestern part of the state and only 2 or 3 inches in the southeastern part. Throughout the state there is a well-defined wet season during the winter months and an almost entire absence of rainfall in the summer months. The latter condition makes irrigation necessary for the growing of summer crops in some sections where the total precipitation would be sufficient if more evenly distributed throughout the year, while the concentration of the year's precipitation in a short period makes it possible to grow some crops, particularly grain, without irrigation where it would not be possible if the rainfall were distributed through the year.

That part of the state lying north of San Francisco Bay, except a part of the Sacramento Valley, receives more than 20 inches of precipitation annually, and crops are grown both with and without irrigation, while the part of the state south of San Francisco Bay, except in the high mountains, receives less than 20 inches, and irrigation is generally practiced, although some crops are grown without it.

In Sacramento Valley the average annual precipitation is between 15 and 20 inches, but practically all of this occurs in the winter. Grain crops are generally grown without irrigation, and alfalfa, rice, and orchards are irrigated.

In San Joaquin Valley the average annual precipitation is from 5 to 14 inches, and here most crops except grain are generally irrigated; while there are large areas of irrigated grain.

In the southeastern part of the state desert conditions are found, the average annual precipitation being from 2 to 5 inches, and no crops can be grown without irrigation.

Along the coast of southern California the precipitation is from 15 to 20 inches, and crops are quite generally grown both with and without irrigation.

In the Sierra Nevada Mountains the snowfall in the winter is very heavy, and this maintains a good summer flow in most of the streams.

The summer of 1919 was one of the driest on record and in some sections, especially in the San Joaquin Valley, this occasioned a shortage of water for irrigation.

**WATER SUPPLY FOR IRRIGATION.**

In northern California, except the Sacramento Valley, the supply of water available for irrigation is limited, and the area irrigated is small.

In the Sacramento Valley water is taken from the Sacramento and its tributaries, and while there is a

shortage at times there is a very large supply of flood water available for storage.

In the San Joaquin Valley, where the larger part of the irrigated land of the state is located, the water supply comes principally from San Joaquin River and its tributaries from the east which rise in the high Sierras. These rivers carry large volumes of water during the rainy season and in the early summer when the snow in the mountains is melting, but have a low discharge in the summer, so that there is usually a shortage of water in this season. While some storage has been provided, there is opportunity for much more, and efforts are being made to have the owners of existing enterprises combine to build reservoirs and coordinate their canal systems in such a way as to save the flood waters and make the largest use of them. Natural overflow and seepage from irrigation have brought the ground water near the surface in many places, and during recent years many wells have been sunk and water is pumped from them to supplement the supply from streams when they are low. There is opportunity for a large extension of irrigation from this source as well as from the storage of flood waters. In 1919 the water supply in this section was unusually short, and much land usually irrigated was not watered.

In the coast region of southern California there are many short streams rising in the coast range and discharging into the Pacific. In some sections there is little opportunity for storage, and a large part of the water goes unused. In this section, as well as in other parts of the state, there are many wells, both flowing and ~~pumped~~. The heavy draft on the underground supplies has lowered the ground water to such an extent that many wells that once flowed are now pumped, and the lift in pumped wells has greatly increased. This condition is being remedied to some extent by spreading the flood waters over the gravelly lands where the streams emerge from the mountains, so that some of the water will find its way into the underground supply rather than waste down the stream channels.

Similar work is proposed for the Coachella Valley, in southeastern California, where small areas are watered from wells.

Imperial Valley is supplied from Colorado River. Although the water supply in the river is usually sufficient there is sometimes difficulty in getting the water from the river into the canal because of silting. Plans for storage and for relocating the canal are under discussion. A large area of land in this valley is available for cultivation and a large quantity of water is available for storage. There are other opportunities in California to use water from Colorado River, where it forms the boundary between California and Arizona, and some land has been irrigated. Here, as in the Imperial Valley, the water supply is ample if storage is provided for the surplus flood waters.



Colorado River extends into or borders seven states, and there are conflicting claims as to the use of its waters that are delaying the construction of reservoirs. Attempts are being made to settle these conflicts through a compact between the states. Such a compact has been authorized by Congress.

### FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS<br>YEAR. | FARMS IRRIGATED. |                                  |                                 | AREA IRRIGATED. |                                  |  |  |  |
|-----------------|------------------|----------------------------------|---------------------------------|-----------------|----------------------------------|--|--|--|
|                 | Num-<br>ber.     | Per<br>cent<br>of in-<br>crease. | Per<br>cent<br>of all<br>farms. | Acres.          | Per<br>cent<br>of in-<br>crease. | Per<br>cent<br>of total<br>land<br>area. | Per<br>cent<br>of land<br>in<br>farms. | Per<br>cent<br>of im-<br>proved<br>land in<br>farms. |
| 1920.....       | 67,391           | 71.3                             | 57.3                            | 4,219,040       | 58.4                             | 4.2                                      | 14.4                                   | 35.5   |
| 1910.....       | 39,352           | 53.3                             | 44.6                            | 2,664,104       | 81.2                             | 2.7                                      | 9.5                                    | 23.4   |
| 1900.....       | 25,675           | 87.0                             | 35.4                            | 1,446,114       | 44.0                             | 1.5                                      | 5.0                                    | 12.1   |
| 1890.....       | 13,732           | .....                            | 25.0                            | 1,004,233       | .....                            | 1.0                                      | 4.7                                    | 8.2  |

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF  
ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-<br>ber of<br>enter-<br>prises. | Area<br>included<br>in enter-<br>prises,<br>1920<br>(acres). | AREA IRRIGATED<br>IN 1910. |   | Area en-<br>terprises<br>were<br>capable of<br>irrigat-<br>ing in<br>1920<br>(acres). |
|--------------------|-------------------------------------|--|----------------------------|---|---|
|                    |                                     |  | Acres.                     | Per<br>cent of<br>acreage in<br>enter-<br>prises. |   |
| Total.....         | 24,115                              | 7,895,207  | 4,219,040                  | 54.1  | 5,891,466   |
| Before 1860.....   | 258                                 | 219,261  | 108,280                    | 49.3  | 131,969   |
| 1860-1869.....     | 358                                 | 152,858  | 88,485                     | 57.9  | 116,015   |
| 1870-1879.....     | 519                                 | 1,992,949  | 1,039,852                  | 53.0  | 1,573,635   |
| 1880-1889.....     | 641                                 | 573,569  | 347,685                    | 60.6  | 392,478   |
| 1890-1899.....     | 788                                 | 767,611  | 404,133                    | 53.3  | 625,592   |
| 1900-1904.....     | 1,105                               | 628,418  | 456,261                    | 72.6  | 558,399   |
| 1905-1909.....     | 1,851                               | 498,171  | 290,080                    | 58.2  | 359,151   |
| 1910-1914.....     | 6,762                               | 1,356,230  | 640,875                    | 47.9  | 928,067   |
| 1915-1919.....     | 7,573                               | 1,290,876  | 541,500                    | 41.4  | 849,319   |
| Not reported.....  | 4,277                               | 435,237  | 292,963                    | 67.3  | 356,874   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                     | AREA IRRIGATED (ACRES). |                  |                        |              | Area enter-<br>prises were<br>capable of irri-<br>gating in 1920<br>(acres). | Area<br>included in enter-<br>prises,<br>1920<br>(acres). |
|--|-------------------------|------------------|------------------------|--------------|--|---|
|  | 1919                    | 1909             | Increase. <sup>1</sup> |              |  |   |
|  |                         |                  | Amount.                | Per<br>cent. |  |   |
| Total.....                                 | 4,219,040               | 2,664,104        | 1,554,936              | 58.4         | 5,891,466  | 7,895,207   |
| Stream, gravity.....                       | 2,564,415               | 2,216,757        | 347,658                | 15.7         | 3,627,280  | 4,469,148   |
| Stream, pumped.....                        | 205,673                 | 29,955           | 2,55,708               | 896.7        | 480,926  | 604,287   |
| Stream, pumped and<br>gravity.....         | 60,278                  | ( <sup>2</sup> ) | 60,278                 | .....        | 62,913   | 84,768  |
| Wells, pumped.....                         | 826,846                 | 276,595          | 550,251                | 198.9        | 1,068,239  | 1,488,213   |
| Wells, flowing.....                        | 17,653                  | 74,128           | -56,475                | -76.2        | 21,826   | 34,739  |
| Wells, flowing and<br>pumped.....          | 23,551                  | ( <sup>2</sup> ) | 23,551                 | .....        | 27,318   | 57,788  |
| Lake, gravity.....                         | 48,081                  | 15,896           | 32,185                 | 202.5        | 48,321   | 159,827   |
| Lake, pumped.....                          | 4,168                   | 2,574            | 1,594                  | 61.9         | 4,429  | 14,067  |
| Springs.....                               | 27,698                  | 31,779           | -4,081                 | -12.8        | 30,285   | 56,227  |
| Stored storm water...                      | 20,351                  | 16,410           | 3,941                  | 24.0         | 20,681   | 38,546  |
| City water.....                            | 515                     | ( <sup>2</sup> ) | 515                    | .....        | 877  | 887   |
| Sewage.....                                | 1,385                   | ( <sup>2</sup> ) | 1,385                  | .....        | 1,398  | 2,189   |
| Stream, gravity, and<br>pumped wells.....  | 87,897                  | ( <sup>2</sup> ) | 87,897                 | .....        | 99,277   | 127,651   |
| Stream, gravity, and<br>flowing wells..... | 4,255                   | ( <sup>2</sup> ) | 4,255                  | .....        | 5,114  | 5,686   |
| Other mixed.....                           | 228,424                 | ( <sup>2</sup> ) | 228,424                | .....        | 371,033  | 560,364   |
| Other and not reported                     | 7,807                   | ( <sup>2</sup> ) | 7,807                  | .....        | 9,549  | 10,820  |

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Not included in classification in 1910

### ACREAGE, BY CHARACTER OF ENTERPRISE.

California was the first state to enact an irrigation district law containing the provision for issuing bonds that are a lien on the lands within the districts. The so-called "Wright Act," containing this provision, was enacted in 1887, and has served as a basis for practically all irrigation district legislation in the United States. Many districts were organized under this act, only a few of which, however, have survived to the present time.

Prior to the enactment of the Wright Act there were some districts created by special act, and there was a special law providing for the organization of districts, without the bonding power, in Los Angeles County.

The Wright Act was amended and reenacted in 1897, the new law being known as the "Bridgeford Act." This law has been amended in various particulars by almost every legislature since its passage, but is still in force.

In 1915 there was enacted a law creating a State Irrigation Board, which was empowered to organize "water districts" under state supervision, rather than county supervision, as was done under the older laws, but this law has been declared unconstitutional by the state supreme court.

Many irrigation districts in California have been organized to build irrigation works, and some have taken over works built by other agencies. The lands in the Imperial Valley have been organized into an irrigation district, which controls the diversion works and the main canal, while mutual companies control the distributing canals. This land is reported under "Cooperative" in Table 5.

California accepted the conditions of the Federal Carey Act (act of Aug. 18, 1894) in 1915, providing for a "Carey Act Commission" and for the organization of "state irrigation districts" to reclaim Carey Act lands. However, no land is reported as irrigated under this law.

In 1917 California enacted a "land settlement" law, providing for the building of irrigation works and other improvements, including dwellings, etc., by the state, and the sale of the farms created on long-time and easy terms to settlers. Only one enterprise had advanced far enough to be reported in the Fourteenth Census, and this appears under "State" in Table 5. Other projects have been begun.

Most of the cooperative enterprises reported in Table 5 are mutual water companies supplying water to members only.

Commercial companies in California are subject to control by the state railroad commission as to rates charged and conditions of service.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920 AND 1910.

| ITEM AND CLASS.  | CENSUS OF— |           | INCREASE. <sup>1</sup> |           |
|--|------------|-----------|------------------------|-----------|
|  | 1920       | 1910      | Acres.                 | Per cent. |
| <b>ACREAGE IRRIGATED.</b>                              |            |           |                        |           |
| Total.....   | 4,219,040  | 2,664,104 | 1,554,936              | 58.4      |
| Individual and partnership.....                        | 1,502,870  | 961,135   | 541,734                | 56.4      |
| Cooperative.....                                       | 1,215,696  | 779,020   | 436,676                | 56.1      |
| Irrigation district.....                               | 577,168    | 173,793   | 403,375                | 232.1     |
| Commercial.....  | 873,499    | 746,235   | 127,264                | 17.0      |
| U. S. Reclamation Service.....                         | 36,622     | 400       | 36,222                 | .....     |
| U. S. Indian Service.....                              | 697        | 3,490     | -2,793                 | -80.0     |
| State.....   | 2,936      | (2)       | 2,936                  | .....     |
| City.....  | 6,213      | (2)       | 6,213                  | .....     |
| Other.....   | 3,064      | (2)       | 3,064                  | .....     |
| Not reported.....                                      | 275        | (2)       | 275                    | .....     |
| <b>ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING.</b> |            |           |                        |           |
| Total.....   | 5,894,466  | 3,619,378 | 2,275,088              | 62.9      |
| Individual and partnership.....                        | 1,919,683  | 1,131,951 | 787,732                | 69.6      |
| Cooperative.....                                       | 1,705,647  | 984,570   | 721,077                | 73.2      |
| Irrigation district.....                               | 880,785    | 294,108   | 606,677                | 295.9     |
| Commercial.....  | 1,307,688  | 1,204,059 | 103,629                | 8.6       |
| U. S. Reclamation Service.....                         | 42,805     | 1,200     | 41,605                 | .....     |
| U. S. Indian Service.....                              | 986        | 3,490     | -2,504                 | -71.7     |
| State.....   | 4,210      | (2)       | 4,210                  | .....     |
| City.....  | 9,073      | (2)       | 9,073                  | .....     |
| Other.....   | 4,054      | (2)       | 4,054                  | .....     |
| Not reported.....                                      | 275        | (2)       | 275                    | .....     |
| <b>ACREAGE INCLUDED IN ENTERPRISES.</b>                |            |           |                        |           |
| Total.....   | 7,895,207  | 5,490,360 | 2,414,847              | 42.2      |
| Individual and partnership.....                        | 2,698,798  | 1,512,511 | 1,186,287              | 78.4      |
| Cooperative.....                                       | 2,148,711  | 1,388,435 | 760,276                | 54.8      |
| Irrigation district.....                               | 1,101,220  | 606,351   | 494,869                | 81.6      |
| Commercial.....  | 1,778,135  | 1,935,063 | -156,928               | -9.5      |
| U. S. Reclamation Service.....                         | 47,669     | 14,200    | 33,469                 | 235.7     |
| U. S. Indian Service.....                              | 5,252      | 3,800     | 1,452                  | 38.2      |
| State.....   | 6,259      | (2)       | 6,259                  | .....     |
| City.....  | 10,645     | (2)       | 10,645                 | .....     |
| Other.....   | 8,168      | (2)       | 8,168                  | .....     |
| Not reported.....                                      | 350        | (2)       | 350                    | .....     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Not included in classification in 1910.

### ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of California relating to water rights are summarized in the following paragraphs:

In 1850 California adopted the common law of England, but without specific mention of water rights.

The first legislation in California relating to water rights was the act of 1872. This act provided that rights to water "flowing in a river or stream or down a canyon or ravine may be acquired by appropriation in the manner provided by law"; that the appropriation must be for some useful or beneficial purpose; that as between appropriators the "first in time is the first in right"; and that the appropriator must post a notice at the point of intended diversion and file a copy in the county records. This law was in effect until 1913.

The constitution of the state, adopted in 1879, contained the following section relating to water rights: "The use of all waters now appropriated, or that may hereafter be appropriated, for sale, rental, or distribution is hereby declared to be a public use, and subject to the regulation and control of the state, in the manner to be prescribed by law." (Art. XIV.)

While the constitution and laws provide for rights being acquired by appropriation, the courts of the state have recognized riparian rights under the law of 1850 referred to above. (*Lux v. Haggins*, 69 Cal., 255.)

In 1913 California adopted a new system of public control of the use of water and attempted to eliminate the conflict between riparian rights and right by appropriation by providing that owners of riparian lands must put water to use in order to retain their rights. The section of the law relating to this point is as follows: "Section 11. All water or the use of water which has never been appropriated, or which has been heretofore appropriated and which has not been in process, from the date of the initial act of appropriation, of being put,

with due diligence in proportion to the magnitude of the work necessary properly to utilize for the purpose of such appropriation such water or the use of water, or which has not been put, or which has ceased to be put to some useful or beneficial purpose, or which may hereafter be appropriated and cease to be put, to the useful or beneficial purpose for which it was appropriated, or which in the future may be appropriated and not be, in the process of being put, from the date of the initial act of the appropriation, to the useful or beneficial purpose for which it was appropriated, with due diligence in proportion to the magnitude of the work necessary properly to utilize for the purpose of such appropriation, such water or the use of water, is hereby declared to be unappropriated. And all waters flowing in any river, stream, canyon, ravine, or other natural channel, excepting so far as such waters have been or are being applied to useful and beneficial purpose upon, or in so far as such waters are or may be reasonably needed for useful, and beneficial purposes upon lands riparian thereto, or otherwise appropriated, is and are hereby declared to be public waters of the state of California and subject to appropriation in accordance with the provisions of the act. If any portion of the waters of any stream shall not be put to a useful or beneficial purpose to or upon lands riparian to such stream for any continuous period of 10 consecutive years after the passage of this act, such non-application shall be deemed to be conclusive presumption that the use of such portions of the waters of such stream is not needed upon said riparian lands for any useful or beneficial purpose; and such portion of the waters of any stream so nonapplied, unless otherwise appropriated for a useful or beneficial purpose, is hereby declared to be in the use of the state and subject to appropriation in accordance with the provisions of this act."

The new law created a water commission, and provided that parties wishing to take water should apply to the water commission for permission to do so, and that the commission should issue licenses on completion of the works in accordance with the permits.

The law of 1913 provided also for the preparation by the commission of findings regarding rights to water, which were to be filed with the courts and were to serve as bases for adjudications of water rights. This part of the law was amended in 1917, changing the procedure and providing that the findings of the commission shall be filed with the courts, and shall be issued as decrees by the courts, after hearings and such changes as the courts may make. After a decree is rendered the commission is to issue to each claimant a certificate setting forth his rights as determined by the court.

An act of 1917 provided that after three years' nonuse of water for the purpose for which it was appropriated or adjudicated "such unused water shall revert to the public and shall be regarded as unappropriated public water."

The portion of the law of 1913 relating to the acquiring of rights is in operation, but the commission is delaying any action for adjudication of rights until the expiration of 10 years from the passage of the act, when rights attaching to riparian lands but not utilized will have expired under the terms of the act.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                                 | 1919      |                       | 1909,<br>per cent<br>of total. |
|--|-----------|-----------------------|--------------------------------|
|  | Acres.    | Per cent<br>of total. |                                |
| Total.....                             | 4,219,040 | 100.0                 | 100.0                          |
| Appropriation and use.....             | 479,361   | 11.4                  | 47.3                           |
| Notice filed and posted.....           | 704,608   | 16.7                  | 16.6                           |
| Adjudicated by court.....              | 982,157   | 23.3                  | 28.0                           |
| Permit from state.....                 | 80,484    | 1.9                   | (1)                            |
| Certificate or license from state..... | 25,484    | 0.6                   | (1)                            |
| Riparian rights.....                   | 240,512   | 5.7                   | 8.2                            |
| Underground.....                       | 863,613   | 20.5                  | (2)                            |
| Other and mixed.....                   | 396,703   | 9.4                   | (2)                            |
| Not reported.....                      | 446,118   | 10.6                  | (2)                            |

<sup>1</sup> No provision for permits or licenses from state in 1909.

<sup>2</sup> This class was not included in the tabulation in 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."



## ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.   | AREA IRRIGATED (ACRES). |                  |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|---|-------------------------|------------------|------------------------------------|---|--|
|   | 1919                    | 1902             | Per cent of increase. <sup>1</sup> |   |  |
| Total.....  | 4,219,040               | 1,708,720        | 146.9                              | 7,805,207                                   | 5,894,466  |
| Colorado River.....   | 447,384                 | 10,000           | .....                              | 621,015                                     | 494,975  |
| Independent streams, northern California.....               | 139,861                 | 125,779          | 11.2                               | 250,336                                     | 193,255  |
| Carson River.....   | 4,459                   | 4,683            | -4.8                               | 7,027                                       | 4,819  |
| Long Valley Creek.....                                      | 12,543                  | 4,060            | 208.9                              | 18,840                                      | 15,951   |
| Mono Lake and tributaries.....                              | 4,190                   | 3,818            | 9.7                                | 70,377                                      | 45,700   |
| Susan River.....  | 31,784                  | 23,533           | 35.1                               | 36,225                                      | 33,313   |
| Walker River.....   | 39,261                  | 52,975           | -25.9                              | 42,295                                      | 40,355   |
| Other independent streams.....                              | 47,624                  | * 36,710         | 29.7                               | 84,572                                      | 53,057   |
| Independent streams, southern California.....               | 200,818                 | 59,358           | 238.3                              | 346,831                                     | 257,988  |
| Mohave River.....   | 4,608                   | 540              | 753.3                              | 21,523                                      | 6,510  |
| Owens River.....  | 144,024                 | 51,902           | 177.5                              | 200,147                                     | 182,748  |
| San Jacinto River.....                                      | 20,869                  | 5,040            | 314.1                              | 34,974                                      | 22,263   |
| Whitewater River.....                                       | 14,643                  | ( <sup>2</sup> ) | .....                              | 37,604                                      | 22,282   |
| Other independent streams.....                              | 16,674                  | * 1,876          | 788.8                              | 52,583                                      | 24,185   |
| Pacific Ocean streams north of San Francisco Bay.....       | 66,001                  | 56,272           | 17.3                               | 146,070                                     | 85,098   |
| Klamath River.....  | 62,535                  | 52,709           | 18.6                               | 122,853                                     | 70,275   |
| Russian River.....  | 3,045                   | 314              | 869.7                              | 12,475                                      | 4,200  |
| Other Pacific Ocean streams north of San Francisco Bay..... | 421                     | * 3,249          | -87.0                              | 10,742                                      | 10,623   |
| Pacific Ocean streams south of San Francisco Bay.....       | 543,385                 | 279,519          | 94.4                               | 831,490                                     | 662,847  |
| Pajaro River.....   | 19,771                  | 14,157           | 39.7                               | 33,620                                      | 25,769   |
| Salinas River.....  | 48,097                  | 10,604           | 353.6                              | 60,989                                      | 57,456   |
| Santa Maria River.....                                      | 9,623                   | 1,544            | 523.3                              | 22,903                                      | 20,460   |
| Santa Ynez River.....                                       | 3,491                   | 1,493            | 133.8                              | 10,082                                      | 9,645  |
| Santa Clara River.....                                      | 28,270                  | 14,214           | 98.9                               | 43,205                                      | 30,216   |
| Los Angeles River.....                                      | 59,072                  | 5,310            | .....                              | 82,657                                      | 73,606   |
| San Gabriel River.....                                      | 127,146                 | 33,766           | 276.6                              | 161,737                                     | 145,022  |
| Santa Ana River.....  | 185,508                 | 70,492           | 163.2                              | 281,630                                     | 218,735  |
| San Diego River.....  | 8,812                   | 5,130            | 71.8                               | 14,039                                      | 10,789   |
| Other Pacific Ocean streams south of San Francisco Bay..... | 53,595                  | * 122,809        | -56.4                              | 120,628                                     | 71,149   |
| Sacramento River and tributaries.....                       | 640,950                 | 206,312          | 210.7                              | 1,204,769                                   | 864,605  |
| Sacramento River direct.....                                | 194,397                 | 10,942           | .....                              | 439,169                                     | 296,748  |
| Pit River.....  | 89,984                  | 72,072           | 24.9                               | 129,984                                     | 107,478  |
| Cow Creek.....  | 6,068                   | 2,321            | 161.4                              | 12,488                                      | 7,446  |
| Cottonwood Creek.....                                       | 2,972                   | 1,858            | 60.0                               | 21,016                                      | 4,112  |
| Battle Creek.....   | 2,966                   | 2,642            | 12.3                               | 6,590                                       | 5,108  |
| Stony Creek.....  | 23,559                  | 4,110            | 473.2                              | 45,143                                      | 36,191   |
| Feather River.....  | 142,841                 | 67,111           | 112.8                              | 186,756                                     | 167,463  |
| Yuba River.....   | 19,473                  | ( <sup>2</sup> ) | .....                              | 69,074                                      | 23,492   |
| Cache Creek.....  | 24,541                  | 3,756            | 553.4                              | 56,498                                      | 31,212   |
| American River.....   | 47,156                  | 10,112           | 366.3                              | 82,695                                      | 52,842   |
| Other tributaries of Sacramento River.....                  | 86,993                  | * 31,388         | 177.2                              | 155,356                                     | 132,513  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells. <sup>3</sup> Not reported separately in 1902.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902—Continued.

| DRAINAGE BASIN.   | AREA IRRIGATED (ACRES). |                  |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|---|-------------------------|------------------|------------------------------------|---|--|
|   | 1919                    | 1902             | Per cent of increase. <sup>1</sup> |   |  |
| San Joaquin River and tributaries.....  | 2,103,694               | 932,931          | 125.5                              | 4,294,966                                   | 3,248,919  |
| San Joaquin River direct.....   | 642,261                 | 129,647          | 395.4                              | 1,083,862                                   | 873,300  |
| Kern River.....   | 200,641                 | 116,189          | 72.7                               | 432,481                                     | 299,665  |
| Tulare Lake.....  | 70,134                  | ( <sup>2</sup> ) | .....                              | 204,860                                     | 147,444  |
| Tule River.....   | 61,223                  | ( <sup>2</sup> ) | .....                              | 175,777                                     | 109,412  |
| Kaweah River.....   | 149,932                 | ( <sup>2</sup> ) | .....                              | 356,703                                     | 299,474  |
| Kings River.....  | 552,601                 | 596,091          | -7.3                               | 1,052,406                                   | 895,263  |
| Fresno River.....   | 12,414                  | 10,729           | 15.7                               | 30,004                                      | 14,016   |
| Merced River.....   | 65,151                  | 19,636           | 231.8                              | 222,715                                     | 71,709   |
| Tuolumne River.....   | 165,533                 | ( <sup>2</sup> ) | .....                              | 298,418                                     | 250,425  |
| Stanislaus River.....   | 75,359                  | 13,840           | 444.5                              | 155,453                                     | 111,192  |
| Calaveras River.....  | 13,323                  | ( <sup>2</sup> ) | .....                              | 21,598                                      | 16,489   |
| Mokelumne River.....  | 36,848                  | 5,558            | 563.0                              | 155,480                                     | 72,144   |
| Cosumnes River.....   | 3,259                   | ( <sup>2</sup> ) | .....                              | 9,011                                       | 6,405  |
| Other tributaries of San Joaquin River.....   | 55,015                  | * 41,241         | 33.4                               | 96,198                                      | 81,981   |
| Tributaries of San Francisco Bay, other than Sacramento and San Joaquin Rivers..... | 76,947                  | 38,549           | 99.6                               | 100,730                                     | 86,779   |
| Coyote Creek.....   | 25,092                  | 8,483            | 195.8                              | 30,979                                      | 26,526   |
| Guadalupe River.....  | 29,248                  | 6,547            | 346.7                              | 34,549                                      | 31,008   |
| Other tributaries of San Francisco Bay.....   | 22,607                  | * 23,519         | -3.9                               | 35,202                                      | 29,245   |

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Not reported separately in 1902.

<sup>3</sup> Includes springs and wells.

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.       | Percent of increase. | AVERAGE PER ACRE. |                       |
|--------------|---------------|----------------------|-------------------|-----------------------|
|              |               |                      | Amount.           | Per cent of increase. |
| 1920.....    | \$194,886,388 | 168.5                | \$33.06           | 64.9                  |
| 1910.....    | 72,580,030    | 278.4                | 20.05             | 51.1                  |
| 1900.....    | 19,181,610    | 47.5                 | 13.27             | 2.5                   |
| 1890.....    | 13,004,817    | .....                | 12.95             | .....                 |

TABLE 9.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$194,886,388           | 100.0              | \$33.06           | 3,714,361                                | \$4.40                              |
| Stream, gravity.....                    | 78,139,147              | 40.1               | 21.54             | 2,275,082                                | 2.06                                |
| Stream, pumped.....                     | 16,267,561              | 8.3                | 33.83             | 267,826                                  | 5.10                                |
| Stream, pumped and gravity.....         | 3,084,038               | 1.6                | 49.02             | 60,137                                   | 1.93                                |
| Wells, pumped.....                      | 54,057,185              | 27.7               | 50.60             | 724,593                                  | 10.40                               |
| Wells, flowing.....                     | 807,353                 | 0.4                | 36.99             | 4,341                                    | 5.91                                |
| Wells, flowing and pumped.....          | 1,776,156               | 0.9                | 65.02             | 20,426                                   | 7.63                                |
| Lake, pumped.....                       | 90,081                  | ( <sup>2</sup> )   | 20.34             | 3,783                                    | 1.66                                |
| Lake, gravity.....                      | 674,320                 | 0.3                | 13.96             | 41,962                                   | 0.39                                |
| Springs.....                            | 1,298,308               | 0.7                | 35.78             | 21,635                                   | 2.21                                |
| Stored storm water.....                 | 6,593,659               | 3.4                | 222.15            | 18,963                                   | 4.25                                |
| City water.....                         | 61,055                  | ( <sup>2</sup> )   | 69.62             | 58                                       | 24.05                               |
| Sewage.....                             | 59,959                  | ( <sup>2</sup> )   | 42.89             | 1,286                                    | 11.25                               |
| Stream, gravity, and pumped wells.....  | 10,001,650              | 5.1                | 100.74            | 67,779                                   | 15.62                               |
| Stream, gravity, and flowing wells..... | 1,264,530               | 0.6                | 247.27            | 1,860                                    | 28.93                               |
| Other mixed.....                        | 19,906,271              | 10.2               | 53.65             | 196,886                                  | 5.36                                |
| Other and not reported.....             | 805,115                 | 0.4                | 84.32             | 7,744                                    | 16.13                               |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

## IRRIGATION—CALIFORNIA.

TABLE 10.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.       | Per cent of total. | Average per acre. |
|--------------------|---------------|--------------------|-------------------|
| Total.....         | \$194,886,388 | 100.0              | \$33.06           |
| Before 1860.....   | 6,802,109     | 3.5                | 50.40             |
| 1860-1869.....     | 2,559,615     | 1.3                | 22.32             |
| 1870-1879.....     | 16,475,201    | 8.5                | 10.47             |
| 1880-1889.....     | 19,046,449    | 9.8                | 48.53             |
| 1890-1899.....     | 31,330,191    | 16.1               | 50.08             |
| 1900-1904.....     | 19,106,308    | 9.8                | 34.22             |
| 1905-1909.....     | 15,252,978    | 7.8                | 42.47             |
| 1910-1914.....     | 41,705,878    | 21.4               | 45.00             |
| 1915-1919.....     | 32,990,398    | 16.9               | 38.85             |
| Not reported.....  | 9,521,261     | 4.9                | 26.68             |

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.   | 1920          | 1902         | INCREASE. <sup>1</sup> |           |
|---|---------------|--------------|------------------------|-----------|
|   |               |              | Amount.                | Per cent. |
| Total.....  | \$194,886,388 | \$23,772,157 | \$171,114,231          | 719.8     |
| Colorado River.....   | 7,429,589     | 500,000      | 6,929,589              |           |
| Independent streams, northern California.....                                       | 6,257,200     | 629,548      | 5,627,652              | 893.9     |
| Carson River.....   | 40,385        | 22,939       | 17,446                 | 76.1      |
| Long Valley Creek.....  | 171,642       | 10,345       | 161,297                | 950.1     |
| Mono Lake and tributaries.....  | 5,363,858     | 15,200       | 5,348,658              |           |
| Susan River.....  | 242,426       | 203,205      | 39,221                 | 19.3      |
| Walker River.....   | 37,575        | 196,445      | -158,870               | -80.9     |
| Other independent streams.....  | 401,314       | 217,514      | 225,900                | 128.8     |
| Independent streams, southern California.....                                       | 19,896,665    | 1,354,970    | 18,541,695             |           |
| Mohave River.....   | 616,769       | 114,800      | 501,969                | 437.3     |
| Owens River.....  | 5,785,132     | 408,875      | 5,376,257              |           |
| San Jacinto River.....  | 2,139,257     | 775,000      | 1,364,257              | 176.0     |
| Whitewater River.....   | 2,242,944     | (*)          | 2,242,944              |           |
| Other independent streams.....  | 9,112,563     | 256,295      | 8,856,268              |           |
| Pacific Ocean streams north of San Francisco Bay.....                               | 2,378,513     | 304,952      | 2,073,561              | 680.0     |
| Klamath River.....  | 1,690,958     | 281,896      | 1,409,062              | 499.9     |
| Russian River.....  | 162,630       | 2,463        | 160,167                |           |
| Other Pacific Ocean streams north of San Francisco Bay.....                         | 524,925       | 220,593      | 504,332                |           |
| Pacific Ocean streams south of San Francisco Bay.....                               | 53,456,601    | 9,509,767    | 43,946,834             | 462.1     |
| Pajaro River.....   | 1,248,343     | 168,593      | 1,079,750              | 640.4     |
| Salinas River.....  | 2,570,331     | 101,960      | 2,468,371              |           |
| Santa Maria River.....  | 573,194       | 32,380       | 540,814                |           |
| Santa Ynez River.....   | 284,037       | 33,745       | 250,292                | 741.7     |
| Santa Clara River.....  | 2,211,473     | 374,151      | 1,837,322              | 491.1     |
| Los Angeles River.....  | 5,508,400     | 309,611      | 5,198,789              |           |
| San Gabriel River.....  | 12,862,319    | 772,597      | 12,089,722             |           |
| Santa Ana River.....  | 19,918,550    | 1,919,531    | 17,999,019             | 937.7     |
| San Diego River.....  | 1,789,124     | 32,100       | 1,757,024              |           |
| Other Pacific Ocean streams south of San Francisco Bay.....                         | 6,490,830     | 25,765,099   | 725,731                | 12.6      |
| Sacramento River and tributaries.....   | 28,833,106    | 1,882,227    | 26,950,879             |           |
| Sacramento River direct.....  | 11,830,374    | 49,368       | 11,781,006             |           |
| Pit River.....  | 799,913       | 274,671      | 525,242                | 191.2     |
| Cow Creek.....  | 126,946       | 15,246       | 111,700                | 732.7     |
| Cottonwood Creek.....   | 573,601       | 124,473      | 449,128                | 360.8     |
| Battle Creek.....   | 95,139        | 34,796       | 60,343                 | 173.4     |
| Stony Creek.....  | 1,539,614     | 42,250       | 1,497,364              |           |
| Feather River.....  | 3,937,380     | 869,841      | 3,067,539              | 352.7     |
| Yuba River.....   | 2,518,770     | (*)          | 2,518,770              |           |
| Cache Creek.....  | 916,477       | 28,115       | 888,362                |           |
| American River.....   | 2,890,114     | 112,768      | 2,777,346              |           |
| Other tributaries of Sacramento River.....  | 3,604,778     | 2330,709     | 3,274,069              | 990.0     |
| San Joaquin River and tributaries.....  | 71,694,653    | 9,103,242    | 62,591,411             | 687.6     |
| San Joaquin River direct.....   | 9,224,164     | 1,504,238    | 7,719,926              | 513.2     |
| Kern River.....   | 17,573,687    | 796,340      | 16,777,347             |           |
| Tulare Lake.....  | 3,910,620     | (*)          | 3,910,620              |           |
| Tule River.....   | 2,842,495     | (*)          | 2,842,495              |           |
| Kaweah River.....   | 6,186,840     | (*)          | 6,186,840              |           |
| Kings River.....  | 8,145,446     | 2,976,688    | 5,168,758              | 173.0     |
| Fresno River.....   | 415,385       | 400,514      | 14,871                 | 3.7       |
| Merced River.....   | 3,812,235     | 1,542,834    | 2,269,401              | 147.1     |
| Tuolumne River.....   | 7,173,802     | (*)          | 7,173,802              |           |
| Stanislaus River.....   | 7,840,486     | 968,964      | 6,871,522              | 709.2     |
| Calaveras River.....  | 818,995       | (*)          | 818,995                |           |
| Mokelumne River.....  | 1,675,137     | 305,239      | 1,369,898              | 448.8     |
| Cosumnes River.....   | 153,899       | (*)          | 153,899                |           |
| Other tributaries of San Joaquin River.....   | 1,921,512     | 2608,425     | 1,313,087              | 215.8     |
| Tributaries of San Francisco Bay, other than Sacramento and San Joaquin Rivers..... | 4,940,061     | 487,451      | 4,452,610              | 913.4     |
| Coyote Creek.....   | 1,453,138     | 43,345       | 1,409,793              |           |
| Guadalupe River.....  | 1,883,049     | 75,795       | 1,807,254              |           |
| Other tributaries of San Francisco Bay.....   | 1,603,874     | 2368,311     | 1,235,563              | 335.5     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells. <sup>3</sup> Not reported separately in 1902.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$194,886,388           | 100.0              | 3,714,361                                | \$4.46                              |
| Individual and partnership..... | 57,616,716              | 29.6               | 1,185,770                                | 6.28                                |
| Cooperative.....                | 48,899,448              | 25.1               | 1,074,361                                | 4.46                                |
| Irrigation district.....        | 33,985,301              | 17.4               | 566,654                                  | 3.42                                |
| Commercial.....                 | 44,996,723              | 23.1               | 854,574                                  | 2.39                                |
| U. S. Reclamation Service.....  | 2,398,220               | 1.2                | 25,300                                   | 1.56                                |
| U. S. Indian Service.....       | 55,556                  | ( <sup>2</sup> )   | 423                                      | 4.90                                |
| State.....                      | 224,909                 | 0.1                | 191                                      | 17.54                               |
| City.....                       | 1,401,320               | 0.7                | 4,026                                    | 19.52                               |
| Other.....                      | 5,277,490               | 2.7                | 3,062                                    | 6.11                                |
| Not reported.....               | 30,705                  | ( <sup>2</sup> )   |  |                                     |

<sup>1</sup> Based on area irrigated in 1919.

<sup>2</sup> Less than one-tenth of 1 per cent.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|   |           |
|---|-----------|
| Number of enterprises reporting land drained or needing drainage.....   | 545       |
| Acreage included in enterprises reporting land drained or needing drainage.....   | 1,623,330 |
| Acreage for which drains have been installed.....   | 319,573   |
| Additional acreage needing drainage.....  | 409,933   |
| Percent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 19.7      |
| Percent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 4.1       |
| Percent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 9.3       |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.     | Measured.  | Not measured. |
|---|------------|------------|---------------|
| Average volume of water entering canals, second-feet..... | 29,110     | 13,190     | 15,920        |
| Area irrigated in 1919..... acres.....                    | 1,511,038  | 1,137,205  | 373,833       |
| Average number of acres per second-foot.....              | 52         | 89         | 23            |
| Total quantity of water entering canals, acre-feet.....   | 14,793,933 | 10,581,929 | 4,212,004     |
| Area irrigated in 1919..... acres.....                    | 2,167,485  | 1,785,976  | 381,509       |
| Average quantity per acre..... acre-feet.....             | 6.8        | 5.9        | 11.0          |
| Total quantity of water delivered..... acre-feet.....     | 3,409,367  | 1,627,316  | 1,782,051     |
| Area irrigated in 1919..... acres.....                    | 1,438,699  | 751,327    | 687,372       |
| Average quantity per acre..... acre-feet.....             | 2.4        | 2.2        | 2.6           |

# IRRIGATION—CALIFORNIA.

9

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....         | 2,070                     | 455                     | 6,040         | 115,237                 | 14,437          | 9,190            | 12,947          | 3,030       | 1,091,394             |
| Before 1860.....   | 187                       | 63                      | 339           | 4,672                   | 2,263           | 438              | 730             | 98          | 108,552               |
| 1860-1869.....     | 189                       | 23                      | 434           | 4,103                   | 935             | 224              | 130             | 19          | 3,635                 |
| 1870-1879.....     | 309                       | 20                      | 607           | 23,774                  | 2,482           | 1,524            | 2,855           | 60          | 77,015                |
| 1880-1889.....     | 313                       | 62                      | 627           | 14,078                  | 1,258           | 437              | 500             | 142         | 107,142               |
| 1890-1899.....     | 296                       | 42                      | 561           | 14,618                  | 1,538           | 1,247            | 1,399           | 159         | 110,318               |
| 1900-1904.....     | 100                       | 36                      | 344           | 17,730                  | 792             | 504              | 2,160           | 163         | 175,719               |
| 1905-1909.....     | 110                       | 40                      | 321           | 6,201                   | 438             | 510              | 873             | 236         | 91,012                |
| 1910-1914.....     | 161                       | 61                      | 1,052         | 10,404                  | 2,468           | 1,708            | 2,490           | 750         | 207,616               |
| 1915-1919.....     | 144                       | 75                      | 1,011         | 11,314                  | 1,170           | 1,781            | 1,625           | 807         | 202,442               |
| Not reported.....  | 261                       | 33                      | 604           | 8,343                   | 1,093           | 817              | 179             | 506         | 7,943                 |

| DATE OF BEGINNING. | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |  |
|--------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|--|
|                    |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.<br>Number. Capacity (gallons per minute). |
| Total.....         | 6,885.9                     | 1,415          | 287,187                        | 25,401        | 10,608,476                     | 21,561          | 386,200                        | 24,134 16,773,692                                |
| Before 1860.....   | 61.3                        | 9              | 1,227                          | 17            | 8,668                          | 18              | 311                            | 23 11,813  |
| 1860-1869.....     | 14.3                        | 36             | 3,926                          | 20            | 32,059                         | 22              | 257                            | 22 35,219  |
| 1870-1879.....     | 234.1                       | 48             | 22,126                         | 58            | 41,461                         | 53              | 1,523                          | 62 46,063  |
| 1880-1889.....     | 711.3                       | 107            | 15,268                         | 257           | 115,851                        | 202             | 11,387                         | 301 804,228                                      |
| 1890-1899.....     | 521.0                       | 120            | 16,240                         | 744           | 261,613                        | 468             | 11,455                         | 578 348,468                                      |
| 1900-1904.....     | 333.7                       | 183            | 29,239                         | 1,339         | 526,339                        | 1,014           | 20,273                         | 1,163 651,708                                    |
| 1905-1909.....     | 743.7                       | 128            | 20,409                         | 2,448         | 1,004,097                      | 1,885           | 34,876                         | 2,156 1,251,035                                  |
| 1910-1914.....     | 2,019.2                     | 201            | 65,565                         | 8,539         | 3,608,435                      | 7,180           | 128,041                        | 8,038 4,668,351                                  |
| 1915-1919.....     | 1,848.4                     | 180            | 60,518                         | 8,410         | 3,605,707                      | 7,568           | 138,009                        | 8,375 6,808,125                                  |
| Not reported.....  | 398.9                       | 343            | 52,729                         | 3,569         | 1,313,250                      | 3,151           | 39,408                         | 3,426 2,148,622                                  |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 2,070                     | 455                     | 6,040         | 115,237                 | 14,437          | 9,190            | 12,947          | 3,030       | 1,091,394             |
| Individual and partnership..... | 1,787                     | 333                     | 5,343         | 34,298                  | 7,116           | 4,351            | 2,641           | 2,655       | 549,335               |
| Cooperative.....                | 153                       | 32                      | 309           | 32,608                  | 2,547           | 1,609            | 3,252           | 191         | 67,226                |
| Irrigation district.....        | 29                        | 18                      | 104           | 19,426                  | 1,006           | 1,309            | 3,581           | 21          | 153,060               |
| Commercial.....                 | 91                        | 62                      | 168           | 26,687                  | 3,659           | 1,753            | 3,495           | 137         | 245,750               |
| U. S. Reclamation Service.....  | 4                         | 1                       | 5             | 787                     | 65              | 31               | 155             | 1           | 51,000                |
| U. S. Indian Service.....       | 5                         | —                       | 10            | 1,108                   | 17              | 35               | 15              | —           | —                     |
| State.....                      | 1                         | 4                       | 2             | 38                      | 16              | —                | —               | 7           | 263                   |
| City.....                       | —                         | —                       | —             | —                       | —               | 2                | 1               | 11          | 80                    |
| Other.....                      | —                         | 3                       | 9             | 195                     | 11              | 10               | 7               | 5           | 34,700                |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |  |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|--|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.<br>Number. Capacity (gallons per minute). |
| Total.....                      | 6,885.9                     | 1,415          | 287,187                        | 25,401        | 10,608,476                     | 21,561          | 386,200                        | 24,134 16,773,692                                |
| Individual and partnership..... | 3,757.4                     | 1,290          | 225,709                        | 24,131        | 9,790,608                      | 20,821          | 311,505                        | 22,823 14,038,640                                |
| Cooperative.....                | 1,762.3                     | 50             | 33,954                         | 922           | 571,860                        | 579             | 50,990                         | 938 1,438,994                                    |
| Irrigation district.....        | 620.0                       | 2              | —                              | 97            | 83,270                         | 36              | 13,416                         | 161 513,150                                      |
| Commercial.....                 | 693.4                       | 56             | 25,885                         | 185           | 126,700                        | 94              | 8,615                          | 153 741,375                                      |
| U. S. Reclamation Service.....  | —                           | —              | —                              | 1             | 400                            | 3               | 263                            | — 3,250  |
| U. S. Indian Service.....       | 12.5                        | 15             | 1,530                          | 17            | 2,568                          | 4               | 120                            | 13 2,568   |
| State.....                      | 11.9                        | —              | —                              | 13            | 3,706                          | 7               | 161                            | 9 4,850  |
| City.....                       | 26.8                        | —              | —                              | 29            | 26,644                         | 13              | 1,090                          | 27 28,245  |
| Other.....                      | 1.6                         | 2              | 100                            | 6             | 2,720                          | 4               | 40                             | 6 2,620  |

## IRRIGATION—CALIFORNIA.

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.   | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|   |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....  | 2,070                     | 455                     | 6,040         | 115,237                 | 14,437          | 9,190            | 12,947          | 3,030       | 1,091,394             |
| Colorado River.....   | 3                         | 1                       | 47            | 6,577                   | 498             | 494              | 1,990           |             |                       |
| Independent streams, northern California.....                                       | 215                       | 22                      | 574           | 5,145                   | 868             | 396              | 172             | 54          | 116,574               |
| Carson River.....   | 15                        | 1                       | 18            | 52                      | 20              | 14               | 1               | 2           | 4                     |
| Long Valley Creek.....  | 59                        | 2                       | 102           | 585                     | 131             | 90               | 44              | 6           | 857                   |
| Mono Lake and tributaries.....  | 4                         | 3                       | 21            | 525                     | 26              | 11               | 8               | 3           | 34,700                |
| Susan River.....  | 93                        | 7                       | 82            | 1,861                   | 215             | 114              | 45              | 15          | 63,949                |
| Walker River.....   | 7                         |                         | 64            | 925                     | 161             | 3                | 5               | 5           | 10,000                |
| Other independent streams.....  | 37                        | 9                       | 287           | 1,197                   | 315             | 164              | 69              | 23          | 7,064                 |
| Independent streams, southern California.....                                       | 32                        | 18                      | 381           | 8,724                   | 446             | 410              | 988             | 284         | 132,308               |
| Mohave River.....   | 2                         |                         | 21            | 189                     | 23              | 9                | 4               | 18          | 27                    |
| Owens River.....  | 7                         | 4                       | 53            | 1,598                   | 138             | 5                | 4               | 20          | 26,006                |
| San Jacinto River.....  | 7                         | 11                      | 32            | 251                     | 50              | 28               | 14              | 94          | 105,688               |
| Whitewater River.....   | 3                         |                         | 12            | 57                      | 47              | 15               | 2               | 41          | 50                    |
| Other independent streams.....  | 14                        | 3                       | 263           | 6,629                   | 188             | 353              | 964             | 111         | 537                   |
| Pacific Ocean streams north of San Francisco Bay.....                               | 469                       | 38                      | 971           | 5,850                   | 1,083           | 323              | 479             | 84          | 95,351                |
| Klamath River.....  | 448                       | 23                      | 925           | 5,716                   | 1,058           | 284              | 113             | 70          | 95,054                |
| Russian River.....  | 9                         | 10                      | 18            | 23                      | 8               | 25               | 364             | 10          | 142                   |
| Other Pacific Ocean streams north of San Francisco Bay.....                         | 12                        | 5                       | 28            | 111                     | 17              | 14               | 2               | 4           | 155                   |
| Pacific Ocean streams south of San Francisco Bay.....                               | 197                       | 82                      | 716           | 9,418                   | 928             | 1,281            | 419             | 925         | 68,969                |
| Pajaro River.....   | 29                        | 9                       | 94            | 278                     | 66              | 81               | 29              | 19          | 5,995                 |
| Salinas River.....  | 7                         | 4                       | 140           | 553                     | 117             | 403              | 98              | 21          | 73                    |
| Santa Maria River.....  | 1                         | 1                       | 16            | 69                      | 13              | 25               | 3               | 8           | 36                    |
| Santa Ynez River.....   | 9                         | 8                       | 18            | 227                     | 10              | 10               | 4               | 16          | 2,502                 |
| Santa Clara River.....  | 15                        | 3                       | 38            | 191                     | 49              | 56               | 30              | 30          | 2,741                 |
| Los Angeles River.....  | 11                        | 3                       | 79            | 266                     | 81              | 191              | 78              | 164         | 4,950                 |
| San Gabriel River.....  | 18                        | 1                       | 54            | 3,040                   | 89              | 61               | 47              | 129         | 7,168                 |
| Santa Ana River.....  | 39                        | 12                      | 123           | 2,096                   | 302             | 139              | 34              | 139         | 3,514                 |
| San Diego River.....  | 4                         | 2                       | 11            |                         |                 | 5                | 4               | 63          | 18,904                |
| Other Pacific Ocean streams south of San Francisco Bay.....                         | 64                        | 39                      | 143           | 1,798                   | 201             | 310              | 92              | 336         | 23,086                |
| Sacramento River and tributaries.....   | 859                       | 200                     | 1,821         | 23,514                  | 4,574           | 1,743            | 1,955           | 220         | 348,435               |
| Sacramento River direct.....  | 6                         | 3                       | 192           | 5,803                   | 585             | 559              | 693             | 24          | 285                   |
| Pit River.....  | 392                       | 63                      | 489           | 5,160                   | 730             | 150              | 78              | 63          | 202,877               |
| Cow Creek.....  | 40                        |                         | 64            | 367                     | 118             | 30               | 23              | 1           |                       |
| Cottonwood Creek.....   | 16                        |                         | 41            | 147                     | 78              | 19               | 30              | 8           | 6,300                 |
| Battle Creek.....   | 26                        |                         | 71            | 358                     | 114             | 17               | 4               |             |                       |
| Stony Creek.....  | 44                        | 5                       | 63            | 1,590                   | 81              | 22               | 130             | 4           | 51,001                |
| Feather River.....  | 221                       | 52                      | 332           | 4,399                   | 455             | 424              | 130             | 12          | 243                   |
| Yuba River.....   | 41                        | 33                      | 136           | 1,235                   | 481             | 65               | 96              | 32          | 56,672                |
| Cache Creek.....  | 6                         | 3                       | 20            | 1,197                   | 87              | 30               | 115             | 4           | 181                   |
| American River.....   | 51                        | 31                      | 109           | 1,264                   | 1,498           | 135              | 374             | 53          | 30,682                |
| Other tributaries of Sacramento River.....  | 86                        | 9                       | 304           | 1,094                   | 347             | 202              | 282             | 19          | 194                   |
| San Joaquin River and tributaries.....  | 269                       | 85                      | 1,452         | 55,628                  | 5,995           | 4,394            | 6,904           | 1,419       | 329,522               |
| San Joaquin River direct.....   | 23                        | 2                       | 176           | 11,431                  | 1,237           | 1,203            | 2,103           | 120         | 1,937                 |
| Kern River.....   | 17                        | 11                      | 142           | 6,273                   | 427             | 156              | 140             | 185         | 60,469                |
| Tulare Lake.....  | 26                        |                         | 67            | 562                     | 101             | 200              | 601             | 671         | 110,553               |
| Tule River.....   | 44                        | 2                       | 115           | 2,465                   | 426             | 209              | 155             | 118         | 523                   |
| Kaweah River.....   | 19                        | 1                       | 95            | 5,133                   | 339             | 271              | 497             | 72          | 2,348                 |
| Kings River.....  | 27                        | 5                       | 128           | 17,194                  | 892             | 465              | 981             | 67          | 6,116                 |
| Fresno River.....   | 5                         |                         | 7             | 314                     | 5               | 6                | 107             | 19          | 263                   |
| Merced River.....   | 17                        | 1                       | 159           | 2,171                   | 476             | 597              | 290             | 9           | 8,019                 |
| Tuolumne River.....   | 17                        | 15                      | 110           | 5,834                   | 626             | 835              | 907             | 12          | 86,007                |
| Stanislaus River.....   | 12                        | 13                      | 59            | 1,444                   | 190             | 142              | 813             | 17          | 42,526                |
| Calaveras River.....  | 22                        | 8                       | 129           | 224                     | 86              | 33               | 12              | 25          | 17                    |
| Mokelumne River.....  | 31                        | 25                      | 126           | 1,598                   | 1,024           | 62               | 153             | 33          | 678                   |
| Cosumnes River.....   | 6                         |                         | 13            | 103                     | 55              | 2                | 15              | 2           |                       |
| Other tributaries of San Joaquin River.....   | 3                         | 2                       | 126           | 882                     | 111             | 213              | 130             | 66          | 10,066                |
| Tributaries of San Francisco Bay, other than Sacramento and San Joaquin Rivers..... | 26                        | 9                       | 78            | 381                     | 45              | 149              | 40              | 44          | 225                   |
| Coyote Creek.....   | 6                         |                         | 6             | 24                      | 5               |                  |                 | 3           |                       |
| Guadalupe River.....  | 8                         |                         | 12            | 271                     | 21              | 4                | 20              |             |                       |
| Other tributaries of San Francisco Bay.....   | 12                        | 9                       | 60            | 86                      | 19              | 145              | 20              | 41          | 234                   |

## IRRIGATION—CALIFORNIA.

11

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920—Continued.

| DRAINAGE BASIN.   | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |                            |
|---|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|----------------------------|
|   |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average<br>lift<br>(feet). |
|   |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |                            |
| Total.....  | 6,885.9                           | 1,415          | 287,187                              | 25,401        | 10,608,470                           | 21,561          | 386,200                                  | 24,134  | 16,773,692                           | 41                         |
| Colorado River.....   | 0.4                               |                |                                      | 1             | 900                                  | 2               | 73                                       | 2       | 2,000                                | 42                         |
| Independent streams, northern California.....                                       | 8.6                               | 75             | 6,647                                | 30            | 13,144                               | 27              | 552                                      | 28      | 28,414                               | 35                         |
| Carson River.....   | 0.5                               |                |                                      |               |                                      |                 |  |         |                                      |                            |
| Long Valley Creek.....  | 2.1                               |                |                                      | 1             | 480                                  | 3               | 9  | 3       | 1,180                                | 17                         |
| Susun River.....  | 2.0                               |                |                                      | 1             | 75                                   | 4               | 31                                       | 4       | 3,460                                | 23                         |
| Other independent streams.....  | 4.0                               | 75             | 6,647                                | 28            | 12,580                               | 20              | 509                                      | 21      | 23,774                               | 37                         |
| Independent streams, southern California.....                                       | 760.7                             | 368            | 51,386                               | 1,087         | 401,122                              | 843             | 15,093                                   | 802     | 433,667                              | 58                         |
| Mohave River.....   | 28.8                              | 31             | 4,874                                | 88            | 45,477                               | 86              | 2,145                                    | 86      | 45,960                               | 80                         |
| Owens River.....  | 388.5                             | 23             | 537                                  | 9             | 4,088                                | 12              | 137                                      | 12      | 4,558                                | 24                         |
| San Jacinto River.....  | 145.0                             | 9              | 115                                  | 236           | 66,833                               | 183             | 3,546                                    | 203     | 76,386                               | 73                         |
| Whitewater River.....   | 77.5                              | 242            | 36,860                               | 325           | 121,466                              | 235             | 3,212                                    | 247     | 126,356                              | 41                         |
| Other independent streams.....  | 120.9                             | 63             | 9,000                                | 429           | 166,258                              | 327             | 6,653                                    | 344     | 180,407                              | 57                         |
| Pacific Ocean streams north of San Francisco Bay..                                  | 52.4                              | 4              |                                      | 107           | 35,194                               | 186             | 3,858                                    | 190     | 168,103                              | 22                         |
| Klamath River.....  | 19.1                              | 3              |                                      | 14            | 4,375                                | 43              | 2,695                                    | 47      | 111,709                              | 13                         |
| Russian River.....  | 27.2                              | 1              |                                      | 89            | 30,231                               | 128             | 1,058                                    | 128     | 51,239                               | 23                         |
| Other Pacific Ocean streams north of San Francisco Bay.....                         | 6.1                               |                |                                      | 4             | 585                                  | 15              | 105                                      | 15      | 5,215                                | 17                         |
| Pacific Ocean streams south of San Francisco Bay..                                  | 4,011.4                           | 713            | 164,294                              | 7,068         | 3,061,724                            | 5,203           | 129,331                                  | 6,071   | 3,604,090                            | 57                         |
| Pajaro River.....   | 83.2                              | 17             | 2,000                                | 688           | 186,255                              | 370             | 7,083                                    | 417     | 203,845                              | 35                         |
| Salinas River.....  | 166.6                             | 18             | 3,808                                | 697           | 422,195                              | 239             | 10,085                                   | 286     | 424,032                              | 25                         |
| Santa Maria River.....  | 28.9                              | 13             | 2,700                                | 118           | 66,303                               | 62              | 2,934                                    | 78      | 201,631                              | 47                         |
| Santa Ynez River.....   | 28.7                              | 7              | 1,510                                | 60            | 16,401                               | 61              | 1,011                                    | 84      | 199,630                              | 80                         |
| Santa Clara River.....  | 151.0                             | 1              | 700                                  | 136           | 92,049                               | 125             | 5,126                                    | 161     | 102,181                              | 67                         |
| Los Angeles River.....  | 528.2                             | 45             | 24,963                               | 849           | 443,036                              | 745             | 16,208                                   | 825     | 458,932                              | 52                         |
| San Gabriel River.....  | 832.9                             | 160            | 28,363                               | 1,034         | 557,934                              | 825             | 25,675                                   | 951     | 579,133                              | 72                         |
| Santa Ana River.....  | 921.5                             | 360            | 62,663                               | 1,816         | 1,002,743                            | 1,523           | 45,315                                   | 1,830   | 1,018,090                            | 61                         |
| San Diego River.....  | 145.2                             | 1              | 8                                    | 533           | 51,210                               | 319             | 2,313                                    | 374     | 65,462                               | 56                         |
| Other Pacific Ocean streams south of San Francisco Bay.....                         | 1,146.2                           | 91             | 37,519                               | 1,137         | 223,502                              | 931             | 12,951                                   | 1,059   | 408,258                              | 59                         |
| Sacramento River and tributaries.....   | 361.2                             | 36             | 2,957                                | 3,508         | 1,473,602                            | 3,430           | 64,163                                   | 3,898   | 4,181,240                            | 16                         |
| Sacramento River direct.....  | 61.2                              |                |                                      | 514           | 279,456                              | 655             | 28,625                                   | 807     | 2,616,658                            | 24                         |
| Pit River.....  | 2.9                               | 14             | 663                                  | 4             | 395                                  | 36              | 440                                      | 36      | 32,886                               | 18                         |
| Cow Creek.....  | 0.4                               |                |                                      |               |                                      | 11              | 87                                       | 11      | 8,955                                | 14                         |
| Cottonwood Creek.....   | 0.6                               |                |                                      |               |                                      | 9               | 100                                      | 10      | 7,865                                | 33                         |
| Battle Creek.....   | 0.3                               |                |                                      | 2             | 730                                  | 3               | 63                                       | 4       | 3,300                                | 25                         |
| Stony Creek.....  | 17.5                              |                |                                      | 68            | 40,451                               | 61              | 759                                      | 66      | 45,959                               | 25                         |
| Feather River.....  | 117.3                             | 9              | 1,284                                | 845           | 341,583                              | 728             | 8,425                                    | 828     | 394,677                              | 22                         |
| Yuba River.....   | 6.2                               | 2              | 30                                   | 8             | 2,725                                | 9               | 1,572                                    | 11      | 2,751                                | 35                         |
| Cache Creek.....  | 0.4                               |                |                                      | 144           | 91,211                               | 75              | 1,524                                    | 76      | 92,391                               | 24                         |
| American River.....   | 77.8                              |                |                                      | 163           | 93,894                               | 172             | 2,358                                    | 190     | 95,838                               | 26                         |
| Other tributaries of Sacramento River.....  | 76.6                              | 11             | 950                                  | 1,760         | 623,337                              | 1,671           | 20,210                                   | 1,859   | 883,260                              | 30                         |
| San Joaquin River and tributaries.....  | 1,366.6                           | 145            | 48,828                               | 11,149        | 4,911,280                            | 9,973           | 136,911                                  | 10,951  | 7,400,131                            | 34                         |
| San Joaquin River direct.....   | 184.8                             | 49             | 15,155                               | 1,531         | 668,420                              | 1,481           | 30,086                                   | 1,639   | 1,295,475                            | 25                         |
| Kern River.....   | 83.1                              | 17             | 13,880                               | 441           | 219,674                              | 384             | 6,676                                    | 405     | 223,608                              | 47                         |
| Tulare Lake.....  | 261.9                             | 24             | 8,253                                | 1,100         | 434,565                              | 906             | 12,841                                   | 1,069   | 1,330,434                            | 59                         |
| Tule River.....   | 162.7                             | 2              | 251                                  | 1,146         | 493,272                              | 974             | 11,329                                   | 1,083   | 995,319                              | 46                         |
| Kaweah River.....   | 269.7                             | 3              | 17                                   | 2,136         | 842,085                              | 1,734           | 21,932                                   | 1,930   | 876,254                              | 41                         |
| Kings River.....  | 239.3                             | 34             | 10,000                               | 2,547         | 1,183,710                            | 2,283           | 25,426                                   | 2,397   | 1,225,607                            | 23                         |
| Fresno River.....   | 6.3                               | 1              | 200                                  | 145           | 79,255                               | 134             | 1,520                                    | 144     | 82,738                               | 33                         |
| Merced River.....   | 5.2                               | 1              | 75                                   | 216           | 120,465                              | 213             | 2,774                                    | 235     | 157,865                              | 21                         |
| Tuolumne River.....   | 14.4                              | 1              | 400                                  | 63            | 53,880                               | 66              | 1,231                                    | 69      | 59,360                               | 33                         |
| Stanislaus River.....   | 41.0                              |                |                                      | 34            | 26,490                               | 36              | 1,158                                    | 41      | 73,140                               | 26                         |
| Calaveras River.....  | 29.4                              | 6              | 220                                  | 565           | 186,181                              | 544             | 4,358                                    | 585     | 200,337                              | 26                         |
| Mokelumne River.....  | 82.2                              | 2              | 25                                   | 709           | 356,156                              | 694             | 8,309                                    | 765     | 451,434                              | 33                         |
| Coast Range River.....  | 5.5                               |                |                                      | 117           | 50,870                               | 111             | 1,788                                    | 131     | 84,740                               | 28                         |
| Other tributaries of San Joaquin River.....   | 11.1                              | 5              | 382                                  | 399           | 193,237                              | 413             | 7,483                                    | 458     | 343,822                              | 28                         |
| Tributaries of San Francisco Bay, other than Sacramento and San Joaquin Rivers..... | 264.5                             | 74             | 13,075                               | 2,451         | 705,510                              | 1,897           | 36,219                                   | 2,102   | 862,987                              | 55                         |
| Coyote Creek.....   | 60.2                              | 14             | 3,430                                | 821           | 246,483                              | 657             | 12,407                                   | 725     | 312,320                              | 50                         |
| Guadalupe River.....  | 99.3                              | 51             | 7,700                                | 725           | 242,912                              | 512             | 13,480                                   | 572     | 278,221                              | 67                         |
| Other tributaries of San Francisco Bay.....   | 105.1                             | 9              | 1,925                                | 905           | 216,115                              | 728             | 10,332                                   | 805     | 272,446                              | 51                         |

## IRRIGATION—CALIFORNIA.

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP.   | AREA HARVESTED. |                              |         |                              |                                     | QUANTITY HARVESTED. |               |                              |           |                              |                                     |
|---|-----------------|------------------------------|---------|------------------------------|-------------------------------------|---------------------|---------------|------------------------------|-----------|------------------------------|-------------------------------------|
|   | 1919            |                              | 1909    |                              | Per cent of in-crease. <sup>1</sup> | Unit.               | 1919          |                              | 1909      |                              | Per cent of in-crease. <sup>1</sup> |
|   | Acres.          | Per cent of total for state. | Acres.  | Per cent of total for state. |                                     |                     | Amount.       | Per cent of total for state. | Amount.   | Per cent of total for state. |                                     |
| <b>Cereals:</b>                               |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 1 Corn.....                                   | 56,958          | 48.8                         | 17,802  | 34.3                         | 220.0                               | Bu....              | 1,964,828     | 57.0                         | 491,978   | 38.6                         | 209.4                               |
| 2 Oats.....                                   | 9,359           | 6.4                          | 5,903   | 3.1                          | 58.5                                | Bu....              | 286,878       | 9.0                          | 205,727   | 5.0                          | 29.7                                |
| 3 Winter wheat.....                           | 85,245          | 9.2                          | 22,603  | 4.7                          | 491.0                               | Bu....              | 1,636,503     | 11.2                         | 408,706   | 6.6                          | 476.0                               |
| 4 Spring wheat.....                           | 48,390          | 20.9                         | 77,785  | 6.5                          | 65.6                                | Bu....              | 717,549       | 31.8                         | 1,844,971 | 7.0                          | 78.8                                |
| 5 Barley.....                                 | 128,812         | 13.0                         | 107     | 1.5                          |                                     | Bu....              | 3,299,308     | 15.1                         | 1,265     | 1.8                          |                                     |
| 6 Rye.....                                    | 2,546           | 13.8                         | (2)     |                              |                                     | Bu....              | 20,294        | 15.8                         | (2)       |                              |                                     |
| 7 Kafir, milo, etc.....                       | 124,092         | 73.9                         | (2)     |                              |                                     | Bu....              | 3,253,711     | 80.3                         | (2)       |                              |                                     |
| 8 Rough rice.....                             | 130,367         | 100.0                        | (2)     |                              |                                     | Bu....              | 6,926,313     | 100.0                        | (2)       |                              |                                     |
| 9 Mixed crops.....                            | 1,633           | 59.2                         | (2)     |                              |                                     | Bu....              | 58,300        | 78.5                         | (2)       |                              |                                     |
| <b>Other grains and seeds:</b>                |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 10 Clover and alfalfa seed <sup>2</sup> ..... | 2,319           | 18.0                         | 2,570   | 29.3                         | -9.8                                | Bu....              | 9,702         | 23.7                         | 5,011     | 24.5                         | 64.1                                |
| 11 Dry beans, navy, etc.....                  | 148,379         | 31.5                         | 11,384  | 7.2                          |                                     | Bu....              | 2,459,350     | 37.5                         | 244,624   | 7.3                          | 905.4                               |
| 12 Dry peas (Canada).....                     | 1,504           | 7.2                          | 290     | 9.8                          | 418.6                               | Bu....              | 24,850        | 13.6                         | 9,902     | 17.2                         | 151.0                               |
| 13 Sugar-beet seed.....                       | 503             | 71.4                         | (2)     |                              |                                     | Lbs..               | 138,000       | 51.8                         | (2)       |                              |                                     |
| 14 Flower and vegetable seed.....             | 3,234           | 22.9                         | (2)     |                              |                                     | Lbs..               | 2,056,510     | 37.6                         | (2)       |                              |                                     |
| <b>Hay and forage:</b>                        |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 15 Timothy alone.....                         | 2,919           | 22.5                         | 8,026   | 58.5                         | -63.6                               | Tons..              | 4,936         | 25.5                         | 11,236    | 56.2                         | -56.1                               |
| 16 Timothy and clover mixed.....              | 38,786          | 74.2                         | 20,880  | 44.7                         | 85.8                                | Tons..              | 54,806        | 72.8                         | 34,177    | 46.7                         | 60.4                                |
| 17 Clover alone.....                          | 4,882           | 32.1                         | 1,176   | 13.8                         | 315.1                               | Tons..              | 6,396         | 26.0                         | 2,689     | 13.2                         | 137.9                               |
| 18 Alfalfa.....                               | 556,656         | 77.5                         | 366,602 | 75.7                         | 51.8                                | Tons..              | 1,967,529     | 81.6                         | 1,280,105 | 78.1                         | 53.7                                |
| 19 Other tame grasses.....                    | 15,863          | 31.8                         | 6,504   | 7.0                          | 143.9                               | Tons..              | 22,678        | 33.7                         | 10,656    | 8.7                          | 112.8                               |
| 20 Annual legumes cut for hay.....            | 3,055           | 11.8                         | 101,187 | 6.3                          | 46.7                                | Tons..              | 8,726         | 12.4                         | 146,013   | 7.2                          | 39.1                                |
| 21 Small grains cut for hay.....              | 145,337         | 13.4                         | 153,672 | 60.7                         | -44.3                               | Tons..              | 199,432       | 15.4                         | 189,904   | 67.6                         | -49.1                               |
| 22 Wild, salt, or prairie grasses.....        | 85,603          | 48.0                         | (2)     |                              |                                     | Tons..              | 96,722        | 52.1                         | (2)       |                              |                                     |
| 23 Silage crops.....                          | 16,244          | 56.0                         | (2)     |                              |                                     | Tons..              | 110,291       | 57.4                         | (2)       |                              |                                     |
| 24 Corn cut for forage.....                   | 5,069           | 37.1                         | (2)     |                              |                                     | Tons..              | 12,946        | 51.9                         | (2)       |                              |                                     |
| 25 Kafir, sorghum, etc., for forage.....      | 7,418           | 51.1                         | (2)     |                              |                                     | Tons..              | 14,667        | 59.8                         | (2)       |                              |                                     |
| 26 Root crops for forage.....                 | 634             | 9.4                          | (2)     |                              |                                     | Tons..              | 5,712         | 4.5                          | (2)       |                              |                                     |
| <b>Vegetables:</b>                            |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 27 Potatoes.....                              | 29,698          | 46.9                         | 32,735  | 48.4                         | -9.3                                | Bu....              | 4,502,597     | 54.8                         | 5,180,006 | 52.7                         | -13.1                               |
| 28 Sweet potatoes and yams.....               | 5,858           | 76.8                         | (2)     |                              |                                     | Bu....              | 659,734       | 76.1                         | (2)       |                              |                                     |
| 29 Cabbages.....                              | 3,279           | 60.5                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 30 Cantaloupes and muskmelons.....            | 13,800          | 61.3                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 31 Celery.....                                | 2,605           | 48.7                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 32 Cucumbers.....                             | 477             | 26.7                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 33 Green beans.....                           | 1,564           | 37.9                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 34 Green peas.....                            | 2,258           | 27.4                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 35 Lettuce.....                               | 4,266           | 69.7                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 36 Onions.....                                | 5,801           | 68.2                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 37 Sweet corn.....                            | 2,219           | 42.2                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 38 Tomatoes.....                              | 16,997          | 54.1                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 39 Watermelons.....                           | 3,979           | 54.2                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 40 Asparagus.....                             | 9,626           | 55.2                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 41 Cauliflower.....                           | 2,362           | 64.4                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 42 Peppers (green).....                       | 4,255           | 87.4                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 43 Pumpkins.....                              | 544             | 48.1                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| 44 Spinach.....                               | 867             | 36.1                         | (2)     |                              |                                     |                     |               |                              |           |                              |                                     |
| <b>Miscellaneous crops:</b>                   |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 45 Sugar beets grown for sugar.....           | 55,720          | 63.1                         | 14,657  | 18.6                         | 280.2                               | Tons..              | 422,427       | 63.3                         | 171,494   | 20.3                         | 146.3                               |
| 46 Cotton.....                                | 83,963          | 96.2                         | (2)     |                              |                                     | Bales..             | 44,681        | 96.3                         | (2)       |                              |                                     |
| 47 Broom corn.....                            | 883             | 40.5                         | (2)     |                              |                                     | Lbs..               | 351,700       | 44.4                         | (2)       |                              |                                     |
| 48 Hops.....                                  | 2,172           | 26.8                         | (2)     |                              |                                     | Lbs..               | 3,091,623     | 20.3                         | (2)       |                              |                                     |
| <b>Small fruits:</b>                          |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 49 Strawberries.....                          | 1,465           | 29.5                         | (2)     |                              |                                     | Qts..               | 5,143,533     | 47.6                         | (2)       |                              |                                     |
| <b>Orchard fruits:</b>                        |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 50 Apples.....                                | 480,683         | 25.7                         | (2)     |                              |                                     | Bu....              | 1,335,057     | 17.0                         | (2)       |                              |                                     |
| 51 Peaches.....                               | 45,662,259      | 62.5                         | (2)     |                              |                                     | Bu....              | 10,318,362    | 64.6                         | (2)       |                              |                                     |
| 52 Pears.....                                 | 1,017,060       | 44.1                         | (2)     |                              |                                     | Bu....              | 1,783,951     | 45.1                         | (2)       |                              |                                     |
| 53 Plums and prunes.....                      | 3,841,678       | 43.8                         | (2)     |                              |                                     | Bu....              | 6,542,548     | 49.6                         | (2)       |                              |                                     |
| 54 Cherries.....                              | 428,569         | 43.3                         | (2)     |                              |                                     | Bu....              | 326,449       | 49.9                         | (2)       |                              |                                     |
| 55 Apricots.....                              | 1,630,763       | 44.2                         | (2)     |                              |                                     | Bu....              | 2,608,136     | 44.1                         | (2)       |                              |                                     |
| 56 Quinces.....                               | 12,403          | 48.0                         | (2)     |                              |                                     | Bu....              | 18,315        | 58.3                         | (2)       |                              |                                     |
| <b>Grapes</b> .....                           | 573,217,234     | 47.8                         | 74,984  |                              |                                     | Lbs..               | 1,128,175,200 | 54.9                         | (2)       |                              |                                     |
| <b>Subtropical fruits:</b>                    |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 58 Oranges.....                               | 48,678,956      | 84.3                         | (2)     |                              |                                     | Boxes.              | 18,725,602    | 86.6                         | (2)       |                              |                                     |
| 59 Lemons.....                                | 2,299,716       | 79.7                         | (2)     |                              |                                     | Boxes.              | 5,776,149     | 88.2                         | (2)       |                              |                                     |
| 60 Grapefruit (pomeloes).....                 | 4193,819        | 83.9                         | (2)     |                              |                                     | Boxes.              | 393,923       | 84.7                         | (2)       |                              |                                     |
| 61 Figs.....                                  | 246,884         | 49.0                         | (2)     |                              |                                     | Lbs..               | 10,074,552    | 46.2                         | (2)       |                              |                                     |
| 62 Alligator pears (avocados).....            | 10,674          | 89.6                         | (2)     |                              |                                     | Crates.             | 7,294         | 92.1                         | (2)       |                              |                                     |
| 63 Dates.....                                 | 14,406          | 83.3                         | (2)     |                              |                                     | Lbs..               | 118,311       | 81.6                         | (2)       |                              |                                     |
| 64 Olives.....                                | 536,543         | 58.9                         | (2)     |                              |                                     | Lbs..               | 12,264,764    | 69.8                         | (2)       |                              |                                     |
| 65 Japanese persimmons.....                   | 5,510           | 39.8                         | (2)     |                              |                                     | Bu....              | 9,500         | 44.3                         | (2)       |                              |                                     |
| 66 Pomegranates.....                          | 14,710          | 60.6                         | (2)     |                              |                                     | Lbs..               | 590,091       | 61.9                         | (2)       |                              |                                     |
| <b>Nuts:</b>                                  |                 |                              |         |                              |                                     |                     |               |                              |           |                              |                                     |
| 67 Almonds.....                               | 464,071         | 19.3                         | (2)     |                              |                                     | Lbs..               | 3,190,813     | 20.3                         | (2)       |                              |                                     |
| 68 Walnuts (English or Persian).....          | 616,372         | 48.4                         | (2)     |                              |                                     | Lbs..               | 30,210,494    | 51.1                         | (2)       |                              |                                     |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Not reported separately in 1909.

<sup>3</sup> Excluding red clover seed (1919).  
<sup>4</sup> Number of trees of bearing age.

<sup>5</sup> Number of vines of bearing age.

# IRRIGATION—CALIFORNIA.

13

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909—Continued.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

|                                |  | AVERAGE YIELD PER ACRE, 1919. |            |                        |                    |                                |   | VALUE.      |                              |           |                              |                                    |
|--------------------------------|--|-------------------------------|------------|------------------------|--------------------|--------------------------------|---|-------------|------------------------------|-----------|------------------------------|------------------------------------|
| CROP.                          |  | Unit.                         | For state. | On non-irrigated land. | On irrigated land. |                                |   | 1919        |                              | 1909      |                              | Per cent of increase. <sup>1</sup> |
|                                |  |                               |            |                        | Average.           | Per cent of average for state. | Per cent of average on nonirrigated land. | Amount.     | Per cent of total for state. | Amount.   | Per cent of total for state. |                                    |
| <b>Cereals:</b>                |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 1                              | Corn.....                                  | Bu....                        | 29.5       | 24.8                   | 34.5               | 116.9                          | 139.1                                     | \$3,310,208 | 57.0                         | \$410,312 | 40.9                         | 658.6                              |
| 2                              | Oats.....                                  | Bu....                        | 20.2       | 19.6                   | 28.5               | 141.1                          | 145.4                                     | 266,878     | 9.0                          | 137,160   | 5.2                          | 94.6                               |
| 3                              | Winter wheat.....                          | Bu....                        | 15.8       | 15.5                   | 19.2               | 121.5                          | 123.9                                     | 3,583,942   | 11.2                         | 428,668   | 6.8                          | .....                              |
| 4                              | Spring wheat.....                          | Bu....                        | 13.9       | 13.5                   | 14.8               | 106.5                          | 109.6                                     | 1,571,432   | 31.8                         | 1,097,541 | 6.4                          | 381.0                              |
| 5                              | Barley.....                                | Bu....                        | 22.2       | 21.7                   | 25.6               | 115.3                          | 118.0                                     | 5,278,893   | 15.1                         | 1,133     | 1.7                          | .....                              |
| 6                              | Rye.....                                   | Bu....                        | 10.1       | 9.9                    | 11.5               | 113.9                          | 116.2                                     | 51,194      | 15.8                         | (2)       | (2)                          | .....                              |
| 7                              | Kafir, milo, etc.....                      | Bu....                        | 24.1       | 18.2                   | 26.2               | 108.7                          | 111.0                                     | 5,531,399   | 80.3                         | (2)       | (2)                          | .....                              |
| 8                              | Rough rice.....                            | Bu....                        | 53.1       | .....                  | 53.1               | 100.0                          | .....                                     | 20,432,627  | 101.0                        | (2)       | (2)                          | .....                              |
| 9                              | Mixed crops.....                           | Bu....                        | 26.9       | 14.1                   | 35.7               | 132.7                          | 253.2                                     | 81,620      | 78.5                         | (2)       | (2)                          | .....                              |
| <b>Other grains and seeds:</b> |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 10                             | Clover and alfalfa seed <sup>2</sup> ..... | Bu....                        | 3.2        | 3.0                    | 4.2                | 131.3                          | 140.0                                     | 203,742     | 23.7                         | 53,829    | 26.8                         | 278.5                              |
| 11                             | Dry beans, navy, etc.....                  | Bu....                        | 13.9       | 12.7                   | 16.6               | 119.4                          | 130.7                                     | 11,558,944  | 37.5                         | 378,770   | 6.0                          | .....                              |
| 12                             | Dry peas (Canada).....                     | Bu....                        | 8.7        | 8.1                    | 10.5               | 119.7                          | 203.7                                     | 88,218      | 13.6                         | 15,331    | 15.2                         | 475.4                              |
| 13                             | Sugar-beet seed.....                       | Lbs....                       | 378.7      | 639.8                  | 274.4              | 72.5                           | 42.9                                      | 96,600      | 51.8                         | (2)       | (2)                          | .....                              |
| 14                             | Flower and vegetable seed.....             | Lbs....                       | 386.7      | 312.9                  | 635.9              | 161.1                          | 203.2                                     | 2,036,510   | 37.6                         | (2)       | (2)                          | .....                              |
| <b>Hay and forage:</b>         |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 15                             | Timothy alone.....                         | Tons..                        | 1.50       | 1.44                   | 1.69               | 112.7                          | 117.4                                     | 93,784      | 23.5                         | 90,083    | 48.5                         | 4.1                                |
| 16                             | Timothy and clover mixed.....              | Tons..                        | 1.44       | 1.52                   | 1.41               | 97.9                           | 92.8                                      | 1,013,911   | 72.8                         | 316,983   | 50.4                         | 219.9                              |
| 17                             | Clover alone.....                          | Tons..                        | 1.62       | 1.70                   | 1.31               | 80.9                           | 71.4                                      | 118,326     | 26.0                         | 40,429    | 19.0                         | 192.7                              |
| 18                             | Alfalfa.....                               | Tons..                        | 3.36       | 2.75                   | 3.53               | 105.1                          | 128.4                                     | 44,369,462  | 81.6                         | 9,981,370 | 70.3                         | 343.4                              |
| 19                             | Other tame grasses.....                    | Tons..                        | 1.35       | 1.32                   | 1.43               | 105.9                          | 108.3                                     | 390,830     | 23.7                         | 112,097   | 8.8                          | 251.0                              |
| 20                             | Annual legumes cut for hay.....            | Tons..                        | 1.16       | 1.15                   | 1.22               | 105.2                          | 106.1                                     | 74,520      | 12.4                         | 1,532,681 | 6.4                          | 210.6                              |
| 21                             | Small grains cut for hay.....              | Tons..                        | 1.19       | 1.17                   | 1.37               | 115.1                          | 117.1                                     | 4,686,652   | 15.4                         | (2)       | (2)                          | .....                              |
| 22                             | Wild, salt, or prairie grasses.....        | Tons..                        | 1.01       | 0.96                   | 1.13               | 108.7                          | 117.7                                     | 1,351,108   | 52.1                         | 1,194,716 | 58.9                         | 13.3                               |
| 23                             | Silage crops.....                          | Tons..                        | 7.04       | 6.67                   | 7.34               | 104.3                          | 110.0                                     | 1,133,261   | 37.4                         | (2)       | (2)                          | .....                              |
| 24                             | Corn cut for forage.....                   | Tons..                        | 1.83       | 1.40                   | 2.35               | 130.3                          | 182.1                                     | 181,214     | 51.9                         | (2)       | (2)                          | .....                              |
| 25                             | Kafir, sorghum, etc., for forage.....      | Tons..                        | 1.69       | 1.39                   | 1.98               | 117.2                          | 142.4                                     | 220,005     | 59.8                         | (2)       | (2)                          | .....                              |
| 26                             | Root crops for forage.....                 | Tons..                        | 18.67      | 19.67                  | 9.01               | 48.3                           | 45.8                                      | 91,248      | 4.5                          | (2)       | (2)                          | .....                              |
| <b>Vegetables:</b>             |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 27                             | Potatoes.....                              | Bu....                        | 120.8      | 110.6                  | 151.6              | 116.8                          | 137.1                                     | 10,355,973  | 54.8                         | 2,440,931 | 50.0                         | 324.3                              |
| 28                             | Sweet potatoes and yams.....               | Bu....                        | 113.6      | 117.0                  | 112.6              | 99.1                           | 90.2                                      | 1,517,388   | 76.1                         | (2)       | (2)                          | .....                              |
| 29                             | Cabbages.....                              | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 547,205     | 57.4                         | (2)       | (2)                          | .....                              |
| 30                             | Cantaloupes and muskmelons.....            | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 2,753,155   | 70.7                         | (2)       | (2)                          | .....                              |
| 31                             | Celery.....                                | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 721,521     | 17.5                         | (2)       | (2)                          | .....                              |
| 32                             | Cucumbers.....                             | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 87,701      | 28.0                         | (2)       | (2)                          | .....                              |
| 33                             | Green beans.....                           | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 292,933     | 56.1                         | (2)       | (2)                          | .....                              |
| 34                             | Green peas.....                            | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 387,079     | 36.1                         | (2)       | (2)                          | .....                              |
| 35                             | Lettuce.....                               | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 1,190,363   | 70.4                         | (2)       | (2)                          | .....                              |
| 36                             | Onions.....                                | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 2,009,151   | 71.3                         | (2)       | (2)                          | .....                              |
| 37                             | Sweet corn.....                            | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 197,015     | 42.9                         | (2)       | (2)                          | .....                              |
| 38                             | Tomatoes.....                              | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 2,121,514   | 59.3                         | (2)       | (2)                          | .....                              |
| 39                             | Watermelons.....                           | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 327,028     | 52.8                         | (2)       | (2)                          | .....                              |
| 40                             | Asparagus.....                             | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 1,654,081   | 62.6                         | (2)       | (2)                          | .....                              |
| 41                             | Cauliflower.....                           | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 437,880     | 68.3                         | (2)       | (2)                          | .....                              |
| 42                             | Peppers (green).....                       | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 632,101     | 83.0                         | (2)       | (2)                          | .....                              |
| 43                             | Pumpkins.....                              | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 18,753      | 48.0                         | (2)       | (2)                          | .....                              |
| 44                             | Spinach.....                               | Bu....                        | .....      | .....                  | .....              | .....                          | .....                                     | 128,516     | 41.1                         | (2)       | (2)                          | .....                              |
| <b>Miscellaneous crops:</b>    |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 45                             | Sugar beets grown for sugar.....           | Tons..                        | 7.56       | 7.51                   | 7.58               | 100.3                          | 100.9                                     | 5,491,551   | 63.3                         | 839,561   | 10.5                         | 554.1                              |
| 46                             | Cotton.....                                | Bales                         | 0.53       | 0.52                   | 0.53               | 100.0                          | 101.9                                     | 8,891,519   | 90.3                         | (2)       | (2)                          | .....                              |
| 47                             | Broom corn.....                            | Lbs....                       | 363.6      | 340.0                  | 398.3              | 106.5                          | 117.1                                     | 28,130      | 44.4                         | (2)       | (2)                          | .....                              |
| 48                             | Hops.....                                  | Lbs....                       | 1,553.3    | 1,499.9                | 1,699.6            | 109.4                          | 113.3                                     | 1,919,644   | 29.3                         | (2)       | (2)                          | .....                              |
| <b>Small fruits:</b>           |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 49                             | Strawberries.....                          | Qts....                       | 2,172.9    | 1,614.3                | 3,510.9            | 161.6                          | 217.5                                     | 1,028,707   | 47.6                         | (2)       | (2)                          | .....                              |
| <b>Orchard fruits:</b>         |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 50                             | Apples.....                                | Bu....                        | 42.5       | 42.8                   | 41.7               | 98.0                           | 90.7                                      | 2,009,338   | 17.0                         | (2)       | (2)                          | .....                              |
| 51                             | Peaches.....                               | Bu....                        | 41.8       | 41.7                   | 41.8               | 100.0                          | 105.9                                     | 19,088,970  | 64.6                         | (2)       | (2)                          | .....                              |
| 52                             | Pears.....                                 | Bu....                        | 41.7       | 41.7                   | 41.8               | 105.9                          | 105.9                                     | 3,211,112   | 45.1                         | (2)       | (2)                          | .....                              |
| 53                             | Plums and prunes.....                      | Bu....                        | 41.5       | 41.4                   | 41.7               | 113.3                          | 121.4                                     | 14,066,478  | 49.6                         | (2)       | (2)                          | .....                              |
| 54                             | Cherries.....                              | Bu....                        | 41.0       | 40.9                   | 41.1               | 110.0                          | 122.2                                     | 1,305,796   | 40.9                         | (2)       | (2)                          | .....                              |
| 55                             | Apricots.....                              | Bu....                        | 41.6       | 41.6                   | 41.6               | 100.0                          | 100.0                                     | 5,216,272   | 44.1                         | (2)       | (2)                          | .....                              |
| 56                             | Quinces.....                               | Bu....                        | 41.2       | 41.0                   | 41.5               | 125.0                          | 150.0                                     | 36,630      | 58.3                         | (2)       | (2)                          | .....                              |
| 57                             | Grapes.....                                | Lbs....                       | 13.4       | 11.6                   | 15.4               | 114.9                          | 132.8                                     | 36,101,606  | 54.9                         | 3,038,436 | 28.0                         | .....                              |
| <b>Subtropical fruits:</b>     |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 58                             | Oranges.....                               | Boxes                         | 42.1       | 41.8                   | 42.2               | 104.8                          | 122.2                                     | 58,049,366  | 86.6                         | (2)       | (2)                          | .....                              |
| 59                             | Lemons.....                                | Boxes                         | 42.3       | 41.3                   | 42.5               | 108.7                          | 192.3                                     | 16,750,832  | 88.2                         | (2)       | (2)                          | .....                              |
| 60                             | Grape fruit (pomeloes).....                | Boxes                         | 42.0       | 41.9                   | 42.0               | 100.0                          | 105.3                                     | 787,846     | 84.7                         | (2)       | (2)                          | .....                              |
| 61                             | Figs.....                                  | Lbs....                       | 443.3      | 445.6                  | 440.8              | 94.2                           | 89.5                                      | 1,007,455   | 46.2                         | (2)       | (2)                          | .....                              |
| 62                             | Alligator pears (avocados).....            | Crates                        | 40.7       | 40.5                   | 40.7               | 100.0                          | 140.0                                     | 58,352      | 92.1                         | (2)       | (2)                          | .....                              |
| 63                             | Dates.....                                 | Lbs....                       | 48.4       | 49.2                   | 48.2               | 97.6                           | 89.1                                      | 23,662      | 81.6                         | (2)       | (2)                          | .....                              |
| 64                             | Olives.....                                | Lbs....                       | 419.3      | 414.2                  | 422.9              | 118.7                          | 161.3                                     | 981,181     | 69.8                         | (2)       | (2)                          | .....                              |
| 65                             | Japanese persimmons.....                   | Bu....                        | 41.5       | 41.4                   | 41.7               | 113.3                          | 121.4                                     | 38,000      | 44.3                         | (2)       | (2)                          | .....                              |
| 66                             | Pomegranates.....                          | Lbs....                       | 439.3      | 438.1                  | 440.1              | 102.0                          | 105.2                                     | 35,405      | 61.9                         | (2)       | (2)                          | .....                              |
| <b>Nuts:</b>                   |  |                               |            |                        |                    |                                |   |             |                              |           |                              |                                    |
| 67                             | Almonds.....                               | Lbs....                       | 46.5       | 46.4                   | 46.9               | 106.2                          | 107.8                                     | 797,703     | 20.3                         | (2)       | (2)                          | .....                              |
| 68                             | Walnuts (English or Persian).....          | Lbs....                       | 46.4       | 43.9                   | 49.0               | 105.6                          | 111.6                                     | 9,063,148   | 51.1                         | (2)       | (2)                          | .....                              |

<sup>1</sup> Per cent not shown when more than 1,000.  
<sup>2</sup> Not reported separately in 1909.

<sup>3</sup> Excluding red clover seed (1919).  
<sup>4</sup> Yield per tree.

<sup>5</sup> Yield per vine.



## IRRIGATION—CALIFORNIA.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                          |  | THE STATE.   | Alameda. | Alpine. | Amador. | Butte.    | Calaveras. | Colusa.   | Contra Costa. | Eldorado. |
|--------------------------|--|--------------|----------|---------|---------|-----------|------------|-----------|---------------|-----------|
| 1                        | Number of all farms in 1920.....   | 1 117,670    | 2,778    | 21      | 479     | 2,219     | 606        | 816       | 1,675         | 729       |
| 2                        | Number of farms irrigated in 1919.....   | 67,391       | 473      | 18      | 101     | 989       | 306        | 325       | 131           | 393       |
| 3                        | Per cent of all farms.....   | 57.3         | 17.0     | 85.7    | 21.1    | 44.6      | 50.5       | 39.8      | 7.8           | 53.9      |
| 4                        | Number of farms irrigated in 1909.....   | 39,352       | 50       | 32      | 73      | 556       | 154        | 112       | 78            | 244       |
| 5                        | Per cent of increase, 1909-1919.....   | 71.3         |          |         |         | 77.9      | 98.7       | 190.2     |               | 61.1      |
| LAND AND FARM AREA.      |  |              |          |         |         |           |            |           |               |           |
| 6                        | Approximate land area.....acres..  | 1 99,617,280 | 468,480  | 496,640 | 384,640 | 1,086,720 | 657,280    | 729,600   | 456,960       | 1,111,680 |
| 7                        | All land in farms.....acres..  | 1 29,365,667 | 359,742  | 10,042  | 312,106 | 404,625   | 366,195    | 438,417   | 375,065       | 240,265   |
| 8                        | Improved land in farms.....acres..   | 1 11,878,339 | 185,324  | 4,306   | 59,986  | 253,745   | 58,957     | 302,429   | 238,369       | 43,413    |
| 9                        | Area irrigated in 1919.....acres..   | 4,219,040    | 9,346    | 4,459   | 326     | 93,559    | 2,859      | 44,097    | 33,079        | 6,731     |
| 10                       | Per cent of improved land in farms.....  | 35.5         | 5.0      | 103.6   | 0.5     | 36.9      | 4.8        | 14.6      | 13.9          | 15.5      |
| 11                       | Area irrigated in 1909.....acres..   | 2,664,104    | 1,859    | 3,349   | 826     | 28,754    | 1,275      | 4,276     | 26,856        | 5,122     |
| 12                       | Per cent of increase, 1909-1919.....   | 58.4         | 402.7    | 33.1    | -60.5   | 225.4     | 124.2      | 931.3     | 23.2          | 31.4      |
| 13                       | Area enterprises were capable of irrigating in 1920.....acres..  | 5,894,466    | 13,357   | 4,819   | 489     | 114,754   | 33,828     | 69,149    | 46,482        | 9,833     |
| 14                       | Area enterprises were capable of irrigating in 1910.....acres..  | 3,619,378    | 1,872    | 3,399   | 3,973   | 115,075   | 3,161      | 16,541    | 32,562        | 5,501     |
| 15                       | Per cent of increase, 1910-1920.....   | 62.9         | 613.5    | 41.8    | -87.7   | -0.3      | 970.2      | 318.0     | 42.7          | 78.7      |
| 16                       | Area included in enterprises in 1920.....acres..   | 7,805,207    | 16,543   | 7,027   | 1,093   | 123,524   | 42,093     | 88,948    | 67,876        | 16,848    |
| 17                       | Area included in enterprises in 1910.....acres..   | 5,490,360    | 2,605    | 3,435   | 4,139   | 233,500   | 3,919      | 18,783    | 32,640        | 20,264    |
| 18                       | Per cent of increase, 1910-1920.....   | 42.2         | 535.0    | 104.6   | -73.6   | -47.1     | 974.1      | 373.6     | 108.0         | -16.9     |
| 19                       | Area of irrigated land reported as available for settlement.....acres..                                    | 533,981      |          |         |         | 4,500     | 2,960      |           | 8,000         |           |
| IRRIGATION WORKS.        |  |              |          |         |         |           |            |           |               |           |
| Independent enterprises: |  |              |          |         |         |           |            |           |               |           |
| 20                       | Number, 1920.....  | 24,115       | 264      | 15      | 35      | 197       | 140        | 99        | 56            | 91        |
| 21                       | Number, 1910.....  | 13,970       | 53       | 21      | 49      | 144       | 150        | 45        | 185           | 50        |
| Main ditches:            |  |              |          |         |         |           |            |           |               |           |
| 22                       | Number, 1920.....  | 6,040        | 48       | 18      | 23      | 74        | 144        | 84        | 11            | 82        |
| 23                       | Number, 1910.....  | 8,590        | 49       | 25      | 55      | 135       | 148        | 38        | 176           | 56        |
| 24                       | Length, 1920.....miles..   | 14,437       | 12       | 20      | 64      | 225       | 247        | 258       | 186           | 1,268     |
| 25                       | Length, 1910.....miles..   | 12,620       | 21       | 34      | 185     | 270       | 124        | 44        | 172           | 285       |
| 26                       | Capacity, 1920.....second-feet..   | 115,237      | 23       | 52      | 53      | 2,751     | 466        | 2,095     | 339           | 390       |
| 27                       | Capacity, 1910.....second-feet..   | 89,597       | 605      | 179     | 255     | 2,028     | 206        | 531       | 60            | 445       |
| Laterals:                |  |              |          |         |         |           |            |           |               |           |
| 28                       | Number, 1920.....  | 9,190        | 142      | 14      | 3       | 181       | 52         | 100       | 111           | 46        |
| 29                       | Number, 1910.....  | 6,143        |          | 3       | 12      | 145       | 32         | 10        |               | 25        |
| 30                       | Length, 1920.....miles..   | 12,947       | 19       | 1       | 30      | 27        | 131        | 120       | 175           | 110       |
| 31                       | Length, 1910.....miles..   | 8,509        |          | 1       | 56      | 170       | 31         | 7         |               | 55        |
| Reservoirs:              |  |              |          |         |         |           |            |           |               |           |
| 32                       | Number, 1920.....  | 3,030        | 10       |         | 18      | 8         | 47         | 2         | 1             | 35        |
| 33                       | Number, 1910.....  | 1,583        | 52       |         | 14      | 27        | 29         |           | 1             | 22        |
| 34                       | Capacity, 1920.....acre-feet..   | 1,091,394    | 1        | 4       | 196     | 30        | 10,935     | 51,000    | 5             | 19,966    |
| 35                       | Capacity, 1910.....acre-feet..   | 743,269      | 3        |         | 309     | 360       | 12,029     |           | 1             | 711       |
| Flowing wells:           |  |              |          |         |         |           |            |           |               |           |
| 36                       | Number, 1920.....  | 1,415        |          |         |         |           | 5          |           | 2             |           |
| 37                       | Number, 1910.....  | 2,361        |          |         |         |           | 6          |           | 1             |           |
| 38                       | Capacity, 1920.....gallons per minute..  | 287,187      |          |         |         |           | 65         |           |               |           |
| 39                       | Capacity, 1910.....gallons per minute..  | 477,343      |          |         |         |           | 40         |           | 143           |           |
| Pumped wells:            |  |              |          |         |         |           |            |           |               |           |
| 40                       | Number, 1920.....  | 25,401       | 382      |         | 4       | 153       | 20         | 66        | 49            | 6         |
| 41                       | Number, 1910.....  | 10,724       | 56       |         |         | 46        | 7          | 3         | 26            |           |
| 42                       | Capacity, 1920.....gallons per minute..  | 10,608,476   | 95,329   |         | 150     | 53,890    | 1,205      | 48,735    | 5,897         | 780       |
| 43                       | Capacity, 1910.....gallons per minute..  | 4,119,575    | 3,740    |         |         | 29,686    | 844        | 977       | 1,339         |           |
| Pumping plants:          |  |              |          |         |         |           |            |           |               |           |
| 44                       | Number, 1920.....  | 21,561       | 290      |         | 9       | 157       | 32         | 103       | 56            | 6         |
| 45                       | Number, 1910.....  | 9,297        | 57       |         | 1       | 46        | 9          | 12        | 30            |           |
| 46                       | Engine capacity, 1920.....horsepower..   | 386,200      | 3,797    |         | 34      | 2,803     | 234        | 6,931     | 3,236         | 15        |
| 47                       | Engine capacity, 1910.....horsepower..   | 128,143      | 384      |         | 5       | 555       | 44         | 516       | 751           |           |
| 48                       | Pump capacity, 1920.....gallons per minute..   | 16,773,692   | 112,508  |         | 1,890   | 113,036   | 7,986      | 528,610   | 74,004        | 830       |
| 49                       | Pump capacity, 1910.....gallons per minute..   | 5,276,298    | 5,019    |         | 100     | 32,391    | 1,094      | 51,365    | 138,947       |           |
| 50                       | Average lift, 1920.....feet..  | 41           | 40       |         | 32      | 24        | 41         | 25        | 44            | 37        |
| CAPITAL INVESTED.        |  |              |          |         |         |           |            |           |               |           |
| 51                       | Capital invested to Jan. 1, 1920.....dollars..   | 194,880,388  | 530,053  | 40,385  | 91,295  | 3,383,646 | 1,315,617  | 2,594,164 | 1,380,210     | 499,269   |
| 52                       | Capital invested to July 1, 1910.....dollars..   | 72,580,030   | 57,156   | 7,493   | 265,608 | 1,231,894 | 121,033    | 76,112    | 90,503        | 346,939   |
| 53                       | Per cent of increase, 1910-1920.....   | 168.5        | 827.4    | 439.0   | -65.6   | 174.7     | 987.0      |           |               | 43.9      |
| 54                       | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 33.06        | 39.68    | 8.38    | 186.70  | 29.49     | 38.80      | 37.52     | 29.69         | 50.77     |
| 55                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 20.05        | 30.53    | 2.20    | 66.85   | 10.71     | 38.29      | 4.60      | 2.78          | 63.07     |
| ESTIMATED FINAL COST.    |  |              |          |         |         |           |            |           |               |           |
| 56                       | Estimated final cost of existing enterprises in 1920.....dollars..   | 225,799,123  | 538,538  | 41,385  | 91,295  | 3,776,271 | 1,320,119  | 2,881,964 | 1,587,960     | 702,269   |
| 57                       | Estimated final cost of existing enterprises in 1910.....dollars..   | 84,392,344   | 57,156   | 7,493   | 265,608 | 1,381,894 | 121,033    | 76,112    | 90,503        | 346,939   |
| 58                       | Per cent of increase, 1910-1920.....   | 167.6        | 842.2    | 452.3   | -65.6   | 173.3     | 998.1      |           |               | 102.4     |
| 59                       | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 28.93        | 32.55    | 5.89    | 83.53   | 30.57     | 31.58      | 32.40     | 23.40         | 41.68     |
| 60                       | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 15.37        | 21.94    | 2.18    | 64.17   | 5.92      | 30.88      | 4.05      | 2.77          | 17.12     |

<sup>1</sup> Includes Del Norte County, for which no irrigation is reported.



# IRRIGATION—CALIFORNIA.

15

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—(Continued.)

[A minus sign (-) denotes decrease. Percent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |  | Fresno.   | Glenn.    | Humboldt. | Imperial.  | Inyo.     | Kern.      | Kings.    | Lake.   | Lassen.   |
|------------------------------|--|-----------|-----------|-----------|------------|-----------|------------|-----------|---------|-----------|
| 1                            | Number of all farms in 1920.....   | 8,917     | 1,320     | 1,756     | 2,843      | 521       | 2,020      | 2,171     | 771     | 603       |
| 2                            | Number of farms irrigated in 1919.....   | 7,792     | 897       | 53        | 2,707      | 329       | 1,474      | 1,634     | 71      | 306       |
| 3                            | Percent of all farms.....  | 87.4      | 68.0      | 3.0       | 95.2       | 63.1      | 73.0       | 75.3      | 9.2     | 50.5      |
| 4                            | Number of farms irrigated in 1909.....   | 5,310     | 196       | 33        | 1,250      | 408       | 876        | 1,126     | 43      | 355       |
| 5                            | Percent of increase, 1909-1919.....  | 46.7      | 357.7     | .....     | 116.6      | 19.4      | 68.3       | 45.1      | .....   | -13.7     |
| <b>LAND AND FARM AREA.</b>   |  |           |           |           |            |           |            |           |         |           |
| 6                            | Approximate land area.....acres..  | 3,898,000 | 855,680   | 2,288,000 | 2,616,960  | 6,304,240 | 5,121,920  | 741,760   | 792,320 | 2,899,840 |
| 7                            | All land in farms.....acres..  | 1,319,531 | 524,407   | 717,174   | 347,485    | 140,029   | 1,497,045  | 595,553   | 241,899 | 741,220   |
| 8                            | Improved land in farms.....acres..   | 672,591   | 336,482   | 98,064    | 310,708    | 39,904    | 390,932    | 259,639   | 45,355  | 149,887   |
| 9                            | Area irrigated in 1919.....acres..   | 547,587   | 105,004   | 355       | 415,304    | 74,958    | 223,593    | 187,868   | 1,107   | 53,884    |
| 10                           | Percent of improved land in farms.....   | 81.4      | 31.2      | 0.4       | 134.7      | 187.8     | 57.2       | 72.4      | 2.4     | 38.2      |
| 11                           | Area irrigated in 1909.....acres..   | 402,318   | 5,661     | 208       | 190,711    | 65,163    | 190,034    | 190,949   | 582     | 77,079    |
| 12                           | Percent of increase, 1909-1919.....  | 36.1      | .....     | 70.7      | 117.8      | 15.0      | 17.7       | -1.6      | 90.2    | -50.1     |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 838,048   | 120,992   | 500       | 457,815    | 79,771    | 329,773    | 376,906   | 1,517   | 71,582    |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 590,326   | 16,804    | 333       | 242,000    | 71,815    | 217,418    | 289,523   | 828     | 89,815    |
| 15                           | Percent of increase, 1910-1920.....  | 49.6      | 653.7     | 50.2      | 89.2       | 11.1      | 51.7       | 30.2      | 83.2    | -20.3     |
| 16                           | Area included in enterprises in 1920.....acres..   | 1,098,755 | 292,399   | 664       | 530,855    | 97,098    | 475,645    | 490,845   | 1,841   | 85,873    |
| 17                           | Area included in enterprises in 1910.....acres..   | 633,652   | 202,064   | 969       | 373,000    | 92,319    | 402,806    | 310,523   | 1,268   | 149,530   |
| 18                           | Percent of increase, 1910-1920.....  | 73.4      | 45.3      | -31.3     | 41.6       | 6.2       | 18.1       | 58.1      | 44.4    | -42.6     |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | 67,067    | 4,745     | .....     | 1,800      | 4,300     | 524        | 14,000    | .....   | 3,000     |
| <b>IRRIGATION WORKS.</b>     |  |           |           |           |            |           |            |           |         |           |
| Independent enterprises:     |  |           |           |           |            |           |            |           |         |           |
| 20                           | Number, 1920.....  | 2,968     | 213       | 33        | 17         | 87        | 875        | 345       | 70      | 175       |
| 21                           | Number, 1910.....  | 975       | 116       | 33        | 9          | 188       | 244        | 77        | 43      | 233       |
| Main ditches:                |  |           |           |           |            |           |            |           |         |           |
| 22                           | Number, 1920.....  | 106       | 86        | 27        | 46         | 56        | 165        | 98        | 38      | 208       |
| 23                           | Number, 1910.....  | 254       | 50        | 33        | 12         | 184       | 178        | 27        | 44      | 295       |
| 24                           | Length, 1920.....miles..   | 1,359     | 181       | 34        | 537        | 132       | 445        | 300       | 18      | 404       |
| 25                           | Length, 1910.....miles..   | 841       | 136       | 26        | 117        | 306       | 441        | 137       | 26      | 368       |
| 26                           | Capacity, 1920.....second-feet..   | 10,765    | 2,515     | 200       | 10,375     | 1,368     | 6,314      | 13,580    | 242     | 2,732     |
| 27                           | Capacity, 1910.....second-feet..   | 6,299     | 1,659     | 145       | 3,250      | 2,752     | 9,990      | 4,840     | 90      | 2,248     |
| Laterals:                    |  |           |           |           |            |           |            |           |         |           |
| 28                           | Number, 1920.....  | 1,044     | 168       | 4         | 305        | 5         | 224        | 323       | 22      | 231       |
| 29                           | Number, 1910.....  | 688       | 554       | 4         | 179        | 326       | 118        | 51        | 21      | 263       |
| 30                           | Length, 1920.....miles..   | 2,003     | 329       | 6         | 2,690      | 4         | 149        | 587       | 1       | 114       |
| 31                           | Length, 1910.....miles..   | 1,354     | 1,073     | 2         | 890        | 168       | 257        | 159       | 2       | 116       |
| Reservoirs:                  |  |           |           |           |            |           |            |           |         |           |
| 32                           | Number, 1920.....  | 72        | 9         | 3         | .....      | 18        | 536        | 20        | 9       | 31        |
| 33                           | Number, 1910.....  | 8         | 12        | 5         | .....      | 1         | 51         | 37        | 3       | 29        |
| 34                           | Capacity, 1920.....acre-feet..   | 141       | 8         | 6         | .....      | 1,006     | 61,183     | 6,063     | 181     | 194,422   |
| 35                           | Capacity, 1910.....acre-feet..   | 462       | 45,009    | 7         | .....      | 11,300    | 1,601      | 111       | 2       | 169,552   |
| Flowing wells:               |  |           |           |           |            |           |            |           |         |           |
| 36                           | Number, 1920.....  | 59        | .....     | .....     | .....      | 23        | 27         | 13        | 7       | 10        |
| 37                           | Number, 1910.....  | 3         | .....     | .....     | .....      | 10        | 25         | 75        | 1       | .....     |
| 38                           | Capacity, 1920.....gallons per minute..  | 18,409    | .....     | .....     | .....      | 537       | 17,643     | 2,180     | 950     | 233       |
| 39                           | Capacity, 1910.....gallons per minute..  | 459       | .....     | .....     | .....      | 500       | 12,583     | 19,436    | 75      | .....     |
| Pumped wells:                |  |           |           |           |            |           |            |           |         |           |
| 40                           | Number, 1920.....  | 2,281     | 265       | .....     | 1          | 9         | 984        | 498       | 17      | 4         |
| 41                           | Number, 1910.....  | 855       | 105       | 2         | .....      | 1         | 140        | 20        | 3       | .....     |
| 42                           | Capacity, 1920.....gallons per minute..  | 1,280,347 | 176,251   | .....     | 900        | 4,088     | 415,412    | 202,967   | 5,545   | 1,306     |
| 43                           | Capacity, 1910.....gallons per minute..  | 443,024   | 26,484    | 105       | .....      | 100       | 90,618     | 8,700     | 272     | .....     |
| Pumping plants:              |  |           |           |           |            |           |            |           |         |           |
| 44                           | Number, 1920.....  | 2,130     | 215       | 3         | 1          | 13        | 809        | 346       | 33      | 11        |
| 45                           | Number, 1910.....  | 888       | 77        | 1         | .....      | 1         | 114        | 18        | 11      | 2         |
| 46                           | Engine capacity, 1920.....horsepower..   | 32,361    | 9,214     | 36        | 38         | 137       | 12,504     | 5,225     | 241     | 93        |
| 47                           | Engine capacity, 1910.....horsepower..   | 8,990     | 896       | 3         | .....      | 5         | 2,846      | 174       | 49      | 90        |
| 48                           | Pump capacity, 1920.....gallons per minute..   | 1,412,583 | 1,065,729 | 2,000     | 900        | 4,558     | 1,219,402  | 283,330   | 13,111  | 6,990     |
| 49                           | Pump capacity, 1910.....gallons per minute..   | 515,389   | 62,449    | 105       | .....      | 100       | 90,668     | 12,759    | 4,577   | 6,100     |
| 50                           | Average lift, 1920.....feet..  | 22        | 23        | 11        | 70         | 24        | 53         | 23        | 18      | 22        |
| <b>CAPITAL INVESTED.</b>     |  |           |           |           |            |           |            |           |         |           |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 8,067,930 | 5,581,804 | 37,298    | 14,223,585 | 2,487,561 | 18,419,752 | 3,089,558 | 116,286 | 519,656   |
| 52                           | Capital invested to July 1, 1910.....dollars..   | 1,808,460 | 1,519,591 | 29,027    | 4,955,272  | 962,698   | 1,788,635  | 687,381   | 12,124  | 884,965   |
| 53                           | Percent of increase, 1910-1920.....  | 325.0     | 267.7     | 28.5      | 187.0      | 158.4     | 929.8      | 480.4     | 859.1   | -41.3     |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 9.63      | 43.99     | 74.60     | 31.07      | 31.18     | 55.86      | 10.58     | 76.06   | 7.26      |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 3.39      | 90.43     | 87.17     | 20.48      | 13.41     | 8.23       | 2.37      | 14.64   | 9.85      |
| <b>ESTIMATED FINAL COST.</b> |  |           |           |           |            |           |            |           |         |           |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 9,249,614 | 7,283,303 | 37,798    | 14,323,585 | 2,607,111 | 18,829,815 | 4,362,178 | 216,246 | 583,450   |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 1,808,460 | 3,716,976 | 29,027    | 5,884,182  | 962,698   | 1,788,635  | 687,381   | 12,124  | 1,034,965 |
| 58                           | Percent of increase, 1910-1920.....  | 387.2     | 95.9      | 30.2      | 143.4      | 170.8     | 952.7      | 534.6     | .....   | -43.6     |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 8.42      | 35.98     | 56.92     | 26.98      | 26.60     | 39.59      | 8.89      | 118.16  | 6.79      |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 3.00      | 16.84     | 30.05     | 15.69      | 10.43     | 4.44       | 2.21      | 9.56    | 6.92      |

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |   | Los Angeles. | Madera.   | Marin.  | Mari-<br>posa. | Mendo-<br>cino. | Merced.    | Modoc.    | Mono.     | Monte-<br>rey. | Napa.   |
|------------------------------|---|--------------|-----------|---------|----------------|-----------------|------------|-----------|-----------|----------------|---------|
| 1                            | Number of all farms in 1920.....  | 12,444       | 1,402     | 718     | 367            | 1,759           | 2,840      | 743       | 74        | 1,712          | 1,428   |
| 2                            | Number of farms irrigated in 1919.....  | 9,102        | 930       | 14      | 48             | 92              | 2,334      | 441       | 66        | 451            | 39      |
| 3                            | Per cent of all farms.....  | 73.1         | 66.3      | 1.9     | 13.1           | 5.2             | 82.0       | 59.4      | 89.2      | 26.3           | 2.7     |
| 4                            | Number of farms irrigated in 1909.....  | 4,669        | 158       | 6       | 56             | 39              | 1,417      | 437       | 76        | 258            | 36      |
| 5                            | Per cent of increase, 1909-1919.....  | 94.9         | 488.6     | .....   | .....          | .....           | 64.7       | 0.9       | .....     | 74.8           | .....   |
| <b>LAND AND FARM AREA.</b>   |   |              |           |         |                |                 |            |           |           |                |         |
| 6                            | Approximate land area.....acres..   | 2,633,600    | 1,351,680 | 338,560 | 936,320        | 2,264,960       | 1,276,800  | 2,446,720 | 1,939,200 | 2,131,200      | 501,120 |
| 7                            | All land in farms.....acres..   | 882,333      | 536,726   | 290,148 | 235,849        | 923,087         | 1,122,550  | 596,757   | 42,034    | 1,104,048      | 293,625 |
| 8                            | Improved land in farms.....acres..  | 483,096      | 262,971   | 87,846  | 49,587         | 101,220         | 506,582    | 168,251   | 8,740     | 398,320        | 116,723 |
| 9                            | Area irrigated in 1919.....acres..  | 248,412      | 100,220   | 564     | 66             | 1,255           | 212,851    | 82,845    | 46,012    | 47,336         | 600     |
| 10                           | Per cent of improved land in farms.....   | 51.4         | 38.1      | 0.6     | 0.1            | 1.2             | 42.0       | 49.2      | .....     | 11.9           | 0.6     |
| 11                           | Area irrigated in 1909.....acres..  | 145,586      | 38,705    | 67      | 376            | 371             | 151,998    | 82,075    | 49,027    | 15,050         | 1,191   |
| 12                           | Per cent of increase, 1909-1919.....  | 70.6         | 158.9     | .....   | -82.4          | 238.3           | 40.0       | 0.9       | -0.1      | 214.4          | -44.6   |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..   | 319,368      | 118,672   | 704     | 89             | 11,566          | 238,157    | 80,801    | 80,335    | 50,159         | 1,284   |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..   | 183,506      | 51,230    | 71      | 546            | 590             | 248,670    | 89,470    | 50,007    | 27,176         | 2,035   |
| 15                           | Per cent of increase, 1910-1920.....  | 74.0         | 131.6     | .....   | -83.7          | .....           | 15.9       | 0.4       | 78.6      | 106.6          | -36.9   |
| 16                           | Area included in enterprises in 1920.....acres..  | 364,574      | 161,032   | 713     | 109            | 11,686          | 457,494    | 112,200   | 121,878   | 59,659         | 1,405   |
| 17                           | Area included in enterprises in 1910.....acres..  | 241,794      | 82,321    | 71      | 767            | 1,365           | 281,710    | 124,166   | 84,973    | 20,914         | 2,443   |
| 18                           | Per cent of increase, 1910-1920.....  | 50.8         | 95.6      | .....   | -85.8          | 756.1           | 62.4       | -9.6      | 43.4      | 99.4           | -42.5   |
| 19                           | Area of irrigated land reported as available for settle-<br>ment.....acres..                                  | 6,100        | .....     | .....   | .....          | .....           | 212,500    | .....     | 40,000    | .....          | .....   |
| <b>IRRIGATION WORKS.</b>     |   |              |           |         |                |                 |            |           |           |                |         |
| Independent enterprises:     |   |              |           |         |                |                 |            |           |           |                |         |
| 20                           | Number, 1920.....   | 1,863        | 689       | 4       | 9              | 64              | 479        | 376       | 73        | 189            | 32      |
| 21                           | Number, 1910.....   | 1,567        | 35        | 6       | 48             | 37              | 135        | 388       | 77        | 117            | 35      |
| Main ditches:                |   |              |           |         |                |                 |            |           |           |                |         |
| 22                           | Number, 1920.....   | 414          | 29        | .....   | 6              | 23              | 233        | 470       | 101       | 120            | 6       |
| 23                           | Number, 1910.....   | 601          | 34        | 5       | 49             | 33              | 45         | 440       | 85        | 106            | 26      |
| 24                           | Length, 1920.....miles..  | 332          | 63        | .....   | 3              | 13              | 684        | 655       | 223       | 108            | 1       |
| 25                           | Length, 1910.....miles..  | 800          | 79        | 5       | 21             | 19              | 201        | 637       | 172       | 223            | 8       |
| 26                           | Capacity, 1920.....second-feet..  | 5,059        | 2,066     | .....   | 6              | 86              | 3,972      | 3,078     | 1,526     | 528            | 20      |
| 27                           | Capacity, 1910.....second-feet..  | 2,296        | 1,515     | 21      | 28             | 49              | 4,478      | 2,907     | 1,243     | 1,903          | 25      |
| Laterals:                    |   |              |           |         |                |                 |            |           |           |                |         |
| 28                           | Number, 1920.....   | 621          | 34        | .....   | .....          | 28              | 763        | 175       | 15        | 398            | .....   |
| 29                           | Number, 1910.....   | 494          | 30        | .....   | .....          | 8               | 353        | 490       | 101       | 23             | 3       |
| 30                           | Length, 1920.....miles..  | 221          | 126       | .....   | .....          | 365             | 552        | 101       | 14        | 98             | .....   |
| 31                           | Length, 1910.....miles..  | 500          | 294       | .....   | .....          | 6               | 352        | 175       | 65        | 32             | 3       |
| Reservoirs:                  |   |              |           |         |                |                 |            |           |           |                |         |
| 32                           | Number, 1920.....   | 411          | 107       | 1       | 3              | 10              | 64         | 71        | 12        | 9              | 3       |
| 33                           | Number, 1910.....   | 279          | 3         | 1       | 8              | 7               | 10         | 32        | .....     | 10             | 3       |
| 34                           | Capacity, 1920.....acre-feet..  | 37,591       | 418       | 3       | .....          | 296             | 20,651     | 80,285    | 44,740    | 54             | 1       |
| 35                           | Capacity, 1910.....acre-feet..  | 993          | 12,341    | 1       | 3              | 10              | 15,003     | 33,993    | .....     | 2              | 13      |
| Flowing wells:               |   |              |           |         |                |                 |            |           |           |                |         |
| 36                           | Number, 1920.....   | 123          | 8         | 1       | .....          | .....           | 13         | 71        | .....     | 1              | 1       |
| 37                           | Number, 1910.....   | 376          | .....     | .....   | .....          | .....           | 29         | 45        | .....     | .....          | .....   |
| 38                           | Capacity, 1920.....gallons per minute..   | 41,336       | 2,100     | .....   | .....          | .....           | 3,212      | 5,607     | .....     | 400            | 1,000   |
| 39                           | Capacity, 1910.....gallons per minute..   | 70,818       | .....     | .....   | .....          | .....           | 2,567      | 1,256     | .....     | .....          | .....   |
| Pumped wells:                |   |              |           |         |                |                 |            |           |           |                |         |
| 40                           | Number, 1920.....   | 2,223        | 753       | 7       | .....          | 14              | 543        | 7         | 10        | 606            | 11      |
| 41                           | Number, 1910.....   | 1,673        | 33        | 1       | 2              | 6               | 78         | 2         | .....     | 102            | 2       |
| 42                           | Capacity, 1920.....gallons per minute..   | 1,131,797    | 189,455   | 308     | .....          | 1,859           | 299,395    | 675       | 5,919     | 407,310        | 9,005   |
| 43                           | Capacity, 1910.....gallons per minute..   | 871,143      | 26,518    | 150     | 49             | 2,296           | 52,008     | 44        | .....     | 196,236        | 300     |
| Pumping plants:              |   |              |           |         |                |                 |            |           |           |                |         |
| 44                           | Number, 1920.....   | 1,854        | 701       | 4       | .....          | 39              | 539        | 11        | 9         | 203            | 31      |
| 45                           | Number, 1910.....   | 1,361        | 25        | 6       | .....          | 10              | 108        | 2         | .....     | 124            | 17      |
| 46                           | Engine capacity, 1920.....horsepower..  | 45,752       | 8,307     | 19      | 2              | .....           | 6,094      | 146       | 214       | 9,631          | 314     |
| 47                           | Engine capacity, 1910.....horsepower..  | 30,632       | 604       | 48      | .....          | 481             | 1,605      | 2         | .....     | 5,338          | 115     |
| 48                           | Pump capacity, 1920.....gallons per minute..  | 1,166,131    | 396,483   | 325     | .....          | 18,424          | 349,580    | 3,250     | 5,919     | 406,617        | 21,126  |
| 49                           | Pump capacity, 1910.....gallons per minute..  | 872,718      | 26,518    | 1,100   | 49             | 3,586           | 93,239     | 44        | .....     | 260,513        | 7,751   |
| 50                           | Average lift, 1920.....feet..   | 60           | 33        | 27      | .....          | 33              | 22         | 30        | 34        | 53             | 24      |
| <b>CAPITAL INVESTED.</b>     |   |              |           |         |                |                 |            |           |           |                |         |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..  | 21,038,616   | 1,351,854 | 15,731  | 3,786          | 582,640         | 6,614,674  | 663,660   | 5,079,375 | 2,450,643      | 70,168  |
| 52                           | Capital invested to July 1, 1910.....dollars..  | 7,817,023    | 512,098   | 3,380   | 13,440         | 30,297          | 3,748,211  | 301,040   | 64,282    | 495,916        | 53,948  |
| 53                           | Per cent of increase, 1910-1920.....  | 169.1        | 164.0     | 365.4   | -71.8          | .....           | 76.5       | 120.5     | .....     | 394.2          | 30.1    |
| 54                           | Average cost per acre based on area enterprises were capable<br>of supplying with water in 1920.....dollars.. | 65.88        | 11.39     | 22.35   | 42.54          | 50.38           | 22.96      | 7.39      | 63.57     | 43.64          | 54.65   |
| 55                           | Average cost per acre based on area enterprises were capable<br>of supplying with water in 1910.....dollars.. | 42.60        | 10.00     | 47.61   | 24.62          | 51.35           | 15.07      | 3.36      | 1.29      | 18.25          | 26.51   |
| <b>ESTIMATED FINAL COST.</b> |   |              |           |         |                |                 |            |           |           |                |         |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..  | 23,271,909   | 1,366,599 | 15,731  | 3,786          | 588,040         | 13,106,429 | 760,435   | 7,045,875 | 2,460,643      | 72,608  |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..  | 9,266,023    | 512,098   | 3,380   | 13,440         | 30,297          | 3,748,211  | 316,040   | 64,282    | 578,916        | 53,948  |
| 58                           | Per cent of increase, 1910-1920.....  | 151.2        | 166.9     | 365.4   | -71.8          | .....           | 249.7      | 140.6     | .....     | 325.0          | 34.7    |
| 59                           | Average cost per acre based on estimated final cost and area<br>included in enterprises in 1920.....dollars.. | 63.83        | 8.49      | 22.06   | 34.73          | 50.32           | 28.65      | 6.78      | 57.81     | 41.25          | 51.72   |
| 60                           | Average cost per acre based on estimated final cost and area<br>included in enterprises in 1910.....dollars.. | 38.32        | 6.22      | 47.61   | 17.52          | 22.20           | 13.30      | 2.55      | 0.76      | 19.35          | 22.08   |

# IRRIGATION—CALIFORNIA.

17

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|  | Nevada.   | Orange.   | Placer.   | Plumas.   | River-<br>side. | Sacra-<br>mento. | San<br>Benito. | San Bern-<br>ardino. | San<br>Diego. | San<br>Fran-<br>cisco. |
|--|-----------|-----------|-----------|-----------|-----------------|------------------|----------------|----------------------|---------------|------------------------|
| 1 Number of all farms in 1920.....   | 481       | 4,188     | 1,280     | 150       | 3,949           | 2,975            | 945            | 4,023                | 3,200         | 74                     |
| 2 Number of farms irrigated in 1919.....   | 311       | 3,846     | 814       | 108       | 2,670           | 1,747            | 349            | 3,350                | 1,698         | 23                     |
| 3 Per cent of all farms.....   | 64.7      | 91.8      | 63.6      | 72.0      | 67.6            | 58.7             | 36.9           | 83.3                 | 53.1          | 31.1                   |
| 4 Number of farms irrigated in 1909.....   | 300       | 2,215     | 618       | 151       | 2,174           | 1,053            | 240            | 2,463                | 890           | 25                     |
| 5 Per cent of increase, 1909-1919.....   | 3.7       | 73.6      | 31.7      | —28.5     | 22.8            | 65.0             | 45.4           | 36.0                 | 90.8          | .....                  |
| <b>LAND AND FARM AREA.</b>   |           |           |           |           |                 |                  |                |                      |               |                        |
| 6 Approximate land area.....acres..  | 623,360   | 508,800   | 903,040   | 1,659,520 | 4,622,720       | 629,120          | 890,880        | 12,912,000           | 2,701,440     | 26,880                 |
| 7 All land in farms.....acres..  | 198,441   | 325,703   | 233,153   | 101,653   | 670,293         | 555,503          | 539,378        | 415,738              | 925,192       | 1,295                  |
| 8 Improved land in farms.....acres..   | 26,190    | 200,945   | 136,455   | 34,223    | 348,538         | 309,024          | 122,096        | 175,272              | 262,646       | 840                    |
| 9 Area irrigated in 1919.....acres..   | 3,441     | 87,330    | 27,520    | 22,852    | 106,212         | 72,960           | 12,468         | 105,306              | 24,900        | 372                    |
| 10 Per cent of improved land in farms.....   | 13.1      | 43.5      | 20.2      | 66.8      | 30.5            | 18.3             | 10.2           | 60.1                 | 0.5           | 41.3                   |
| 11 Area irrigated in 1909.....acres..  | 3,839     | 55,056    | 16,845    | 36,002    | 71,436          | 53,683           | 7,180          | 70,278               | 24,944        | 383                    |
| 12 Per cent of increase, 1909-1919.....  | —10.4     | 58.6      | 63.4      | —37.0     | 48.7            | 35.9             | 73.5           | 49.8                 | 0.2           | —2.9                   |
| 13 Area enterprises were capable of irrigating in 1920.....acres..   | 5,002     | 102,076   | 27,520    | 25,478    | 128,788         | 103,271          | 17,186         | 120,798              | 32,148        | 412                    |
| 14 Area enterprises were capable of irrigating in 1910.....acres..   | 4,259     | 63,486    | 23,365    | 37,529    | 103,233         | 69,070           | 13,700         | 86,107               | 31,205        | 383                    |
| 15 Per cent of increase, 1910-1920.....  | 17.4      | 60.8      | 17.8      | —32.1     | 24.8            | 47.6             | 24.6           | 40.3                 | 3.0           | 7.6                    |
| 16 Area included in enterprises in 1920.....acres..  | 5,601     | 113,020   | 40,000    | 28,265    | 226,927         | 141,275          | 23,017         | 184,024              | 68,401        | 412                    |
| 17 Area included in enterprises in 1910.....acres..  | 5,267     | 71,444    | 61,751    | 37,901    | 210,452         | 74,588           | 20,067         | 152,415              | 45,535        | 383                    |
| 18 Per cent of increase, 1910-1920.....  | 6.3       | 58.2      | —35.2     | —25.4     | 7.8             | 89.4             | 14.7           | 20.7                 | 50.2          | 7.6                    |
| 19 Area of irrigated land reported as available for settle-<br>ment.....acres..                                  | .....     | .....     | .....     | .....     | 11,240          | 15,080           | 1,700          | .....                | 7,500         | .....                  |
| <b>IRRIGATION WORKS.</b>   |           |           |           |           |                 |                  |                |                      |               |                        |
| Independent enterprises:   |           |           |           |           |                 |                  |                |                      |               |                        |
| 20 Number, 1920.....   | 96        | 1,012     | 64        | 102       | 807             | 1,159            | 217            | 622                  | —637          | 33                     |
| 21 Number, 1910.....   | 103       | 619       | 35        | 127       | 610             | 889              | 109            | 521                  | 384           | 39                     |
| Main ditches:  |           |           |           |           |                 |                  |                |                      |               |                        |
| 22 Number, 1920.....   | 98        | 34        | 38        | 110       | 91              | 134              | 88             | 96                   | 50            | .....                  |
| 23 Number, 1910.....   | 110       | 300       | 35        | 147       | 301             | 213              | 64             | 291                  | 288           | 24                     |
| 24 Length, 1920.....miles..  | 342       | 82        | 131       | 135       | 235             | 269              | 64             | 147                  | .....         | .....                  |
| 25 Length, 1910.....miles..  | 236       | 180       | 194       | 201       | 500             | 238              | 61             | 466                  | 259           | 7                      |
| 26 Capacity, 1920.....second-feet..  | 454       | 780       | 657       | 1,369     | 2,649           | 1,937            | 204            | 1,291                | 1,653         | .....                  |
| 27 Capacity, 1910.....second-feet..  | 372       | 876       | 437       | 1,176     | 2,825           | 1,555            | 366            | 1,315                | 1,404         | 11                     |
| Laterals:  |           |           |           |           |                 |                  |                |                      |               |                        |
| 28 Number, 1920.....   | 33        | 116       | 53        | 213       | 221             | 254              | 80             | 81                   | 107           | .....                  |
| 29 Number, 1910.....   | 46        | 115       | 46        | 62        | 202             | 5                | 12             | 237                  | 244           | .....                  |
| 30 Length, 1920.....miles..  | 3         | 73        | 216       | 66        | 196             | 148              | 29             | 30                   | 18            | .....                  |
| 31 Length, 1910.....miles..  | 32        | 246       | 108       | 10        | 288             | 8                | 33             | 283                  | 140           | .....                  |
| Reservoirs:  |           |           |           |           |                 |                  |                |                      |               |                        |
| 32 Number, 1920.....   | 25        | 27        | 17        | 1         | 201             | 7                | 19             | 69                   | 134           | .....                  |
| 33 Number, 1910.....   | 24        | 19        | 29        | .....     | 131             | 2                | 6              | 83                   | 68            | 27                     |
| 34 Capacity, 1920.....acre-feet..  | 50,021    | 1,044     | 10,112    | 240       | 113,996         | 698              | 5,996          | 1,369                | 22,142        | .....                  |
| 35 Capacity, 1910.....acre-feet..  | 20,438    | 180       | 53,354    | .....     | 58,440          | 352              | 5,302          | 96,969               | 26,845        | 2                      |
| Flowing wells:   |           |           |           |           |                 |                  |                |                      |               |                        |
| 36 Number, 1920.....   | 3         | 365       | .....     | 6         | 306             | .....            | 4              | 124                  | 5             | 1                      |
| 37 Number, 1910.....   | .....     | 588       | .....     | 3         | 553             | .....            | .....          | 79                   | .....         | .....                  |
| 38 Capacity, 1920.....gallons per minute..   | 38        | 34,199    | .....     | 470       | 60,110          | .....            | 600            | 20,310               | 231           | .....                  |
| 39 Capacity, 1910.....gallons per minute..   | .....     | 92,680    | .....     | 604       | 90,331          | .....            | .....          | 21,825               | .....         | .....                  |
| Pumped wells:  |           |           |           |           |                 |                  |                |                      |               |                        |
| 40 Number, 1920.....   | 5         | 1,151     | 31        | .....     | 837             | 1,433            | 365            | 675                  | 1,122         | 48                     |
| 41 Number, 1910.....   | 5         | 580       | 2         | .....     | 792             | 1,168            | 87             | 449                  | 438           | 39                     |
| 42 Capacity, 1920.....gallons per minute..   | 146       | 549,010   | 4,532     | .....     | 378,010         | 480,220          | 104,860        | 400,263              | 147,860       | 1,725                  |
| 43 Capacity, 1910.....gallons per minute..   | 48        | 260,947   | 289       | .....     | 289,472         | 260,303          | 25,822         | 209,747              | 110,807       | 4,444                  |
| Pumping plants:  |           |           |           |           |                 |                  |                |                      |               |                        |
| 44 Number, 1920.....   | 8         | 1,002     | 44        | 2         | 628             | 1,405            | 183            | 583                  | 651           | 48                     |
| 45 Number, 1910.....   | 4         | 433       | 5         | .....     | 405             | 1,192            | 54             | 402                  | 363           | 39                     |
| 46 Engine capacity, 1920.....horsepower..  | 38        | 24,495    | 276       | 170       | 15,473          | 17,283           | 4,009          | 20,120               | 5,190         | 154                    |
| 47 Engine capacity, 1910.....horsepower..  | 12        | 8,575     | 30        | .....     | 11,067          | 5,050            | 677            | 10,700               | 2,857         | 89                     |
| 48 Pump capacity, 1920.....gallons per minute..  | 494       | 694,759   | 8,131     | 9,000     | 404,046         | 788,172          | 114,360        | 423,835              | 161,517       | 1,807                  |
| 49 Pump capacity, 1910.....gallons per minute..  | 848       | 286,003   | 1,284     | .....     | 346,788         | 335,666          | 29,452         | 233,136              | 112,256       | 4,444                  |
| 50 Average lift, 1920.....feet..   | 31        | 51        | 20        | 10        | 58              | 28               | 34             | 82                   | 52            | 83                     |
| <b>CAPITAL INVESTED.</b>   |           |           |           |           |                 |                  |                |                      |               |                        |
| 51 Capital invested to Jan. 1, 1920.....dollars..  | 1,190,790 | 6,501,903 | 1,162,774 | 226,717   | 12,473,520      | 3,810,095        | 754,801        | 8,738,603            | 4,948,939     | 70,831                 |
| 52 Capital invested to July 1, 1910.....dollars..  | 1,569,028 | 1,948,246 | 2,798,740 | 107,118   | 5,648,469       | 1,452,471        | 177,924        | 9,416,960            | 3,753,127     | 21,975                 |
| 53 Per cent of increase, 1910-1920.....  | —24.1     | 233.7     | —58.5     | 111.7     | 120.8           | 162.4            | 324.3          | —7.2                 | 31.9          | 222.3                  |
| 54 Average cost per acre based on area enterprises were capable<br>of supplying with water in 1920.....dollars.. | 238.06    | 63.70     | 42.25     | 8.90      | 96.85           | 36.90            | 43.92          | 72.34                | 163.04        | 171.92                 |
| 55 Average cost per acre based on area enterprises were capable<br>of supplying with water in 1910.....dollars.. | 368.40    | 30.69     | 119.78    | 2.85      | 54.72           | 20.76            | 12.00          | 109.36               | 120.27        | 57.38                  |
| <b>ESTIMATED FINAL COST.</b>   |           |           |           |           |                 |                  |                |                      |               |                        |
| 56 Estimated final cost of existing enterprises in 1920.....dollars..  | 1,190,790 | 6,758,018 | 1,163,209 | 226,717   | 14,796,051      | 4,291,620        | 767,701        | 8,938,516            | 5,592,954     | 70,831                 |
| 57 Estimated final cost of existing enterprises in 1910.....dollars..  | 1,569,028 | 1,948,246 | 2,798,740 | 107,118   | 5,698,469       | 1,452,471        | 267,924        | 13,038,449           | 3,767,127     | 21,975                 |
| 58 Per cent of increase, 1910-1920.....  | —24.1     | 246.9     | —58.4     | 111.7     | 159.6           | 195.5            | 186.5          | —31.4                | 48.5          | 222.3                  |
| 59 Average cost per acre based on estimated final cost and area<br>included in enterprises in 1920.....dollars.. | 212.00    | 59.79     | 20.08     | 8.02      | 65.20           | 30.38            | 33.35          | 48.57                | 81.77         | 171.92                 |
| 60 Average cost per acre based on estimated final cost and area<br>included in enterprises in 1910.....dollars.. | 297.90    | 27.27     | 45.32     | 2.83      | 27.08           | 19.47            | 13.35          | 85.55                | 82.73         | 57.38                  |

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |  | San Joaquin. | San Luis Obispo. | San Mateo. | Santa Barbara. | Santa Clara. | Santa Cruz. | Shasta.   | Sierra. | Siskiyou. | Solano. |
|------------------------------|--|--------------|------------------|------------|----------------|--------------|-------------|-----------|---------|-----------|---------|
| 1                            | Number of all farms in 1920.....   | 4,500        | 1,803            | 624        | 1,485          | 5,016        | 1,759       | 949       | 77      | 1,052     | 1,358   |
| 2                            | Number of farms irrigated in 1919.....   | 3,047        | 143              | 205        | 437            | 2,649        | 145         | 598       | 62      | 584       | 278     |
| 3                            | Per cent of all farms.....   | 67.7         | 7.9              | 32.9       | 29.4           | 52.8         | 8.2         | 63.0      | 80.5    | 55.5      | 20.5    |
| 4                            | Number of farms irrigated in 1909.....   | 1,452        | 91               | 75         | 137            | 1,101        | 106         | 639       | 94      | 636       | 150     |
| 5                            | Per cent of increase, 1909-1919.....   | 109.8        | .....            | .....      | 219.0          | 140.6        | 36.8        | -6.4      | .....   | -8.2      | 85.3    |
| <b>LAND AND FARM AREA.</b>   |  |              |                  |            |                |              |             |           |         |           |         |
| 6                            | Approximate land area.....acres..  | 926,720      | 2,133,760        | 286,080    | 1,753,600      | 849,920      | 278,400     | 2,469,120 | 590,720 | 4,003,840 | 526,080 |
| 7                            | All land in farms.....acres..  | 706,308      | 1,377,636        | 117,109    | 869,781        | 576,812      | 144,751     | 565,235   | 60,667  | 537,396   | 408,288 |
| 8                            | Improved land in farms.....acres..   | 599,403      | 402,269          | 77,736     | 210,353        | 206,890      | 67,838      | 103,470   | 21,607  | 160,621   | 299,264 |
| 9                            | Area irrigated in 1919.....acres..   | 183,923      | 5,302            | 7,142      | 16,335         | 70,312       | 1,294       | 50,215    | 15,292  | 65,602    | 23,650  |
| 10                           | Per cent of improved land in farms.....  | 30.7         | 1.3              | 9.2        | 7.8            | 34.0         | 1.9         | 48.5      | 70.8    | 39.4      | 7.9     |
| 11                           | Area irrigated in 1909.....acres..   | 59,811       | 1,687            | 3,648      | 12,012         | 37,637       | 1,201       | 33,004    | 17,504  | 60,301    | 3,610   |
| 12                           | Per cent of increase, 1909-1919.....   | 207.5        | 214.3            | 95.8       | 36.0           | 86.8         | 7.7         | 52.1      | -12.6   | 8.8       | 555.1   |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 231,125      | 10,872           | 8,164      | 34,408         | 75,348       | 2,069       | 58,903    | 15,873  | 70,987    | 28,702  |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 77,083       | 2,416            | 3,653      | 13,672         | 50,939       | 1,313       | 36,564    | 17,505  | 66,866    | 7,160   |
| 15                           | Per cent of increase, 1910-1920.....   | 199.8        | 350.0            | 123.5      | 153.5          | 47.9         | 57.6        | 61.1      | -9.3    | 6.2       | 300.9   |
| 16                           | Area included in enterprises in 1920.....acres..   | 324,404      | 11,229           | 9,449      | 37,795         | 86,761       | 2,700       | 110,382   | 18,547  | 130,654   | 36,078  |
| 17                           | Area included in enterprises in 1910.....acres..   | 173,563      | 2,539            | 3,983      | 13,603         | 60,140       | 2,232       | 72,653    | 18,249  | 79,161    | 8,192   |
| 18                           | Per cent of increase, 1910-1920.....   | 86.9         | 342.3            | 137.2      | 177.8          | 44.3         | 21.0        | 51.9      | 1.6     | 65.0      | 340.4   |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | .....        | .....            | .....      | .....          | .....        | .....       | 15,000    | .....   | 2,300     | .....   |
| <b>IRRIGATION WORKS.</b>     |  |              |                  |            |                |              |             |           |         |           |         |
| Independent enterprises:     |  |              |                  |            |                |              |             |           |         |           |         |
| 20                           | Number, 1920.....  | 1,233        | 128              | 206        | 275            | 1,561        | 67          | 336       | 70      | 455       | 251     |
| 21                           | Number, 1910.....  | 1,208        | 65               | 85         | 108            | 842          | 97          | 472       | 100     | 572       | 132     |
| Main ditches:                |  |              |                  |            |                |              |             |           |         |           |         |
| 22                           | Number, 1920.....  | 256          | 38               | 15         | 55             | 26           | 11          | 385       | 87      | 714       | 36      |
| 23                           | Number, 1910.....  | 298          | 51               | 57         | 76             | 458          | 81          | 446       | 119     | 595       | 20      |
| 24                           | Length, 1920.....miles..   | 1,089        | 20               | 7          | 31             | 30           | 2           | 550       | 80      | 850       | 45      |
| 25                           | Length, 1910.....miles..   | 308          | 42               | 58         | 75             | 228          | 41          | 678       | 150     | 688       | 22      |
| 26                           | Capacity, 1920.....second-feet..   | 2,609        | 53               | 13         | 312            | 328          | 7           | 3,970     | 282     | 4,255     | 111     |
| 27                           | Capacity, 1910.....second-feet..   | 5,415        | 84               | 458        | 140            | 1,511        | 161         | 3,150     | 2,304   | 2,576     | 101     |
| Laterals:                    |  |              |                  |            |                |              |             |           |         |           |         |
| 28                           | Number, 1920.....  | 417          | 5                | 54         | 47             | 8            | 1           | 118       | 48      | 316       | 52      |
| 29                           | Number, 1910.....  | 49           | 5                | .....      | 4              | 39           | .....       | 130       | 4       | 172       | .....   |
| 30                           | Length, 1920.....miles..   | 888          | .....            | .....      | 7              | 21           | .....       | 151       | 15      | 109       | 35      |
| 31                           | Length, 1910.....miles..   | 192          | 3                | .....      | 5              | 27           | .....       | 81        | 1       | 41        | .....   |
| Reservoirs:                  |  |              |                  |            |                |              |             |           |         |           |         |
| 32                           | Number, 1920.....  | 25           | 15               | 157        | 83             | 8            | 10          | 12        | 1       | 29        | 4       |
| 33                           | Number, 1910.....  | 73           | 8                | 3          | 32             | 142          | 55          | 10        | 3       | 20        | 3       |
| 34                           | Capacity, 1920.....acre-feet..   | 36,037       | 21               | 1,244      | 14,052         | 21           | 38          | 6,312     | .....   | 4,591     | .....   |
| 35                           | Capacity, 1910.....acre-feet..   | 134,014      | 52               | 33         | 13             | 9            | 1,228       | 3,903     | 8       | 107       | 1       |
| Flowing wells:               |  |              |                  |            |                |              |             |           |         |           |         |
| 36                           | Number, 1920.....  | 3            | 19               | 17         | 33             | 80           | 1           | 3         | .....   | 8         | 4       |
| 37                           | Number, 1910.....  | 4            | 4                | .....      | 7              | 438          | 2           | 2         | .....   | .....     | .....   |
| 38                           | Capacity, 1920.....gallons per minute..  | 180          | 3,808            | 25,723     | 4,341          | 13,075       | 125         | 150       | .....   | 1,350     | .....   |
| 39                           | Capacity, 1910.....gallons per minute..  | .....        | 70               | .....      | 250            | 110,816      | 10          | 290       | .....   | .....     | .....   |
| Pumped wells:                |  |              |                  |            |                |              |             |           |         |           |         |
| 40                           | Number, 1920.....  | 1,376        | 161              | 229        | 296            | 2,159        | 44          | 4         | 1       | 26        | 322     |
| 41                           | Number, 1910.....  | 1,618        | 12               | 40         | 113            | 800          | 58          | 34        | .....   | 3         | 125     |
| 42                           | Capacity, 1920.....gallons per minute..  | 630,697      | 35,862           | 27,009     | 101,925        | 649,247      | 11,076      | 1,340     | 500     | 9,995     | 145,982 |
| 43                           | Capacity, 1910.....gallons per minute..  | 432,281      | 4,416            | 3,956      | 24,520         | 287,668      | 8,383       | 6,550     | .....   | 250       | 70,338  |
| Pumping plants:              |  |              |                  |            |                |              |             |           |         |           |         |
| 44                           | Number, 1920.....  | 1,371        | 119              | 251        | 235            | 1,572        | 59          | 51        | 1       | 45        | 281     |
| 45                           | Number, 1910.....  | 1,304        | 31               | 59         | 65             | 587          | 70          | 61        | .....   | 10        | 127     |
| 46                           | Engine capacity, 1920.....horsepower..   | 18,987       | 1,692            | 2,219      | 5,657          | 33,721       | 685         | 594       | .....   | 2,903     | 4,547   |
| 47                           | Engine capacity, 1910.....horsepower..   | 7,582        | 155              | 421        | 1,442          | 9,404        | 384         | 418       | .....   | 69        | 1,802   |
| 48                           | Pump capacity, 1920.....gallons per minute..   | 907,850      | 62,519           | 26,400     | 543,273        | 780,874      | 19,378      | 47,896    | 500     | 125,674   | 199,892 |
| 49                           | Pump capacity, 1910.....gallons per minute..   | 553,134      | 12,116           | 8,341      | 37,135         | 338,915      | 16,324      | 31,937    | .....   | 1,217     | 100,715 |
| 50                           | Average lift, 1920.....feet..  | 28           | 25               | 78         | 51             | 56           | 42          | 17        | 6       | 40        | 34      |
| <b>CAPITAL INVESTED.</b>     |  |              |                  |            |                |              |             |           |         |           |         |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 7,432,763    | 304,119          | 488,856    | 1,418,022      | 4,364,803    | 388,145     | 3,020,700 | 100,810 | 1,589,073 | 535,348 |
| 52                           | Capital invested to July 1, 1910.....dollars..   | 1,689,720    | 32,311           | 90,921     | 370,186        | 1,337,216    | 76,621      | 430,766   | 69,650  | 370,627   | 135,532 |
| 53                           | Per cent of increase, 1910-1920.....   | 339.9        | 841.2            | 437.7      | 283.1          | 226.4        | 406.6       | 601.2     | 44.7    | 328.8     | 295.0   |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 32.16        | 27.97            | 59.88      | 41.21          | 57.93        | 187.60      | 51.28     | 6.35    | 22.39     | 18.05   |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 21.92        | 13.37            | 24.89      | 27.28          | 26.25        | 58.36       | 11.78     | 3.98    | 5.54      | 18.93   |
| <b>ESTIMATED FINAL COST.</b> |  |              |                  |            |                |              |             |           |         |           |         |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 7,516,649    | 317,729          | 491,350    | 1,498,233      | 4,551,153    | 388,645     | 3,344,079 | 101,940 | 1,814,803 | 560,348 |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 3,324,720    | 32,311           | 90,921     | 370,186        | 1,337,216    | 76,621      | 440,766   | 69,650  | 370,627   | 135,532 |
| 58                           | Per cent of increase, 1910-1920.....   | 126.1        | 883.3            | 440.4      | 304.7          | 240.3        | 407.2       | 658.7     | 46.4    | 389.7     | 313.4   |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 23.17        | 28.30            | 52.00      | 39.64          | 52.46        | 143.94      | 30.30     | 5.50    | 13.89     | 15.53   |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 19.16        | 12.73            | 22.83      | 27.21          | 22.24        | 34.33       | 6.07      | 3.82    | 4.68      | 16.54   |

# IRRIGATION—CALIFORNIA.

19

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS,  
AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|   | Sonoma.   | Stanislaus. | Sutter.   | Tehama.   | Trinity.  | Tulare.    | Tuolumne. | Ventura.  | Yolo.     | Yuba.     |
|---|-----------|-------------|-----------|-----------|-----------|------------|-----------|-----------|-----------|-----------|
| 1 Number of all farms in 1920.....  | 5,739     | 4,566       | 1,437     | 1,414     | 377       | 6,372      | 363       | 1,543     | 1,613     | 487       |
| 2 Number of farms irrigated in 1919.....  | 113       | 4,091       | 669       | 640       | 217       | 5,184      | 149       | 818       | 688       | 242       |
| 3 Per cent of all farms.....  | 2.0       | 89.6        | 46.6      | 45.3      | 57.6      | 81.4       | 41.0      | 53.0      | 42.7      | 49.7      |
| 4 Number of farms irrigated in 1909.....  | 38        | 1,911       | 39        | 366       | 201       | 3,048      | 157       | 489       | 333       | 112       |
| 5 Per cent of increase, 1909-1919.....  |           | 114.1       |           | 74.9      | 8.0       | 70.1       | -5.1      | 67.3      | 106.6     | 116.1     |
| <b>LAND AND FARM AREA.</b>  |           |             |           |           |           |            |           |           |           |           |
| 6 Approximate land area.....acres..   | 1,012,480 | 928,000     | 389,120   | 1,872,000 | 1,981,440 | 3,107,840  | 1,401,600 | 1,189,120 | 648,960   | 404,480   |
| 7 All land in farms.....acres..   | 748,147   | 748,678     | 288,940   | 1,124,502 | 130,290   | 1,084,234  | 220,730   | 384,865   | 398,165   | 228,797   |
| 8 Improved land in farms.....acres..  | 251,730   | 477,871     | 232,070   | 232,722   | 15,078    | 544,598    | 35,380    | 189,924   | 300,094   | 98,997    |
| 9 Area irrigated in 1919.....acres..  | 2,126     | 197,249     | 47,305    | 23,153    | 5,810     | 398,662    | 2,892     | 31,716    | 42,493    | 20,773    |
| 10 Per cent of improved land in farms.....  | 0.8       | 41.3        | 20.4      | 9.9       | 38.5      | 73.2       | 8.2       | 16.7      | 14.2      | 21.0      |
| 11 Area irrigated in 1909.....acres..   | 631       | 84,015      | 1,173     | 14,281    | 6,324     | 265,404    | 2,035     | 25,273    | 11,754    | 3,073     |
| 12 Per cent of increase, 1909-1919.....   | 236.9     | 134.8       |           | 62.1      | -8.1      | 50.2       | 42.1      | 25.5      | 261.5     | 576.0     |
| 13 Area enterprises were capable of irrigating in 1920.....acres..  | 3,091     | 309,362     | 96,984    | 39,415    | 9,041     | 658,386    | 2,943     | 35,875    | 65,440    | 24,049    |
| 14 Area enterprises were capable of irrigating in 1910.....acres..  | 761       | 141,785     | 1,361     | 23,167    | 7,127     | 337,938    | 2,083     | 49,407    | 14,697    | 6,401     |
| 15 Per cent of increase, 1910-1920.....   | 306.2     | 118.2       |           | 70.1      | 26.9      | 94.8       | 41.3      | -27.4     | 345.3     | 275.7     |
| 16 Area included in enterprises in 1920.....acres..   | 11,256    | 375,270     | 102,945   | 44,670    | 15,010    | 764,733    | 25,371    | 50,737    | 104,716   | 71,995    |
| 17 Area included in enterprises in 1910.....acres..   | 951       | 340,914     | 1,959     | 36,020    | 9,513     | 466,735    | 5,958     | 56,357    | 55,967    | 46,322    |
| 18 Per cent of increase, 1910-1920.....   |           | 10.1        |           | 24.0      | 57.8      | 63.8       | 325.8     | -10.0     | 87.1      | 55.4      |
| 19 Area of irrigated land reported as available for settlement.....acres..                                    |           | 77,833      |           | 2,900     |           | 2,700      |           |           | 20,906    | 6,720     |
| <b>IRRIGATION WORKS.</b>  |           |             |           |           |           |            |           |           |           |           |
| Independent enterprises:  |           |             |           |           |           |            |           |           |           |           |
| 20 Number, 1920.....  | 93        | 106         | 487       | 333       | 222       | 3,570      | 53        | 130       | 254       | 78        |
| 21 Number, 1910.....  | 40        | 27          | 21        | 270       | 193       | 908        | 61        | 189       | 47        | 39        |
| Main ditches:   |           |             |           |           |           |            |           |           |           |           |
| 22 Number, 1920.....  | 5         | 94          | 67        | 150       | 261       | 211        | 50        | 23        | 28        | 67        |
| 23 Number, 1910.....  | 32        | 23          | 13        | 136       | 208       | 752        | 62        | 148       | 8         | 36        |
| 24 Length, 1920.....miles..   | 2         | 607         | 100       | 193       | 245       | 770        | 63        | 42        | 139       | 188       |
| 25 Length, 1910.....miles..   | 21        | 153         | 6         | 164       | 228       | 1,033      | 153       | 177       | 87        | 128       |
| 26 Capacity, 1920.....second-feet..   | 6         | 6,150       | 1,168     | 1,111     | 1,536     | 8,018      | 251       | 169       | 1,641     | 786       |
| 27 Capacity, 1910.....second-feet..   | 14        | 3,074       | 27        | 1,325     | 802       | 6,526      | 245       | 627       | 214       | 398       |
| Laterals:   |           |             |           |           |           |            |           |           |           |           |
| 28 Number, 1920.....  | 2         | 914         | 201       | 97        | 55        | 432        | 32        | 48        | 43        | 43        |
| 29 Number, 1910.....  |           | 34          |           | 41        | 41        | 577        | 11        | 53        | 8         | 13        |
| 30 Length, 1920.....miles..   |           | 1,074       | 182       | 226       | 15        | 1,252      | 130       | 30        | 155       | 105       |
| 31 Length, 1910.....miles..   |           | 274         |           | 40        | 13        | 629        | 24        | 87        | 83        | 87        |
| Reservoirs:   |           |             |           |           |           |            |           |           |           |           |
| 32 Number, 1920.....  | 4         | 4           | 4         | 14        | 41        | 527        | 15        | 23        | 3         | 9         |
| 33 Number, 1910.....  | 3         | 5           | 6         | 43        | 30        | 63         | 9         | 32        | 5         | 5         |
| 34 Capacity, 1920.....acre-feet..   |           | 75,156      | 2         | 185       | 90,458    | 112,806    | 6,086     | 2,749     | 151       | 6,651     |
| 35 Capacity, 1910.....acre-feet..   | 1         | 30,016      | 1         | 311       | 427       | 1,326      | 10        | 80        | 2         | 80        |
| Flowing wells:  |           |             |           |           |           |            |           |           |           |           |
| 36 Number, 1920.....  | 1         | 1           | 2         |           |           | 23         |           | 42        |           |           |
| 37 Number, 1910.....  |           |             |           |           |           | 79         | 2         | 32        |           |           |
| 38 Capacity, 1920.....gallons per minute..  |           | 400         | 800       | 1         |           | 7,173      |           | 11,435    |           |           |
| 39 Capacity, 1910.....gallons per minute..  |           |             |           | 8         |           | 35,513     | 14        | 17,455    |           |           |
| Pumped wells:   |           |             |           |           |           |            |           |           |           |           |
| 40 Number, 1920.....  | 78        | 100         | 742       | 281       | 5         | 4,515      | 2         | 149       | 285       | 49        |
| 41 Number, 1910.....  | 11        | 3           | 18        | 141       | 1         | 794        |           | 157       | 58        | 11        |
| 42 Capacity, 1920.....gallons per minute..  | 28,381    | 84,205      | 319,535   | 96,585    | 605       | 1,776,335  | 25        | 80,734    | 166,698   | 30,551    |
| 43 Capacity, 1910.....gallons per minute..  | 6,831     | 950         | 6,016     | 16,275    | 750       | 237,420    | 10        | 64,829    | 29,409    | 1,605     |
| Pumping plants:   |           |             |           |           |           |            |           |           |           |           |
| 44 Number, 1920.....  | 98        | 114         | 628       | 261       | 12        | 3,758      | 4         | 105       | 276       | 41        |
| 45 Number, 1910.....  | 27        | 21          | 19        | 165       | 3         | 739        | 7         | 126       | 46        | 11        |
| 46 Engine capacity, 1920.....horsepower..   | 614       | 4,803       | 10,541    | 2,190     | 69        | 45,032     | 12        | 5,592     | 8,852     | 2,365     |
| 47 Engine capacity, 1910.....horsepower..   | 134       | 707         | 124       | 751       | 34        | 7,804      | 89        | 2,970     | 981       | 62        |
| 48 Pump capacity, 1920.....gallons per minute..   | 33,524    | 232,785     | 826,630   | 106,285   | 3,990     | 2,331,179  | 25        | 94,130    | 549,814   | 20,852    |
| 49 Pump capacity, 1910.....gallons per minute..   | 16,763    | 185,950     | 6,616     | 39,680    | 1,920     | 244,318    | 765       | 72,704    | 69,694    | 1,605     |
| 50 Average lift, 1920.....feet..  | 19        | 31          | 21        | 27        | 15        | 43         | 30        | 82        | 26        | 24        |
| <b>CAPITAL INVESTED.</b>  |           |             |           |           |           |            |           |           |           |           |
| 51 Capital invested to Jan. 1, 1920.....dollars..   | 107,314   | 9,639,519   | 2,931,118 | 1,048,959 | 206,875   | 12,529,432 | 965,667   | 2,691,027 | 2,003,591 | 1,486,598 |
| 52 Capital invested to July 1, 1910.....dollars..   | 13,801    | 4,051,870   | 18,800    | 263,055   | 173,414   | 5,634,379  | 180,474   | 2,262,205 | 311,660   | 198,268   |
| 53 Per cent of increase, 1910-1920.....   | 677.6     | 137.9       |           | 298.8     | 19.3      | 122.4      | 435.1     | 19.0      | 542.9     | 649.8     |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 34.72     | 31.16       | 30.22     | 26.61     | 22.88     | 19.03      | 328.12    | 75.01     | 30.62     | 61.82     |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 18.14     | 28.58       | 13.81     | 11.35     | 24.33     | 16.67      | 86.04     | 45.79     | 21.21     | 30.97     |
| <b>ESTIMATED FINAL COST.</b>  |           |             |           |           |           |            |           |           |           |           |
| 56 Estimated final cost of existing enterprises in 1920.....dollars..   | 125,064   | 17,006,504  | 3,239,043 | 1,081,145 | 215,025   | 12,973,985 | 965,667   | 3,066,027 | 3,629,826 | 1,981,373 |
| 57 Estimated final cost of existing enterprises in 1910.....dollars..   | 13,801    | 5,326,870   | 18,800    | 342,555   | 173,414   | 5,643,379  | 180,474   | 2,317,205 | 311,660   | 198,268   |
| 58 Per cent of increase, 1910-1920.....   | 806.2     | 219.3       |           | 215.6     | 24.0      | 129.9      | 435.1     | 32.3      |           | 899.3     |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 11.11     | 45.32       | 31.46     | 24.20     | 14.33     | 16.97      | 38.06     | 60.43     | 34.66     | 27.52     |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 14.51     | 15.63       | 9.60      | 9.51      | 18.23     | 12.09      | 30.29     | 41.12     | 5.57      | 4.28      |

## IRRIGATION : COLORADO

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 7     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 8     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 8     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 9     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 12    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 13    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 6     |  |       |
| Acreage, by drainage basin.....                        | 6     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Colorado collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of

showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

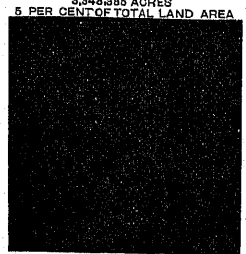
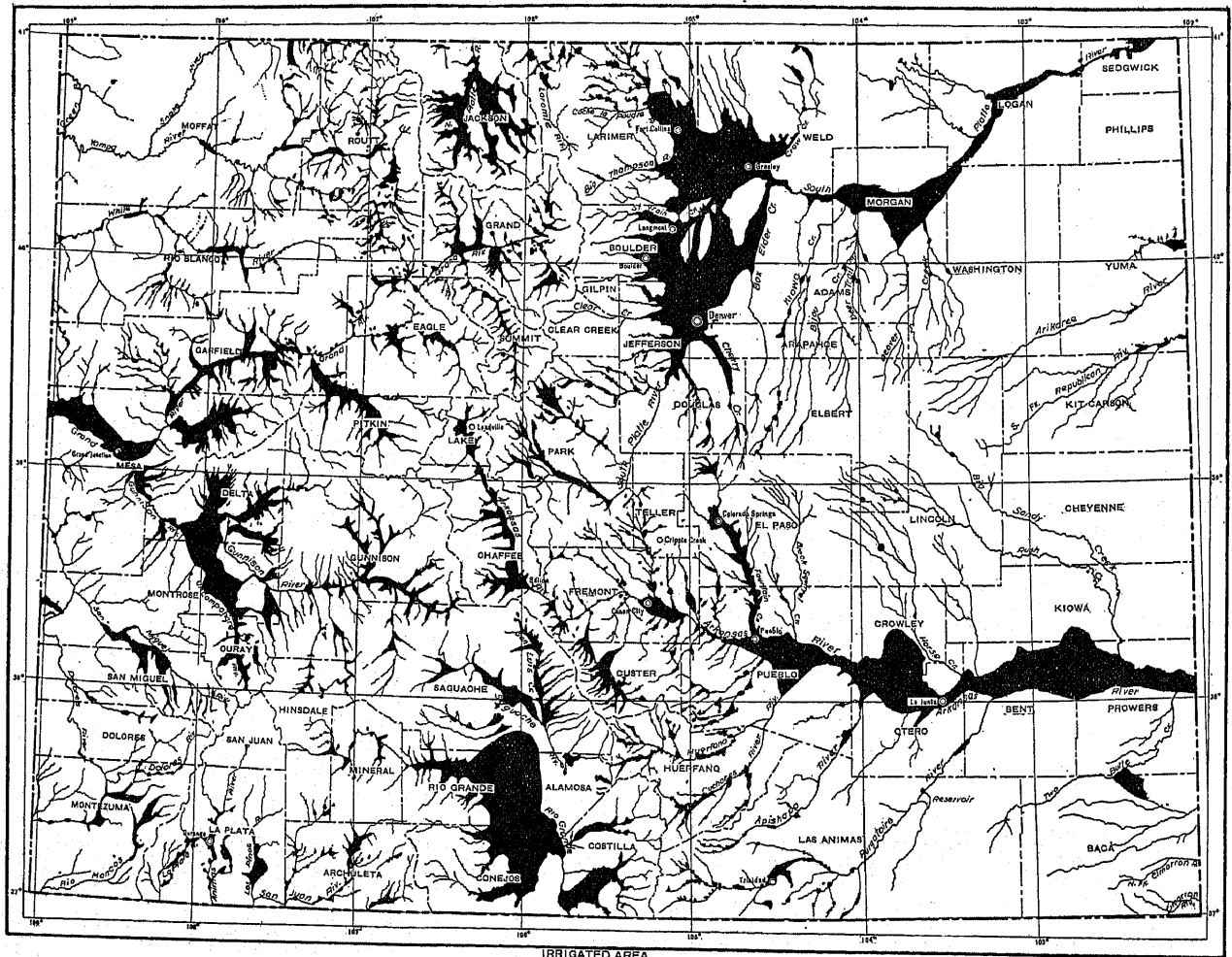
TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—   |                  | INCREASE. <sup>1</sup> |           |
|--|--------------|------------------|------------------------|-----------|
|  | 1920         | 1910             | Amount.                | Per cent. |
| Number of all farms.....   | 59,934       | 46,170           | 13,764                 | 29.8      |
| Approximate land area of the state..... acres..  | 66,341,120   | 66,341,120       |                        |           |
| All land in farms..... acres..   | 24,462,014   | 13,532,113       | 10,929,901             | 80.8      |
| Improved land in farms..... acres..  | 7,744,757    | 4,302,101        | 3,442,656              | 80.0      |
| Number of farms irrigated.....   | 28,756       | 25,857           | 2,899                  | 11.2      |
| Area irrigated..... acres..  | 3,348,385    | 2,792,032        | 556,353                | 19.9      |
| Area enterprises were capable of irrigating..... acres..                               | 3,855,348    | 3,990,166        | -134,818               | -3.4      |
| Area included in enterprises..... acres..  | 5,220,588    | 5,917,457        | -696,869               | -11.8     |
| Per cent irrigated:  |              |                  |                        |           |
| Number of all farms.....   | 48.0         | 56.0             | -8.0                   |           |
| Approximate land area of state.....  | 5.0          | 4.2              | 0.8                    |           |
| Land in farms.....   | 13.7         | 20.6             | -6.9                   |           |
| Improved land in farms.....  | 43.2         | 64.9             | -21.7                  |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 506,963      | 1,198,134        | -691,171               | -57.7     |
| Excess of area included in enterprises over area irrigated..... acres..                | 1,872,203    | 3,125,425        | -1,253,222             | -40.1     |
| Area of irrigated land reported as available for settlement..... acres..               | 274,282      | ( <sup>2</sup> ) | 274,282                |           |
| Capital invested.....  | \$88,302,442 | \$56,636,443     | \$31,665,999           | 55.9      |
| Average per acre enterprises were capable of irrigating.....                           | \$22.90      | \$14.19          | \$8.71                 | 61.4      |
| Estimated final cost of existing enterprises.....                                      | \$95,198,423 | \$76,443,239     | \$18,755,184           | 24.5      |
| Average per acre included in enterprises.....  | \$18.24      | \$12.92          | \$5.32                 | 41.2      |
| Average cost of operation and maintenance per acre.....                                | \$0.87       | \$0.75           | \$0.12                 |           |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.<sup>2</sup> Not reported in 1910.

# COLORADO

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.





## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

The main ranges of the Rocky Mountains divide the state of Colorado approximately in half, east and west. In the mountainous section, through the middle of the state, the precipitation is heavy. Both east and west of the mountains it decreases. That part of the state east of the mountains consists of high plains sloping to the east, with a divide running from the base of the mountains to the eastern line of the state. From this divide the land slopes to the north toward South Platte River and to the south toward Arkansas River. The precipitation drops abruptly near the base of the mountains and gradually increases toward the east, the normal precipitation on the plains being between 12 and 15 inches, being highest on the divide between the South Platte and the Arkansas and lowest in the stream valleys. The heaviest precipitation occurs in the summer months. In all of the plains section some crops are grown without irrigation, but irrigation is practiced wherever water is available. In this part of the state the area of land susceptible of irrigation is practically unlimited, but the water supply is sufficient for only a small part of the land.

To the west of the main ranges of mountains the country is very much broken by short ranges of mountains and hills, and precipitation varies greatly with altitude and exposure. The valleys of the western slope have the smallest annual precipitation in the state, the normal being but 7 or 8 inches in the valley of Grand River and in the northwestern part of the state. In these lower valleys crops can not be grown successfully without irrigation. In this western half of the state the tillable land is limited to the comparatively narrow valleys, most of the remainder of the land being too rough for cultivation.

In the south central part of the state, on the headwaters of the Rio Grande, lies the San Luis Valley, which contains a large area of level land. The altitude is high, the seasons are short, and the normal precipitation is less than 10 inches. Toward the base of the mountains that surround the valley the precipitation is heavier and crops are grown without irrigation.

In the north central part of the state is a similar high valley on the headwaters of the North Platte. This valley is not so extensive as the San Luis Valley, and the rainfall is slightly greater.

For the state as a whole the precipitation for 1919 was slightly above the normal, but it was considerably below normal in the South Platte Valley and considerably above normal in the Arkansas Valley. On the western slope it was about normal.

The state has a large percentage of sunshine with a low relative humidity, making very favorable climatic conditions for crop growing, when sufficient moisture is available, from either rainfall or irrigation.

## WATER SUPPLY FOR IRRIGATION.

From the high mountain mass in central Colorado streams flow in all directions. To the east the South Platte and the Arkansas flow across the plains into Nebraska and Kansas, respectively; to the south the Rio Grande flows into and through New Mexico; to the west flow the Grand and other streams that unite to form the Colorado; and to the north flows the North Platte, into and through Wyoming. On all these streams there is more or less controversy between water users in Colorado and those in the lower states. These mountains receive a heavy snowfall in winter, and the melting snows supply most of the spring and summer flow of the streams, although the summer rains help to keep up stream flow. All of the streams heading in the mountains have high floods in the early summer, with much reduced flow during the late summer and autumn. The floods supply abundant water for grain and hay crops that mature in June and July, but the growing of crops that have a long growing season and mature in the fall, such as potatoes, beets, orchard fruits, and alfalfa, requires storage of the flood and winter flow of the streams.

In the valleys of the South Platte and the Arkansas many reservoirs have been built, and most of the flood and winter flow is stored. These streams are typical plains streams, and in their natural condition lost in the sands in their courses across the plains, much of the water flowing in them as they left the mountains. The irrigation of the lands along these rivers has caused a large inflow by seepage from the watered lands, resulting in a much better supply of water along their courses than was available before irrigation began. The storage of flood waters and return seepage have made possible a large extension of the irrigated areas on the lower reaches of these rivers.

On account of the limited area on the western slope susceptible of irrigation and the large flow of the streams there has not been so much necessity for storage, and consequently, there are few reservoirs.

The existence of an abundant supply of water on the western slope and an unlimited area of irrigable land on the plains has led to the diversion of some water from the streams on the western side of the mountains to the streams flowing onto the plains and to the formulation of plans for diverting much larger volumes. On the other hand, there are plans for storing the surplus water on the western slope for use on lands in Arizona and California that can be reached by canals from Colorado River.

Up to the present time there has been little occasion to use underground water for irrigation. No doubt large quantities of water can be pumped from wells.

On the plains there are many drainage channels which carry water during storms or when local snows are melting, but their supply is so uncertain that they are of little value for irrigation.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                        |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 28,756           | 11.2                   | 48.0                   | 3,348,385       | 19.9                   | 5.0                          | 13.7                       | 43.2                                 |
| 1910.....    | 25,857           | 46.8                   | 56.0                   | 2,792,032       | 73.3                   | 4.2                          | 20.6                       | 64.9                                 |
| 1900.....    | 17,613           | 82.3                   | 71.3                   | 1,611,271       | 80.9                   | 2.4                          | 17.0                       | 70.9                                 |
| 1890.....    | 9,659            | .....                  | 58.9                   | 890,735         | .....                  | 1.3                          | 19.4                       | 48.8                                 |

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area in-cluded in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                       | Area enter-prises were ca-pable of irrigating in 1920 (acres). |
|--------------------|--------------------------|---|-------------------------|---------------------------------------|--|
|                    |                          |   | Acres.                  | Per cent of acre-age in enter-prises. |  |
| Total.....         | 6,634                    | 5,220,588                                     | 3,348,385               | 64.1                                  | 3,855,348  |
| Before 1860.....   | 38                       | 43,371  | 37,742                  | 87.0                                  | 38,440   |
| 1860-1869.....     | 507                      | 714,931                                       | 634,865                 | 88.8                                  | 660,950  |
| 1870-1879.....     | 976                      | 859,680                                       | 647,771                 | 75.4                                  | 710,167  |
| 1880-1889.....     | 1,799                    | 1,633,747                                     | 1,155,088               | 70.7                                  | 1,315,772  |
| 1890-1899.....     | 953                      | 494,975                                       | 294,493                 | 59.5                                  | 344,834  |
| 1900-1904.....     | 584                      | 412,782                                       | 210,673                 | 51.0                                  | 282,857  |
| 1905-1909.....     | 494                      | 609,773                                       | 215,729                 | 35.4                                  | 289,617  |
| 1910-1914.....     | 525                      | 318,365                                       | 80,674                  | 25.3                                  | 124,976  |
| 1915-1919.....     | 393                      | 57,815  | 19,885                  | 34.4                                  | 30,626   |
| Not reported.....  | 365                      | 75,149  | 51,465                  | 68.5                                  | 57,109   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                  | AREA IRRIGATED (ACRES). |                  |                        |           | Area enter-prises were capable of irrigating in 1920 (acres). | Area included in enter-prises, 1920 (acres). |
|---|-------------------------|------------------|------------------------|-----------|---|--|
|   | 1919                    | 1909             | Increase. <sup>1</sup> |           |   |  |
|   |                         |                  | Amount.                | Per cent. |   |  |
| Total.....                              | 3, 348, 385             | 2, 792, 032      | 556, 353               | 19.9      | 3, 855, 348   | 5, 220, 588                                  |
| Stream, gravity.....                    | 3, 028, 787             | 2, 745, 035      | 283, 752               | 10.3      | 3, 465, 037   | 4, 459, 308                                  |
| Stream, pumped.....                     | 12, 747                 | 13, 248          | -501                   | -3.8      | 20, 256   | 26, 699                                      |
| Stream, pumped and gravity.....         | 9, 430                  | ( <sup>2</sup> ) | 9, 430                 | .....     | 9, 525  | 9, 820                                       |
| Wells, pumped.....                      | 10, 114                 | 3, 111           | 7, 003                 | 225.1     | 16, 061   | 19, 840                                      |
| Wells, flowing.....                     | 4, 191                  | 5, 171           | -980                   | -19.0     | 4, 335  | 5, 934                                       |
| Wells, flowing and pumped.....          | 85                      | ( <sup>2</sup> ) | 85                     | .....     | 160   | 2, 045                                       |
| Lake, pumped.....                       | 871                     | 634              | 237                    | 37.4      | 1, 171  | 1, 249                                       |
| Lake, gravity.....                      | 2, 867                  | 422              | 2, 445                 | 579.4     | 3, 589  | 5, 247                                       |
| Springs.....                            | 10, 856                 | 8, 320           | 2, 536                 | 30.5      | 13, 677   | 18, 711                                      |
| Stored storm water.....                 | 16, 909                 | 16, 091          | 818                    | 5.1       | 33, 139   | 58, 298                                      |
| City water.....                         | 11                      | ( <sup>2</sup> ) | 11                     | .....     | 19  | 38   |
| Sewage.....                             | 195                     | ( <sup>2</sup> ) | 195                    | .....     | 255   | 460  |
| Stream, gravity, and pumped wells.....  | 16, 258                 | ( <sup>2</sup> ) | 16, 258                | .....     | 16, 564   | 17, 188                                      |
| Stream, gravity, and flowing wells..... | 67, 880                 | ( <sup>2</sup> ) | 67, 880                | .....     | 82, 520   | 179, 745                                     |
| Other mixed.....                        | 165, 825                | ( <sup>2</sup> ) | 165, 825               | .....     | 187, 157  | 413, 973                                     |
| Other and not reported.                 | 1, 359                  | ( <sup>2</sup> ) | 1, 359                 | .....     | 1, 883  | 2, 038                                       |

<sup>1</sup> A minus sign (-) denotes decrease.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

The original irrigation district law in Colorado was enacted in 1901, and it has been amended from time to time since that date. Generally, irrigation dis-

tricts have been organized to take over works already built, but in Colorado this form of organization has been utilized to a considerable extent for building new works. In some instances they have taken over cooperative or commercial enterprises, but the larger part of the acreage credited to districts in Table 5 represents enterprises originally undertaken by districts.

In addition to supplying water to lands in its own projects, as shown in Table 5, the United States Reclamation Service works delivered water to about 8,500 acres in other enterprises under the terms of the Warren Act (act of Congress, Feb. 21, 1911).

The state of Colorado accepted the conditions of the Federal Carey Act (act of Congress, Aug. 18, 1894) in 1895, and has amended this law from time to time, but very little has been accomplished under this law.

Colorado undertook the construction of irrigation works by the use of convict labor, but this policy was abandoned and the works that were begun were turned over to other agencies.

The small area credited to the state in Table 5 belongs to a state institution and does not represent a scheme of state construction.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                 | CENSUS OF—           |                  | INCREASE. <sup>1</sup> |           |
|---|----------------------|------------------|------------------------|-----------|
|   | 1920                 | 1910             | Acres.                 | Per cent. |
| ACREAGE IRRIGATED.                              |                      |                  |                        |           |
| Total.....                                      | 3,348,385            | 2,792,032        | 556,353                | 19.9      |
| Individual and partnership.....                 | 1,014,412            | 1,226,025        | -211,613               | -17.3     |
| Cooperative.....                                | 1,789,385            | 1,273,141        | 516,244                | 40.5      |
| Irrigation district.....                        | 248,409              | 115,304          | 133,105                | 115.4     |
| Carey Act.....                                  | 2,430                | 485              | 1,945                  | 401.0     |
| Commercial.....                                 | 212,138              | 159,457          | 52,681                 | 33.0      |
| U. S. Reclamation Service.....                  | <sup>2</sup> 71,145  | 16,600           | 54,545                 | 328.6     |
| U. S. Indian Service.....                       | 4,286                | 1,020            | 3,266                  | 318.2     |
| State.....                                      | 80                   | ( <sup>3</sup> ) | 80                     | .....     |
| City.....                                       | 5,825                | ( <sup>3</sup> ) | 5,825                  | .....     |
| Not reported.....                               | 295                  | ( <sup>3</sup> ) | 295                    | .....     |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |                      |                  |                        |           |
| Total.....                                      | 3,855,348            | 3,990,166        | -134,818               | -3.4      |
| Individual and partnership.....                 | 1,194,422            | 1,581,941        | -387,519               | -24.5     |
| Cooperative.....                                | 1,993,361            | 1,870,447        | 122,914                | 6.6       |
| Irrigation district.....                        | 269,504              | 207,570          | 61,934                 | 29.8      |
| Carey Act.....                                  | 15,000               | 6,085            | 8,915                  | 146.5     |
| Commercial.....                                 | 229,641              | 292,103          | -62,462                | -22.4     |
| U. S. Reclamation Service.....                  | <sup>2</sup> 135,265 | 30,000           | 105,265                | 350.9     |
| U. S. Indian Service.....                       | 14,000               | 2,020            | 12,880                 | 637.6     |
| State.....                                      | 80                   | ( <sup>3</sup> ) | 80                     | .....     |
| City.....                                       | 5,825                | ( <sup>3</sup> ) | 5,825                  | .....     |
| Not reported.....                               | 350                  | ( <sup>3</sup> ) | 350                    | .....     |
| ACREAGE INCLUDED IN ENTERPRISES.                |                      |                  |                        |           |
| Total.....                                      | 5,220,588            | 5,917,457        | -696,869               | -11.8     |
| Individual and partnership.....                 | 1,730,635            | 2,039,533        | -308,898               | -15.1     |
| Cooperative.....                                | 2,419,267            | 2,436,367        | -17,100                | -0.7      |
| Irrigation district.....                        | 504,073              | 487,370          | 17,003                 | 3.6       |
| Carey Act.....                                  | 34,000               | 59,480           | -25,480                | -42.8     |
| Commercial.....                                 | 358,243              | 681,687          | -323,444               | -47.4     |
| U. S. Reclamation Service.....                  | <sup>2</sup> 150,515 | 193,000          | -42,485                | -22.0     |
| U. S. Indian Service.....                       | 16,100               | 20,020           | -3,920                 | -19.6     |
| State.....                                      | 80                   | ( <sup>3</sup> ) | 80                     | .....     |
| City.....                                       | 6,425                | ( <sup>3</sup> ) | 6,425                  | .....     |
| Not reported.....                               | 350                  | ( <sup>3</sup> ) | 350                    | .....     |

<sup>1</sup> A minus sign (-) denotes decrease.<sup>2</sup> Does not include about 8,500 acres to which water is supplied under the Warren Act.<sup>3</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Colorado relating to water rights are summarized in the following paragraphs:

The territory of Colorado was organized in 1861, and the first territorial legislature enacted a law declaring the right of persons holding land on the banks or margins or in the neighborhood of streams to use the water for purposes of irrigation, and providing for securing the right of way for ditches to lands not bordering the streams. The supreme court of the state has held that this is not a recognition of riparian rights, but rather of the right to take water away from the streams. (*Crippen v. White*, 28 Colo., p. 298.)

During the territorial period the legislature enacted many laws chartering ditch companies, and granting them the right to construct ditches and collect charges for supplying water, but it enacted no further general legislation.

The state of Colorado was admitted to the Union in 1876. The constitution of the state, adopted March 14, 1876, declared that "The water of every natural stream not heretofore appropriated within the state of Colorado is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as hereinafter provided," and "The right to divert unappropriated waters of any natural stream for beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purpose."

In 1881 a law was enacted requiring parties building irrigation works to file in the county offices maps and statements describing their works and the intended use of water. This act was declared unconstitutional in 1899 (*Lamar Canal Co. v. Amity Canal Co.*, 26 Colo., p. 370), but during the 18 years from its passage to 1899 many filings were made in the county offices throughout the state.

A law requiring the filing of maps and plans in the office of the state engineer was enacted in 1903, and this law, with various amendments, is still in force. This filing is not an application for permission to appropriate water, no such permits being required in Colorado.

Colorado was the pioneer state in providing a special procedure in the courts for defining rights to water. A law enacted in 1879 divided the state into districts, gave the district courts exclusive jurisdiction of water-right adjudications, and provided that on or before July 5, 1879, the district judges should appoint referees who were to bring actions to define all rights to water and formulate decrees. This law was superseded in 1881 by a law requiring all claimants to file statements of their claims with the clerks of the appropriate district courts on or before June 1, 1881, and providing that at any time after that date any one or more parties claiming water from any stream might petition the court having jurisdiction of the stream for an adjudication of all rights to water from that stream. This law, with provision for the defining of rights acquired after an adjudication, is still in force.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                       | 1919      |                    | 1909               |
|------------------------------|-----------|--------------------|--------------------|
|                              | Acres.    | Per cent of total. | Per cent of total. |
| Total.....                   | 3,348,385 | 100.0              | 100.0              |
| Appropriation and use.....   | 114,616   | 3.4                | 9.3                |
| Notice filed and posted..... | 209,262   | 6.2                | 5.1                |
| Adjudicated by court.....    | 2,918,383 | 87.2               | 84.4               |
| Underground.....             | 14,558    | 0.4                | (1)                |
| Other and mixed.....         | 12,275    | 0.4                | (1)                |
| Not reported.....            | 79,291    | 2.4                | (1)                |

<sup>1</sup> This class was not included in the tabulation in 1909. All land for which the class of rights was not reported was included in "Appropriation and use."

## ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.                              | AREA IRRIGATED (ACRES). |           |                                     | Area included in enter-prises, 1920 (acres). | Area enter-prises were capable of irrigating in 1920 (acres). |
|--|-------------------------|-----------|-------------------------------------|--|---|
|  | 1919                    | 1902      | Per cent of in-crease. <sup>1</sup> |  |   |
| Total.....                                   | 3,348,385               | 1,754,761 | 90.8                                | 5,220,588                                    | 3,855,348   |
| South Platte River and tributaries.....      | 1,179,880               | 661,981   | 78.2                                | 1,607,384                                    | 1,280,347   |
| South Platte River direct.....               | 345,130                 | 218,527   | 57.9                                | 500,912                                      | 379,720   |
| Bear Creek.....                              | 8,778                   | 11,174    | -21.4                               | 12,093                                       | 10,373  |
| Clear Creek.....                             | 79,172                  | 76,259    | 3.8                                 | 84,450                                       | 79,940  |
| St. Vrain Creek.....                         | 244,831                 | 95,583    | 153.5                               | 281,467                                      | 205,731   |
| Big Thompson Creek.....                      | 96,678                  | 68,806    | 40.5                                | 105,673                                      | 98,711  |
| Big Beaver Creek.....                        | 6,429                   | 17,100    | -62.4                               | 11,825                                       | 10,699  |
| Cache la Poudre River.....                   | 263,708                 | 145,203   | 81.6                                | 287,963                                      | 278,613   |
| Lone Tree Creek.....                         | 2,968                   | (2)       | .....                               | 122,466                                      | 5,362   |
| Crow Creek.....                              | 1,945                   | (2)       | .....                               | 7,450  | 2,250   |
| Other tributaries of South Platte River..... | 130,241                 | * 28,329  | 350.7                               | 193,085                                      | 148,948   |
| Republican River and tributaries.....        | 8,441                   | 5,097     | 65.6                                | 15,507                                       | 10,407  |
| Smoky Hill River and tributaries.....        | 30                      | (2)       | .....                               | 30   | 30  |
| Arkansas River and tributaries.....          | 641,476                 | 300,115   | 113.7                               | 938,533                                      | 709,068   |
| Arkansas River direct.....                   | 421,051                 | 212,341   | 98.3                                | 490,580                                      | 438,378   |
| South Fork.....                              | 10,401                  | 5,422     | 91.8                                | 12,374                                       | 10,430  |
| Fountain River.....                          | 20,465                  | 13,870    | 47.5                                | 39,224                                       | 24,964  |
| St. Charles River.....                       | 11,855                  | 3,432     | 245.4                               | 22,310                                       | 13,791  |
| Huerfano River.....                          | 55,528                  | 14,078    | 294.4                               | 103,554                                      | 64,474  |
| Apishapa River.....                          | 8,292                   | 4,089     | 102.8                               | 65,615                                       | 11,430  |
| Purgatoire or Las Animas River.....          | 43,533                  | 19,702    | 121.0                               | 51,172                                       | 47,402  |
| Other tributaries of Arkansas River.....     | 70,351                  | * 27,181  | 158.8                               | 153,704                                      | 98,199  |
| Rio Grande and tributaries.....              | 608,924                 | 303,985   | 100.3                               | 1,063,656                                    | 746,610   |
| Rio Grande direct.....                       | 326,688                 | 187,837   | 73.9                                | 508,127                                      | 420,140   |
| Saguache River.....                          | 38,032                  | 11,730    | 224.2                               | 41,447                                       | 39,363  |
| San Luis River.....                          | 51,329                  | 3,679     | .....                               | 175,871                                      | 68,309  |
| Alamosa River.....                           | 35,601                  | 15,753    | 126.0                               | 72,528                                       | 40,551  |
| La Jara River.....                           | 10,627                  | (2)       | .....                               | 15,424                                       | 12,005  |
| Conejos River.....                           | 88,676                  | 44,035    | 101.4                               | 115,887                                      | 95,680  |
| Trinchera River.....                         | 12,435                  | 3,768     | 231.3                               | 59,699                                       | 19,319  |
| Other tributaries of Rio Grande.....         | 45,486                  | * 37,183  | 22.3                                | 74,673                                       | 51,243  |
| San Juan River and tributaries.....          | 87,228                  | 34,757    | 151.0                               | 152,934                                      | 103,675   |
| San Juan River direct.....                   | 1,451                   | 1,947     | -25.5                               | 2,989  | 1,634   |
| Los Pinos River.....                         | 28,762                  | 6,130     | 369.2                               | 52,946                                       | 40,773  |
| Animas River.....                            | 17,819                  | 6,889     | 158.7                               | 38,043                                       | 19,519  |
| La Plata River.....                          | 17,174                  | 6,972     | 146.3                               | 20,473                                       | 17,935  |
| Manitou River.....                           | 9,040                   | 5,115     | 76.7                                | 18,149                                       | 9,494   |
| Other tributaries of San Juan River.....     | 12,982                  | * 7,704   | 68.5                                | 20,334                                       | 14,320  |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.

\* Included in "other tributaries" in 1902.

\* Includes springs and wells.

# IRRIGATION—COLORADO.

7

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902—Continued.

| DRAINAGE BASIN.                              | AREA IRRIGATED (ACRES). |         |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|--|-------------------------|---------|------------------------------------|---|--|
|  | 1919                    | 1902    | Per cent of increase. <sup>1</sup> |   |  |
| Grand River and tributaries..                | 585,301                 | 300,631 | 94.7                               | 1,041,637                                   | 733,805  |
| Grand River direct.....                      | 71,958                  | 37,878  | 96.0                               | 125,422                                     | 101,249  |
| Fraser River.....                            | 9,331                   | 2,070   | 218.7                              | 27,010                                      | 10,795   |
| Muddy Creek.....                             | 5,050                   | 4,105   | 23.0                               | 7,255                                       | 5,075  |
| Blue River.....                              | 10,541                  | 2,704   | 277.3                              | 16,297                                      | 11,771   |
| Eagle River.....                             | 15,118                  | 10,805  | 39.1                               | 28,435                                      | 15,580   |
| Roaring Fork.....                            | 30,738                  | 21,050  | 46.0                               | 47,305                                      | 31,104   |
| Plateau Creek.....                           | 26,200                  | 13,380  | 96.3                               | 40,757                                      | 25,616   |
| Gunnison River and tributaries.....          | 250,913                 | 150,254 | 67.0                               | 409,934                                     | 320,756  |
| Gunnison River direct.....                   | 10,813                  | 9,000   | 86.8                               | 21,049                                      | 19,909   |
| Taylor River.....                            | 590                     | 12,018  | -95.3                              | 620   | 620  |
| Tomichi Creek.....                           | 21,752                  | 10,152  | 114.3                              | 30,298                                      | 23,068   |
| North Fork River.....                        | 31,000                  | 17,174  | 80.5                               | 57,180                                      | 33,801   |
| Smith Fork River.....                        | 15,314                  | 5,954   | 157.2                              | 31,340                                      | 25,000   |
| Uncompahgre River.....                       | 86,119                  | 50,300  | 52.7                               | 130,756                                     | 137,756  |
| Other tributaries of Gunnison River.....     | 70,340                  | 39,557  | 100.6                              | 120,082                                     | 88,012   |
| Rio Dolores.....                             | 74,916                  | 21,560  | 247.5                              | 180,011                                     | 84,973   |
| Other tributaries of Grand River.....        | 90,476                  | 30,069  | 150.8                              | 158,611                                     | 114,880  |
| Green River and tributaries.....             | 94,003                  | 82,451  | 14.0                               | 165,279                                     | 115,921  |
| Yampa River and tributaries.....             | 68,198                  | 59,059  | 15.5                               | 124,598                                     | 86,503   |
| Yampa River direct.....                      | 18,020                  | (*)     | .....                              | 28,221                                      | 18,832   |
| Little Snake River.....                      | 0,017                   | (*)     | .....                              | 16,242                                      | 12,449   |
| Other tributaries of Yampa River.....        | 40,552                  | (*)     | .....                              | 80,135                                      | 55,222   |
| White River.....                             | 25,025                  | 22,752  | 12.6                               | 40,441                                      | 20,238   |
| Other tributaries of Green River.....        | 180                     | 2,640   | -71.9                              | 240   | 180  |
| North Platte River and tributaries.....      | 143,102                 | 65,744  | 117.7                              | 235,028                                     | 155,485  |
| North Platte River direct.....               | 2,520                   | (*)     | .....                              | 23,520                                      | 2,520  |
| Laramie River.....                           | 6,160                   | (*)     | .....                              | 6,425                                       | 6,160  |
| Other tributaries of North Platte River..... | 134,422                 | (*)     | .....                              | 205,083                                     | 146,805  |

<sup>1</sup> A minus sign (—) denotes decrease.  
<sup>2</sup> Includes springs and wells.  
<sup>3</sup> Included in "other tributaries" in 1902.

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                       |
|--------------|--------------|-----------------------|-------------------|-----------------------|
|              |              |                       | Amount.           | Per cent of increase. |
| 1920.....    | \$88,302,442 | 55.9                  | \$22.90           | 61.4                  |
| 1910.....    | 56,036,443   | 381.7                 | 14.19             | 94.4                  |
| 1900.....    | 11,758,703   | 84.6                  | 7.30              | 2.1                   |
| 1890.....    | 6,368,755    | .....                 | 7.15              | .....                 |

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$88,302,442 | 100.0              | \$22.90           |
| Before 1890.....   | 265,660      | 0.3                | 6.91              |
| 1890-1899.....     | 14,410,037   | 16.3               | 21.80             |
| 1870-1879.....     | 8,150,179    | 9.2                | 11.48             |
| 1880-1889.....     | 17,150,419   | 19.4               | 13.03             |
| 1890-1899.....     | 7,043,688    | 8.0                | 20.43             |
| 1900-1904.....     | 14,101,894   | 16.0               | 56.90             |
| 1905-1909.....     | 14,192,932   | 16.1               | 49.01             |
| 1910-1914.....     | 11,476,877   | 13.0               | 95.08             |
| 1915-1919.....     | 550,890      | 0.6                | 17.99             |
| Not reported.....  | 956,866      | 1.1                | 16.76             |

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.  
 [When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1919. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$88,302,442            | 100.0              | \$22.90           | 3,030,771                                | \$6.87                              |
| Stream, gravity.....                    | 68,852,489              | 78.0               | 19.87             | 2,729,530                                | 0.82                                |
| Stream, pumped.....                     | 2,490,900               | 2.8                | 122.97            | 11,617                                   | 9.49                                |
| Stream, pumped and gravity.....         | 307,392                 | 0.4                | 41.72             | 9,430                                    | 2.34                                |
| Wells, pumped.....                      | 375,277                 | 0.4                | 23.37             | 9,350                                    | 4.54                                |
| Wells, flowing.....                     | 55,251                  | 0.1                | 12.75             | 3,847                                    | 0.52                                |
| Wells, flowing and pumped.....          | 5,300                   | (*)                | 33.12             | 85                                       | 4.78                                |
| Lake, pumped.....                       | 27,530                  | (*)                | 23.51             | 801                                      | 3.21                                |
| Lake, gravity.....                      | 84,935                  | 0.1                | 23.67             | 1,751                                    | 1.14                                |
| Springs.....                            | 188,020                 | 0.2                | 13.81             | 7,095                                    | 1.20                                |
| Stored storm water.....                 | 1,467,459               | 1.7                | 44.28             | 14,948                                   | 1.25                                |
| City water.....                         | 97                      | (*)                | 5.11              | 11                                       | 1.82                                |
| Sewage.....                             | 1,048                   | (*)                | 6.46              | 95                                       | 0.71                                |
| Stream, gravity, and pumped wells.....  | 190,454                 | 0.2                | 11.50             | 15,913                                   | 0.75                                |
| Stream, gravity, and flowing wells..... | 1,033,076               | 1.2                | 12.52             | 67,880                                   | 0.50                                |
| Other mixed.....                        | 13,084,350              | 14.8               | 69.91             | 156,097                                  | 1.07                                |
| Other and not reported.....             | 47,355                  | 0.1                | 25.15             | 1,121                                    | 1.69                                |

<sup>1</sup> Based on area irrigated in 1919.  
<sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                              | 1920         | 1902         | INCREASE. <sup>1</sup> |           |
|--|--------------|--------------|------------------------|-----------|
|  |              |              | Amount.                | Per cent. |
| Total.....                                   | \$88,302,442 | \$14,700,561 | \$73,532,881           | 497.9     |
| South Platte River and tributaries.....      | 36,019,471   | 4,786,288    | 31,233,183             | 652.6     |
| South Platte River direct.....               | 9,111,900    | 2,003,610    | 7,108,290              | 354.8     |
| Bear Creek.....                              | 137,240      | 76,635       | 60,605                 | 79.1      |
| Clear Creek.....                             | 862,209      | 404,775      | 457,434                | 113.0     |
| St. Vrain Creek.....                         | 9,298,122    | 398,650      | 8,899,472              | .....     |
| Big Thompson Creek.....                      | 1,102,316    | 600,166      | 502,150                | 83.7      |
| Big Beaver Creek.....                        | 52,600       | 98,000       | -45,400                | -46.3     |
| Cache la Poudre River.....                   | 7,907,593    | 1,065,357    | 6,842,236              | 642.2     |
| Lone Tree Creek.....                         | 2,731,100    | (*)          | 2,731,100              | .....     |
| Crow Creek.....                              | 51,700       | (*)          | 51,700                 | .....     |
| Other tributaries of South Platte River..... | 4,764,691    | 139,095      | 4,625,596              | .....     |
| Republican River and tributaries.....        | 89,463       | 63,782       | 25,681                 | 40.3      |
| Smoky Hill River and tributaries.....        | 1,200        | (*)          | 1,200                  | .....     |
| Arkansas River and tributaries.....          | 19,710,289   | 3,626,670    | 16,083,619             | 443.5     |
| Arkansas River direct.....                   | 10,980,245   | 2,951,550    | 8,037,695              | 272.3     |
| South Fork.....                              | 89,000       | 24,785       | 64,215                 | 178.4     |
| Fountain River.....                          | 965,287      | 106,240      | 859,047                | 808.6     |
| St. Charles River.....                       | 241,884      | 22,060       | 219,824                | 966.5     |
| Huerfano River.....                          | 3,204,519    | 72,690       | 3,131,829              | .....     |
| Apishapa River.....                          | 1,190,695    | 4,970        | 1,185,725              | .....     |
| Purgatoire or Las Animas River.....          | 491,450      | 151,413      | 340,037                | 224.6     |
| Other tributaries of Arkansas River.....     | 2,558,209    | 292,962      | 2,265,247              | 778.2     |
| Rio Grande and tributaries.....              | 4,825,680    | 1,079,939    | 3,745,741              | 143.7     |
| Rio Grande direct.....                       | 1,526,753    | 1,717,395    | -190,642               | -11.1     |
| Saguache River.....                          | 103,048      | 16,165       | 86,883                 | 537.5     |
| San Luis River.....                          | 184,812      | 4,220        | 180,592                | .....     |
| Alamosa River.....                           | 556,909      | 27,080       | 529,829                | .....     |
| La Jara River.....                           | 30,275       | .....        | 30,275                 | .....     |
| Conejos River.....                           | 564,739      | 68,242       | 496,497                | 727.6     |
| Trinchera River.....                         | 659,890      | 23,650       | 636,240                | .....     |
| Other tributaries of Rio Grande.....         | 1,199,734    | 123,187      | 1,076,547              | 873.9     |
| San Juan River and tributaries.....          | 1,166,170    | 238,990      | 927,180                | 388.0     |
| San Juan River direct.....                   | 25,200       | 14,925       | 10,275                 | 68.8      |
| Los Pinos River.....                         | 521,590      | 80,030       | 441,560                | 551.7     |
| Animas River.....                            | 323,638      | 55,770       | 267,868                | 480.3     |
| La Plata River.....                          | 94,613       | 38,185       | 56,428                 | 147.8     |
| Mancos River.....                            | 35,477       | 14,910       | 20,567                 | 137.9     |
| Other tributaries of San Juan River.....     | 165,652      | 85,170       | 80,482                 | 371.0     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Included in "other tributaries" in 1902.  
<sup>3</sup> Includes springs and wells.  
<sup>4</sup> None reported in 1902.



TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN:  
1920 AND 1902—Continued.

| DRAINAGE BASIN.                              | 1920         | 1902             | INCREASE. <sup>1</sup> |           |
|--|--------------|------------------|------------------------|-----------|
|  |              |                  | Amount.                | Per cent. |
| Grand River and tributaries.....             | \$24,281,722 | \$3,547,697      | \$20,734,025           | 584.4     |
| Grand River direct.....                      | 5,923,462    | 477,950          | 5,445,512              | 967.0     |
| Fraser River.....                            | 55,860       | 5,235            | 50,625                 | 282.9     |
| Muddy Creek.....                             | 33,122       | 8,650            | 24,472                 | 445.9     |
| Blue River.....                              | 116,608      | 21,359           | 95,249                 | 44.3      |
| Eagle River.....                             | 109,012      | 75,570           | 33,442                 | 149.6     |
| Roaring Fork.....                            | 407,296      | 163,170          | 244,096                | 469.3     |
| Plateau Creek.....                           | 341,755      | 60,035           | 281,720                | 694.9     |
| Gunnison River and tributaries.....          | 10,745,767   | 1,351,906        | 9,393,861              | 946.439   |
| Gunnison River direct.....                   | 1,001,819    | 55,380           | 946,439                | —89.4     |
| Taylor River.....                            | 6,900        | 64,985           | —58,085                | 355.9     |
| Tomichi Creek.....                           | 129,243      | 28,350           | 100,893                | 128.3     |
| North Fork River.....                        | 622,647      | 272,705          | 349,942                | 374.471   |
| Smith Fork River.....                        | 396,075      | 21,600           | 374,475                | 980.0     |
| Uncompahgre River.....                       | 6,945,702    | 643,121          | 6,302,581              | 265.765   |
| Other tributaries of Gunnison River.....     | 1,643,381    | 265,765          | 1,377,616              | 319.1     |
| Rio Dolores.....                             | 4,847,569    | 1,156,793        | 3,690,776              | 649.4     |
| Other tributaries of Grand River             | 1,701,301    | 227,029          | 1,474,272              | 288.6     |
| Green River and tributaries.....             | 1,372,889    | 382,895          | 989,994                | 277.3     |
| Yampa River and tributaries...               | 923,673      | 244,785          | 678,888                | 277.3     |
| Yampa River direct.....                      | 162,768      | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |
| Little Snake River.....                      | 237,254      | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |
| Other tributaries of Yampa River.....        | 523,651      | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |
| White River.....                             | 447,141      | 137,005          | 310,136                | 226.4     |
| Other tributaries of Green River             | 2,075        | 21,105           | 970                    | 87.8      |
| North Platte River and tributaries           | 835,578      | 143,300          | 692,278                | 483.1     |
| North Platte River direct.....               | 41,200       | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |
| Laramie River.....                           | 51,800       | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |
| Other tributaries of North Platte River..... | 742,578      | ( <sup>2</sup> ) | ( <sup>2</sup> )       | .....     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.<sup>2</sup> Includes springs and wells.<sup>3</sup> Main stream and tributaries shown as one item in 1902; consequently only increase for group as a whole can be shown.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$88,302,442            | 100.0              | 3,030,771                                | \$0.87                              |
| Individual and partnership..... | 11,599,883              | 13.1               | 854,213                                  | 0.70                                |
| Cooperative.....                | 42,911,035              | 48.6               | 1,634,568                                | 0.75                                |
| Irrigation district.....        | 16,269,026              | 18.4               | 248,409                                  | 1.50                                |
| Carey Act.....                  | 1,205,988               | 1.4                | 2,430                                    | 2.88                                |
| Commercial.....                 | 5,711,887               | 6.5                | 212,135                                  | 1.11                                |
| U. S. Reclamation Service.....  | 10,253,231              | 11.6               | 71,145                                   | 2.59                                |
| U. S. Indian Service.....       | 220,979                 | 0.3                | 3,766                                    | 0.67                                |
| State.....                      | 3,994                   | ( <sup>2</sup> )   | 80                                       | 7.50                                |
| City.....                       | 117,665                 | 0.1                | 4,025                                    | 3.17                                |
| Not reported.....               | 8,754                   | ( <sup>2</sup> )   | .....                                    | .....                               |

<sup>1</sup> Based on area irrigated in 1919.<sup>2</sup> Less than one-tenth of 1 per cent.

In classifying capital invested by type of enterprise the average capital invested per acre is not presented,

for the reason that it is not possible to compute this correctly. The United States Reclamation Service supplies water to enterprises controlled by agencies of other classes shown in the table and a part of its expenditure is properly chargeable to those lands; but the area so served varies from time to time, and consequently it is not possible to tell how much should be charged to such lands or how it should be distributed among the various classes.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |           |
|--|-----------|
| Number of enterprises reporting land drained or needing drainage.....  | 420       |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 1,520,311 |
| Acreage for which drains have been installed.....  | 113,899   |
| Additional acreage needing drainage.....   | 220,711   |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 7.5       |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 2.2       |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 6.4       |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.     | Measured. | Not measured. |
|---|------------|-----------|---------------|
| Average volume of water entering canals, second-feet..... | 37,146     | 14,558    | 22,588        |
| Area irrigated in 1919..... acres..                       | 2,174,612  | 1,373,031 | 801,581       |
| Average number of acres per second-foot.....              | 59         | 94        | 35            |
| Total quantity of water entering canals, acre-feet.....   | 13,877,292 | 4,848,103 | 9,029,189     |
| Area irrigated in 1919..... acres..                       | 2,446,702  | 1,752,587 | 694,115       |
| Average quantity per acre..... acre-feet..                | 5.7        | 2.8       | 13.0          |
| Total quantity of water delivered..... acre-feet..        | 3,233,531  | 1,832,530 | 1,401,001     |
| Area irrigated in 1919..... acres..                       | 1,504,593  | 1,089,659 | 414,934       |
| Average quantity per acre..... acre-feet..                | 2.1        | 1.7       | 3.4           |

# IRRIGATION—COLORADO.

9

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....         | 3,647                     | 803                     | 8,867         | 119,558                 | 19,022          | 6,185            | 8,571           | 979         | 2,406,372             |
| Before 1860.....   | 35                        | 2                       | 47            | 1,275                   | 137             | 55               | 53              | 1           | 938                   |
| 1860-1869.....     | 562                       | 61                      | 704           | 15,006                  | 2,233           | 914              | 1,509           | 60          | 217,180               |
| 1870-1879.....     | 769                       | 84                      | 1,614         | 17,963                  | 3,232           | 710              | 1,340           | 109         | 252,248               |
| 1880-1889.....     | 1,635                     | 179                     | 2,593         | 35,600                  | 5,472           | 1,920            | 2,509           | 196         | 462,018               |
| 1890-1899.....     | 380                       | 147                     | 1,204         | 12,981                  | 2,511           | 859              | 643             | 187         | 153,435               |
| 1900-1904.....     | 226                       | 68                      | 740           | 12,389                  | 1,599           | 521              | 713             | 98          | 304,827               |
| 1905-1909.....     | 294                       | 112                     | 631           | 13,065                  | 1,799           | 379              | 962             | 142         | 868,305               |
| 1910-1914.....     | 183                       | 79                      | 557           | 5,101                   | 1,007           | 421              | 423             | 109         | 107,673               |
| 1915-1919.....     | 78                        | 39                      | 350           | 4,602                   | 325             | 184              | 60              | 41          | 27,570                |
| Not reported.....  | 85                        | 32                      | 427           | 1,516                   | 707             | 222              | 359             | 36          | 12,178                |

| DATE OF BEGINNING. | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|--------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                    |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                    |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....         | 217.3                       | 476            | 20,139                         | 527           | 210,094                        | 406             | 8,635                          | 435     | 299,726                        |
| Before 1860.....   | 0.5                         | -----          | -----                          | 1             | 700                            | 1               | 10                             | 1       | 700                            |
| 1860-1869.....     | 30.5                        | -----          | -----                          | 4             | 2,100                          | 5               | 68                             | 5       | 3,100                          |
| 1870-1879.....     | 3.1                         | 22             | 590                            | 1             | -----                          | 4               | 77                             | 4       | 2,711                          |
| 1880-1889.....     | 16.1                        | 306            | 12,100                         | 15            | 9,838                          | 18              | 240                            | 22      | 14,807                         |
| 1890-1899.....     | 7.8                         | 36             | 859                            | 19            | 10,200                         | 18              | 361                            | 18      | 16,131                         |
| 1900-1904.....     | 19.7                        | 35             | 1,895                          | 28            | 11,575                         | 29              | 310                            | 36      | 20,805                         |
| 1905-1909.....     | 106.9                       | 20             | 320                            | 37            | 35,549                         | 42              | 3,583                          | 55      | 46,024                         |
| 1910-1914.....     | 24.9                        | 29             | 3,104                          | 132           | 48,714                         | 115             | 1,639                          | 115     | 79,954                         |
| 1915-1919.....     | 5.8                         | 17             | 782                            | 268           | 84,250                         | 155             | 2,116                          | 160     | 106,544                        |
| Not reported.....  | 3.0                         | 11             | 480                            | 22            | 7,162                          | 10              | 231                            | 19      | 8,950                          |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-foot). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 3,647                     | 803                     | 8,867         | 119,558                 | 19,022          | 6,185            | 8,571           | 979         | 2,406,372             |
| Individual and partnership..... | 3,153                     | 479                     | 8,155         | 54,191                  | 12,195          | 3,438            | 2,441           | 644         | 567,316               |
| Cooperative.....                | 429                       | 290                     | 594           | 48,985                  | 5,324           | 1,691            | 2,144           | 293         | 951,984               |
| Irrigation district.....        | 23                        | 18                      | 48            | 5,078                   | 681             | 266              | 354             | 25          | 277,101               |
| Carey Act.....                  | 2                         | 2                       | 4             | 520                     | 42              | 5                | 23              | 3           | 57,000                |
| Commercial.....                 | 17                        | 13                      | 38            | 6,816                   | 468             | 316              | 1,035           | 13          | 552,947               |
| U. S. Reclamation Service.....  | 16                        | .....                   | 11            | 2,898                   | 217             | 144              | 518             | .....       | .....                 |
| U. S. Indian Service.....       | 1                         | .....                   | 8             | 197                     | 45              | 13               | 53              | .....       | .....                 |
| State.....                      | .....                     | .....                   | .....         | .....                   | .....           | 10               | 2               | .....       | .....                 |
| City.....                       | 6                         | 1                       | 7             | 232                     | 48              | .....            | .....           | 1           | 24                    |
| Not reported.....               | .....                     | .....                   | 2             | 41                      | 2               | 2                | 1               | .....       | .....                 |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                                 |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....                      | 217.3                       | 476            | 20,139                         | 527           | 210,094                        | 406             | 8,635                          | 435     | 299,726                        |
| Individual and partnership..... | 66.5                        | 169            | 8,039                          | 506           | 198,344                        | 388             | 4,875                          | 403     | 264,431                        |
| Cooperative.....                | 36.2                        | 7              | 100                            | 8             | 4,500                          | 6               | 342                            | 7       | 13,300                         |
| Irrigation district.....        | 10.5                        | 300            | 12,000                         | .....         | .....                          | 4               | 2,525                          | 11      | 3,500                          |
| Carey Act.....                  | 41.2                        | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | 25                             |
| Commercial.....                 | 44.0                        | .....          | .....                          | .....         | .....                          | 1               | 600                            | 7       | .....                          |
| U. S. Reclamation Service.....  | 11.8                        | .....          | .....                          | .....         | .....                          | 1               | 125                            | 1       | 11,220                         |
| U. S. Indian Service.....       | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                          |
| State.....                      | .....                       | .....          | .....                          | 8             | 1,500                          | 1               | 25                             | 1       | 1,500                          |
| City.....                       | 7.1                         | .....          | .....                          | 5             | 5,750                          | 5               | 143                            | 5       | 5,750                          |
| Not reported.....               | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                          |



## IRRIGATION—COLORADO.

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                              | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|  |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                                   | 3,647                     | 803                     | 8,887         | 119,558                 | 19,022          | 6,185            | 8,571           | 979         | 2,406,372             |
| South Platte River and tributaries.....      | 831                       | 284                     | 1,327         | 36,837                  | 4,860           | 1,109            | 2,230           | 301         | 916,770               |
| South Platte River direct.....               | 103                       | 14                      | 201           | 12,674                  | 1,259           | 288              | 466             | 22          | 421,292               |
| Bear Creek.....                              | 29                        | 7                       | 37            | 359                     | 51              | 27               | 8               | 7           | 916                   |
| Clear Creek.....                             | 81                        | 5                       | 60            | 1,806                   | 177             | 65               | 94              | 12          | 6,767                 |
| St. Vrain Creek.....                         | 171                       | 83                      | 195           | 5,600                   | 1,649           | 219              | 356             | 69          | 123,395               |
| Big Thompson Creek.....                      | 33                        | 23                      | 42            | 2,810                   | 241             | 64               | 116             | 20          | 44,617                |
| Big Beaver Creek.....                        | 4                         | 1                       | 8             | 226                     | 27              | 1                | 1               | 3           | 103                   |
| Cache la Poudre River.....                   | 98                        | 89                      | 232           | 8,379                   | 563             | 313              | 1,016           | 91          | 237,538               |
| Lone Tree Creek.....                         | 1                         | 1                       | 5             | 7                       | 3               | 1                | 1               | 1           | 12                    |
| Crow Creek.....                              | 6                         | 9                       | 6             | 105                     | 8               | 5                | 9               | 9           | 4,200                 |
| Other tributaries of South Platte River..... | 306                       | 62                      | 541           | 4,871                   | 874             | 128              | 135             | 67          | 77,930                |
| Republican River and tributaries.....        | 25                        | 7                       | 33            | 672                     | 67              | 47               | 39              | 4           | 30                    |
| Smoky Hill River and tributaries.....        | 1                         | 1                       | 1             | 5                       | 1               | 1                | 1               | 1           | 5                     |
| Arkansas River and tributaries.....          | 919                       | 154                     | 2,022         | 28,647                  | 3,529           | 2,440            | 2,529           | 245         | 1,075,550             |
| Arkansas River direct.....                   | 58                        | 29                      | 198           | 10,418                  | 990             | 1,379            | 1,820           | 33          | 395,162               |
| South Fork.....                              | 30                        | 65                      | 65            | 348                     | 122             | 42               | 25              | 2           | 202                   |
| Poudre River.....                            | 6                         | 9                       | 113           | 1,046                   | 219             | 64               | 21              | 36          | 13,246                |
| St. Charles River.....                       | 87                        | 12                      | 114           | 757                     | 162             | 42               | 24              | 14          | 3,418                 |
| Huerfano River.....                          | 285                       | 22                      | 336           | 4,336                   | 581             | 506              | 350             | 40          | 111,627               |
| Apishapa River.....                          | 39                        | 15                      | 52            | 1,806                   | 103             | 21               | 32              | 15          | 54,821                |
| Purgatoire or Las Animas River.....          | 101                       | 9                       | 147           | 2,066                   | 356             | 38               | 30              | 18          | 403,099               |
| Other tributaries of Arkansas River.....     | 313                       | 58                      | 997           | 7,330                   | 996             | 348              | 227             | 89          | 94,207                |
| Rio Grande and tributaries.....              | 566                       | 23                      | 1,031         | 14,754                  | 1,971           | 556              | 1,166           | 33          | 265,170               |
| Rio Grande direct.....                       | 47                        | 8                       | 101           | 5,599                   | 387             | 141              | 608             | 9           | 53,678                |
| Saguache River.....                          | 152                       | 251                     | 251           | 752                     | 176             | 88               | 73              | 11          | 202                   |
| San Luis River.....                          | 40                        | 2                       | 252           | 1,670                   | 349             | 50               | 70              | 2           | 179                   |
| Alamosa River.....                           | 30                        | 2                       | 39            | 1,321                   | 142             | 32               | 56              | 2           | 31,750                |
| La Jara River.....                           | 30                        | 31                      | 31            | 390                     | 69              | 9                | 12              | 2           | 3,001                 |
| Conejos River.....                           | 103                       | 2                       | 105           | 3,188                   | 317             | 52               | 72              | 2           | 25,500                |
| Trinchera River.....                         | 27                        | 2                       | 25            | 159                     | 182             | 7                | 4               | 2           | 150,880               |
| Other tributaries of Rio Grande.....         | 137                       | 7                       | 227           | 1,675                   | 349             | 177              | 271             | 5           | 150,880               |
| San Juan River and tributaries.....          | 73                        | 6                       | 417           | 2,775                   | 894             | 259              | 148             | 13          | 3,430                 |
| San Juan River direct.....                   | 1                         | 1                       | 17            | 97                      | 32              | 18               | 2               | 2           | 105                   |
| Los Pinos River.....                         | 5                         | 63                      | 63            | 821                     | 192             | 24               | 69              | 4           | 15                    |
| Animas River.....                            | 81                        | 121                     | 121           | 771                     | 250             | 40               | 9               | 1           | 150                   |
| La Plata River.....                          | 19                        | 2                       | 55            | 426                     | 138             | 45               | 46              | 1           | 3,160                 |
| Manos River.....                             | 11                        | 38                      | 38            | 285                     | 87              | 11               | 12              | 5           | 150                   |
| Other tributaries of San Juan River.....     | 7                         | 3                       | 123           | 975                     | 195             | 121              | 10              | 5           | 3,160                 |
| Grand River and tributaries.....             | 821                       | 234                     | 2,834         | 24,928                  | 5,430           | 1,440            | 1,992           | 289         | 120,590               |
| Grand River direct.....                      | 9                         | 5                       | 69            | 2,541                   | 361             | 264              | 233             | 4           | 475                   |
| Fraser River.....                            | 14                        | 2                       | 61            | 352                     | 112             | 2                | 1               | 2           | 10                    |
| Muddy Creek.....                             | 49                        | 10                      | 50            | 254                     | 64              | 10               | 7               | 10          | 1,727                 |
| Blue River.....                              | 40                        | 3                       | 143           | 467                     | 172             | 34               | 7               | 7           | 39                    |
| Eagle River.....                             | 12                        | 4                       | 122           | 449                     | 202             | 10               | 10              | 8           | 106                   |
| Roaring Fork.....                            | 17                        | 4                       | 240           | 1,314                   | 413             | 163              | 58              | 13          | 804                   |
| Plateau Creek.....                           | 2                         | 41                      | 104           | 790                     | 213             | 127              | 81              | 45          | 15,972                |
| Gunnison River and tributaries.....          | 388                       | 118                     | 1,210         | 12,419                  | 2,257           | 388              | 601             | 140         | 47,521                |
| Gunnison River direct.....                   | 14                        | 1                       | 63            | 1,168                   | 151             | 35               | 19              | 1           | 120                   |
| Taylor River.....                            | 157                       | 1                       | 258           | 1,731                   | 279             | 7                | 5               | 1           | 11,134                |
| Tomichi Creek.....                           | 19                        | 17                      | 138           | 1,154                   | 306             | 87               | 76              | 26          | 1,265                 |
| North Fork River.....                        | 5                         | 4                       | 46            | 562                     | 119             | 21               | 38              | 9           | 220                   |
| Smith Fork River.....                        | 28                        | 4                       | 180           | 2,402                   | 446             | 151              | 359             | 5           | 34,782                |
| Uncompaghe River.....                        | 167                       | 88                      | 521           | 5,387                   | 950             | 87               | 104             | 98          | 42,888                |
| Other tributaries of Gunnison River.....     | 67                        | 19                      | 255           | 2,622                   | 622             | 143              | 417             | 21          | 10,948                |
| Rio Dolores.....                             | 203                       | 28                      | 580           | 3,720                   | 1,014           | 309              | 584             | 38          | 10,948                |
| Other tributaries of Grand River.....        | 203                       | 28                      | 580           | 3,720                   | 1,014           | 309              | 584             | 38          | 10,948                |
| Green River and tributaries.....             | 144                       | 73                      | 809           | 5,333                   | 1,428           | 302              | 413             | 83          | 9,563                 |
| Yampa River and tributaries.....             | 101                       | 57                      | 542           | 2,447                   | 1,018           | 188              | 370             | 64          | 7,860                 |
| Yampa River direct.....                      | 16                        | 4                       | 65            | 408                     | 142             | 19               | 12              | 4           | 1,569                 |
| Little Snake River.....                      | 2                         | 6                       | 77            | 584                     | 138             | 13               | 6               | 6           | 888                   |
| Other tributaries of Yampa River.....        | 83                        | 47                      | 400           | 1,365                   | 738             | 156              | 352             | 54          | 5,403                 |
| White River.....                             | 43                        | 16                      | 265           | 2,883                   | 408             | 114              | 43              | 19          | 1,703                 |
| Other tributaries of Green River.....        | 2                         | 2                       | 2             | 3                       | 2               | 2                | 2               | 2           | 2                     |
| North Platte River and tributaries.....      | 268                       | 11                      | 393           | 5,607                   | 842             | 32               | 54              | 10          | 15,234                |
| North Platte River direct.....               | 3                         | 2                       | 5             | 310                     | 16              | 11               | 11              | 2           | 2,700                 |
| Laramie River.....                           | 32                        | 1                       | 38            | 478                     | 63              | 11               | 11              | 1           | 75                    |
| Other tributaries of North Platte River..... | 233                       | 8                       | 350           | 4,819                   | 763             | 21               | 43              | 7           | 12,459                |

## IRRIGATION—COLORADO.

11

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920—Continued.

| DRAINAGE BASIN.                              | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |   | PUMPED WELLS. |   | PUMPING PLANTS. |  |         |                                      |                            |
|--|-----------------------------------|----------------|---|---------------|---|-----------------|--|---------|--------------------------------------|----------------------------|
|  |                                   | Number.        | Capacity<br>(gallons<br>per<br>minute). | Number.       | Capacity<br>(gallons<br>per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average<br>lift<br>(feet). |
|  |                                   |                |   |               |   | Number.         |  | Number. | Capacity<br>(gallons per<br>minute). |                            |
| Total.....                                   | 217.3                             | 476            | 20,139                                  | 527           | 210,094                                 | 406             | 8,635                                    | 435     | 299,726                              | 23                         |
| South Platte River and tributaries.....      | 46.8                              | 4              | 230                                     | 283           | 124,338                                 | 226             | 3,103                                    | 241     | 166,263                              | 22                         |
| South Platte River direct.....               | 9.7                               | 3              | 170                                     | 90            | 42,452                                  | 76              | 1,096                                    | 78      | 50,812                               | 22                         |
| Bear Creek.....                              | 1.0                               |                |   |               |   | 1               | 7  | 5       |                                      | 40                         |
| Clear Creek.....                             | 0.1                               |                |   |               |   |                 |  |         |                                      |                            |
| St. Vrain Creek.....                         | 12.7                              |                |   | 1             |   | 4               | 100                                      | 4       | 1,000                                | 22                         |
| Big Thompson Creek.....                      | 1.9                               |                |   | 1             | 1,200                                   | 6               | 106                                      | 6       | 5,831                                | 17                         |
| Big Beaver Creek.....                        |                                   |                |   | 7             | 15,250                                  | 4               | 65                                       | 6       | 15,250                               | 26                         |
| Cache la Poudre River.....                   | 17.5                              | 1              | 60                                      | 123           | 53,643                                  | 107             | 1,386                                    | 107     | 74,943                               | 21                         |
| Lone Tree Creek.....                         | 0.5                               |                |   | 20            | 6,938                                   | 13              | 172                                      | 20      | 10,160                               | 24                         |
| Other tributaries of South Platte River..... | 3.4                               |                |   | 41            | 4,825                                   | 15              | 171                                      | 15      | 8,237                                | 26                         |
| Smoky Hill River and tributaries.....        | 0.1                               |                |   |               |   |                 |  |         |                                      |                            |
| Arkansas River and tributaries.....          | 118.6                             | 18             | 3,140                                   | 243           | 85,756                                  | 144             | 1,936                                    | 150     | 105,287                              | 24                         |
| Arkansas River direct.....                   | 13.8                              | 2              | 315                                     | 167           | 66,235                                  | 98              | 1,564                                    | 104     | 83,636                               | 23                         |
| Fountain River.....                          | 11.7                              | 3              | 30                                      | 19            | 7,700                                   | 8               | 126                                      | 8       | 8,200                                | 21                         |
| St. Charles River.....                       | 0.4                               |                |   | 3             | 515                                     | 2               | 16                                       | 2       | 475                                  | 32                         |
| Huerfano River.....                          | 4.5                               |                |   | 11            | 2,070                                   | 6               | 36                                       | 6       | 2,045                                | 40                         |
| Apishapa River.....                          | 0.3                               |                |   | 1             | 144                                     | 1               | 20                                       | 1       | 144                                  | 14                         |
| Purgatoire or Las Animas River.....          | 0.1                               |                |   |               |   | 1               | 7  | 1       | 500                                  | 7                          |
| Other tributaries of Arkansas River.....     | 87.8                              | 13             | 2,795                                   | 42            | 9,092                                   | 28              | 167                                      | 28      | 10,087                               | 26                         |
| Rio Grande and tributaries.....              | 5.9                               | 449            | 16,669                                  | 1             |   | 1               |  | 1       |                                      |                            |
| Rio Grande direct.....                       |                                   | 329            | 13,595                                  |               |   |                 |  |         |                                      |                            |
| Saguache River.....                          |                                   | 83             | 2,672                                   | 1             |   | 1               |  | 1       |                                      |                            |
| San Luis River.....                          | 0.2                               | 22             | 175                                     |               |   |                 |  |         |                                      |                            |
| Alamosa River.....                           | 0.1                               | 8              | 207                                     |               |   |                 |  |         |                                      |                            |
| Conejos River.....                           | 0.1                               | 1              | 20                                      |               |   |                 |  |         |                                      |                            |
| Trinchera River.....                         | 4.0                               |                |   |               |   |                 |  |         |                                      |                            |
| Other tributaries of Rio Grande.....         | 1.5                               | 6              |   |               |   |                 |  |         |                                      |                            |
| San Juan River and tributaries.....          | 0.2                               | 4              | 100                                     |               |   | 2               | 22                                       | 2       | 1,200                                | 85                         |
| San Juan River direct.....                   | 0.1                               |                |   |               |   | 2               | 22                                       | 2       | 1,200                                | 85                         |
| Los Pinos River.....                         | 0.1                               |                |   |               |   |                 |  |         |                                      |                            |
| Animas River.....                            |                                   | 4              | 100                                     |               |   |                 |  |         |                                      |                            |
| Grand River and tributaries.....             | 45.3                              | 1              |   |               |   | 28              | 3,516                                    | 36      | 22,876                               | 32                         |
| Grand River direct.....                      | 11.9                              |                |   |               |   | 8               | 2,600                                    | 14      | 15,070                               | 42                         |
| Muddy Creek.....                             | 0.1                               |                |   |               |   |                 |  |         |                                      |                            |
| Blue River.....                              | 1.2                               |                |   |               |   |                 |  |         |                                      |                            |
| Eagle River.....                             | 5.2                               |                |   |               |   | 2               | 33                                       | 2       | 1,000                                | 58                         |
| Roaring Fork.....                            | 0.3                               |                |   |               |   |                 |  |         |                                      |                            |
| Plateau Creek.....                           | 0.1                               |                |   |               |   |                 |  |         |                                      |                            |
| Gunnison River and tributaries.....          | 18.1                              |                |   |               |   | 17              | 822                                      | 19      | 6,806                                | 22                         |
| Gunnison River direct.....                   | 1.0                               |                |   |               |   | 13              | 759                                      | 15      | 5,706                                | 20                         |
| Tomichi Creek.....                           | 0.4                               |                |   |               |   |                 |  |         |                                      |                            |
| North Fork River.....                        | 2.8                               |                |   |               |   | 1               | 8  | 1       | 300                                  | 14                         |
| Smith Fork River.....                        | 5.1                               |                |   |               |   |                 |  |         |                                      |                            |
| Uncompahgre River.....                       | 4.5                               |                |   |               |   | 1               | 40                                       | 1       |                                      | 53                         |
| Other tributaries of Gunnison River.....     | 4.3                               |                |   |               |   | 2               | 15                                       | 2       | 800                                  | 16                         |
| Rio Dolores.....                             | 1.2                               |                |   |               |   | 1               | 1  | 1       |                                      | 15                         |
| Other tributaries of Grand River.....        | 7.2                               | 1              |   |               |   |                 |  |         |                                      |                            |
| Green River and tributaries.....             | 0.4                               |                |   |               |   | 5               | 58                                       | 5       | 4,100                                | 14                         |
| Yampa River and tributaries.....             | 0.2                               |                |   |               |   | 4               | 48                                       | 4       | 3,200                                | 15                         |
| Yampa River direct.....                      |                                   |                |   |               |   | 4               | 48                                       | 4       | 3,200                                | 15                         |
| Other tributaries of Yampa River.....        | 0.2                               |                |   |               |   |                 |  |         |                                      |                            |
| White River.....                             | 0.2                               |                |   |               |   | 1               | 10                                       | 1       | 900                                  | 10                         |

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP.                                    | AREA HARVESTED. |                              |         |                              |                                    | QUANTITY HARVESTED. |           |                              |           |                                    |
|--|-----------------|------------------------------|---------|------------------------------|------------------------------------|---------------------|-----------|------------------------------|-----------|------------------------------------|
|  | 1919            |                              | 1909    |                              | Per cent of increase. <sup>1</sup> | Unit.               | 1919      |                              | 1909      | Per cent of increase. <sup>1</sup> |
|  | Acres.          | Per cent of total for state. | Acres.  | Per cent of total for state. |                                    |                     | Amount.   | Per cent of total for state. | Amount.   |                                    |
| <b>Cereals:</b>                          |                 |                              |         |                              |                                    |                     |           |                              |           |                                    |
| 1 Corn.....                              | 52,617          | 7.0                          | 25,705  | 7.9                          | 104.7                              | Bu.....             | 1,316,478 | 13.0                         | 567,151   | 11.6                               |
| 2 Oats.....                              | 97,618          | 56.0                         | 192,311 | 60.7                         | -49.2                              | Bu.....             | 3,037,305 | 67.0                         | 6,235,979 | 81.6                               |
| 3 Winter wheat.....                      | 112,648         | 10.9                         | 174,116 | 51.1                         | 44.0                               | Bu.....             | 2,577,277 | 18.8                         | 4,727,350 | 65.4                               |
| 4 Spring wheat.....                      | 139,214         | 46.9                         | 48,775  | 68.3                         | 10.2                               | Bu.....             | 2,994,897 | 65.3                         | 1,483,112 | 78.5                               |
| 5 Barley.....                            | 58,125          | 38.0                         | 898     | 5.7                          | 207.0                              | Bu.....             | 1,383,519 | 49.4                         | 14,135    | 7.1                                |
| 6 Rye.....                               | 2,757           | 2.1                          |         |                              |                                    | Bu.....             | 34,217    | 3.1                          |           |                                    |
| <b>Hay and forage:</b>                   |                 |                              |         |                              |                                    |                     |           |                              |           |                                    |
| 7 Timothy alone.....                     | 33,588          | 75.4                         | 45,029  | 87.4                         | -25.4                              | Tons...             | 46,568    | 75.3                         | 76,660    | 92.9                               |
| 8 Timothy and clover mixed.....          | 106,664         | 85.4                         | 24,049  | 53.4                         | 343.5                              | Tons...             | 188,616   | 87.7                         | 47,007    | 55.5                               |
| 9 Clover alone.....                      | 3,095           | 66.8                         | 405     | 28.6                         | 664.2                              | Tons...             | 4,893     | 67.9                         | 888       | 24.0                               |
| 10 Alfalfa.....                          | 659,812         | 34.4                         | 480,586 | 94.4                         | 37.3                               | Tons...             | 1,568,038 | 88.1                         | 1,222,790 | 96.6                               |
| 11 Other tame grasses.....               | 46,110          | 36.6                         | 52,844  | 51.3                         | -12.7                              | Tons...             | 60,585    | 46.1                         | 95,119    | 66.4                               |
| 12 Annual legumes cut for hay.....       | 9,386           | 73.5                         | 48,171  | 64.2                         | -25.2                              | Tons...             | 14,194    | 80.8                         | 70,057    | 74.3                               |
| 13 Small grains cut for hay.....         | 26,639          | 20.2                         | 299,755 | 75.9                         | -3.0                               | Tons...             | 38,250    | 30.5                         |           |                                    |
| 14 Wild, salt, or prairie grasses.....   | 290,659         | 70.7                         |         |                              |                                    | Tons...             | 280,332   | 76.8                         | 288,536   | 78.3                               |
| 15 Silage crops.....                     | 19,015          | 33.9                         |         |                              |                                    | Tons...             | 119,656   | 50.2                         |           |                                    |
| 16 Corn cut for forage.....              | 14,547          | 8.2                          |         |                              |                                    | Tons...             | 34,234    | 17.9                         |           |                                    |
| 17 Kafir, sorghum, etc., for forage..... | 12,123          | 3.5                          |         |                              |                                    | Tons...             | 24,349    | 5.5                          |           |                                    |
| 18 Root crops for forage.....            | 633             | 41.4                         |         |                              |                                    | Tons...             | 4,255     | 57.2                         |           |                                    |
| <b>Vegetables:</b>                       |                 |                              |         |                              |                                    |                     |           |                              |           |                                    |
| 19 Potatoes.....                         | 50,631          | 65.5                         | 59,221  | 69.0                         | -14.5                              | Bu.....             | 7,475,618 | 84.2                         | 8,408,915 | 71.4                               |
| 20 Cabbages.....                         | 2,791           | 74.0                         |         |                              |                                    | Bu.....             |           |                              |           |                                    |
| 21 Cantaloupes.....                      | 3,530           | 88.1                         |         |                              |                                    | Bu.....             |           |                              |           |                                    |
| 22 Cucumbers.....                        | 1,284           | 80.8                         |         |                              |                                    | Bu.....             |           |                              |           |                                    |
| 23 Tomatoes.....                         | 1,093           | 71.6                         |         |                              |                                    | Bu.....             |           |                              |           |                                    |
| <b>Fruits:</b>                           |                 |                              |         |                              |                                    |                     |           |                              |           |                                    |
| 24 Grapes.....                           | 35,688          | 28.5                         |         |                              |                                    | Lbs...              | 173,669   | 33.0                         |           |                                    |
| 25 Apples.....                           | 879,087         | 49.4                         |         |                              |                                    | Bu.....             | 1,842,018 | 53.9                         |           |                                    |
| 26 Peaches.....                          | 238,370         | 53.3                         |         |                              |                                    | Bu.....             | 460,404   | 63.8                         |           |                                    |
| 27 Pears.....                            | 97,783          | 71.8                         |         |                              |                                    | Bu.....             | 210,944   | 78.3                         |           |                                    |
| 28 Plums and prunes.....                 | 26,582          | 33.2                         |         |                              |                                    | Bu.....             | 19,264    | 42.9                         |           |                                    |
| 29 Cherries.....                         | 419,365         | 55.7                         |         |                              |                                    | Bu.....             | 101,271   | 61.3                         |           |                                    |
| <b>Miscellaneous:</b>                    |                 |                              |         |                              |                                    |                     |           |                              |           |                                    |
| 30 Sugar beets grown for sugar.....      | 137,329         | 82.8                         | 106,905 | 99.0                         | 28.5                               | Tons...             | 1,409,560 | 85.0                         | 1,224,466 | 99.5                               |
| 31 Clover and alfalfa seed.....          | 5,949           | 77.3                         | 4,483   | 57.8                         | 32.7                               | Bu.....             | 21,363    | 78.4                         | 9,628     | 53.4                               |
| 32 Dry beans.....                        | 10,627          | 16.0                         | 2,504   | 49.7                         | 324.4                              | Bu.....             | 120,629   | 28.2                         | 32,444    | 60.2                               |
| 33 Dry peas.....                         | 24,841          | 89.4                         | 15,537  | 64.1                         | 59.9                               | Bu.....             | 265,449   | 89.8                         | 199,945   | 77.4                               |

| CROP.                                    | AVERAGE YIELD PER ACRE: 1919. |            |                        |                    |                                |  | VALUE.      |                              |           |                              |                                    |
|--|-------------------------------|------------|------------------------|--------------------|--------------------------------|--|-------------|------------------------------|-----------|------------------------------|------------------------------------|
|  | Unit.                         | For state. | On non-irrigated land. | On irrigated land. |                                |  | 1919        | Per cent of total for state. | 1909      | Per cent of total for state. | Per cent of increase. <sup>1</sup> |
|  |                               |            |                        | Average.           | Per cent of average for state. | Per cent of average on non-irrigated land. |             |                              |           |                              |                                    |
| <b>Cereals:</b>                          |                               |            |                        |                    |                                |  |             |                              |           |                              |                                    |
| 1 Corn.....                              | Bu.....                       | 13.4       | 12.6                   | 25.0               | 186.6                          | 198.4                                      | \$1,343,069 | 13.0                         | \$370,400 | 13.9                         | 397.6                              |
| 2 Oats.....                              | Bu.....                       | 26.0       | 19.6                   | 31.1               | 119.6                          | 158.7                                      | 2,885,440   | 67.0                         | 3,458,308 | 82.8                         | -16.6                              |
| 3 Winter wheat.....                      | Bu.....                       | 13.3       | 12.1                   | 22.9               | 172.2                          | 189.3                                      | 5,309,191   | 18.8                         | 4,352,823 | 67.3                         | 163.7                              |
| 4 Spring wheat.....                      | Bu.....                       | 15.4       | 10.1                   | 21.5               | 139.6                          | 212.9                                      | 6,169,488   | 65.3                         | 897,849   | 81.6                         | 100.3                              |
| 5 Barley.....                            | Bu.....                       | 18.3       | 14.9                   | 23.8               | 130.1                          | 159.7                                      | 1,798,575   | 49.4                         | 11,284    | 9.1                          | 339.7                              |
| 6 Rye.....                               | Bu.....                       | 8.2        | 8.1                    | 12.4               | 151.2                          | 153.1                                      | 49,615      | 3.1                          |           |                              |                                    |
| <b>Hay and forage:</b>                   |                               |            |                        |                    |                                |  |             |                              |           |                              |                                    |
| 7 Timothy alone.....                     | Tons...                       | 1.39       | 1.40                   | 1.39               | 100.0                          | 99.3                                       | 977,928     | 75.3                         | 602,213   | 80.7                         | 62.4                               |
| 8 Timothy and clover mixed.....          | Tons...                       | 1.72       | 1.46                   | 1.77               | 102.9                          | 121.2                                      | 4,149,552   | 87.7                         | 355,529   | 51.9                         |                                    |
| 9 Clover alone.....                      | Tons...                       | 1.66       | 1.50                   | 1.58               | 101.3                          | 105.3                                      | 83,181      | 67.9                         | 7,864     | 27.0                         | 957.7                              |
| 10 Alfalfa.....                          | Tons...                       | 2.28       | 1.73                   | 2.38               | 104.4                          | 137.6                                      | 29,008,703  | 88.1                         | 9,522,968 | 98.1                         | 204.6                              |
| 11 Other tame grasses.....               | Tons...                       | 1.04       | 0.89                   | 1.31               | 128.0                          | 147.2                                      | 969,360     | 46.1                         | 751,436   | 66.4                         | 29.0                               |
| 12 Annual legumes cut for hay.....       | Tons...                       | 1.38       | 1.00                   | 1.51               | 109.4                          | 151.0                                      | 212,910     | 80.8                         | 501,204   | 59.3                         | 79.8                               |
| 13 Small grains cut for hay.....         | Tons...                       | 0.95       | 0.82                   | 1.44               | 151.6                          | 175.6                                      | 688,500     | 30.6                         |           |                              |                                    |
| 14 Wild, salt, or prairie grasses.....   | Tons...                       | 0.89       | 0.70                   | 0.96               | 107.9                          | 137.1                                      | 4,905,981   | 76.8                         | 2,444,558 | 70.2                         | 100.7                              |
| 15 Silage crops.....                     | Tons...                       | 4.25       | 3.20                   | 6.29               | 148.0                          | 196.6                                      | 1,196,560   | 50.2                         |           |                              |                                    |
| 16 Corn cut for forage.....              | Tons...                       | 1.08       | 0.96                   | 2.35               | 217.6                          | 244.8                                      | 445,042     | 17.9                         |           |                              |                                    |
| 17 Kafir, sorghum, etc., for forage..... | Tons...                       | 1.29       | 1.26                   | 2.01               | 155.8                          | 159.5                                      | 316,537     | 5.5                          |           |                              |                                    |
| 18 Root crops for forage.....            | Tons...                       | 4.86       | 3.55                   | 6.72               | 138.3                          | 189.3                                      | 55,315      | 57.2                         |           |                              |                                    |
| <b>Vegetables:</b>                       |                               |            |                        |                    |                                |  |             |                              |           |                              |                                    |
| 19 Potatoes.....                         | Bu.....                       | 114.8      | 52.4                   | 147.6              | 128.6                          | 281.7                                      | 16,446,360  | 84.2                         | 2,889,789 | 78.0                         | 469.1                              |
| 20 Cabbages.....                         | Bu.....                       |            |                        |                    |                                |  | 544,640     | 73.1                         |           |                              |                                    |
| 21 Cantaloupes.....                      | Bu.....                       |            |                        |                    |                                |  | 616,437     | 89.2                         |           |                              |                                    |
| 22 Cucumbers.....                        | Bu.....                       |            |                        |                    |                                |  | 198,241     | 83.2                         |           |                              |                                    |
| 23 Tomatoes.....                         | Bu.....                       |            |                        |                    |                                |  | 234,779     | 67.8                         |           |                              |                                    |
| <b>Fruits:</b>                           |                               |            |                        |                    |                                |  |             |                              |           |                              |                                    |
| 24 Grapes.....                           | Lbs...                        | 4.2        | 3.9                    | 4.9                | 116.7                          | 125.0                                      | 13,894      | 33.0                         |           |                              |                                    |
| 25 Apples.....                           | Bu.....                       | 71.9       | 71.8                   | 72.1               | 110.5                          | 116.7                                      | 3,039,330   | 53.9                         |           |                              |                                    |
| 26 Peaches.....                          | Bu.....                       | 71.6       | 71.3                   | 71.9               | 118.8                          | 146.2                                      | 851,747     | 63.8                         |           |                              |                                    |
| 27 Pears.....                            | Bu.....                       | 2.0        | 2.5                    | 7.2                | 110.0                          | 146.7                                      | 464,077     | 78.3                         |           |                              |                                    |
| 28 Plums and prunes.....                 | Bu.....                       | 70.6       | 70.5                   | 70.7               | 116.7                          | 140.0                                      | 46,234      | 42.9                         |           |                              |                                    |
| 29 Cherries.....                         | Bu.....                       | 70.5       | 70.4                   | 70.5               | 100.0                          | 125.0                                      | 329,131     | 61.3                         |           |                              |                                    |
| <b>Miscellaneous:</b>                    |                               |            |                        |                    |                                |  |             |                              |           |                              |                                    |
| 30 Sugar beets grown for sugar.....      | Tons...                       | 10.00      | 8.72                   | 10.26              | 102.6                          | 117.7                                      | 14,800,380  | 85.0                         | 6,055,382 | 99.9                         | 144.4                              |
| 31 Clover and alfalfa seed.....          | Bu.....                       | 3.5        | 3.4                    | 3.6                | 102.9                          | 105.9                                      | 491,349     | 78.4                         | 83,070    | 60.5                         | 491.5                              |
| 32 Dry beans.....                        | Bu.....                       | 6.5        | 5.5                    | 11.4               | 175.4                          | 207.3                                      | 410,139     | 28.2                         | 90,652    | 70.4                         | 352.4                              |
| 33 Dry peas.....                         | Bu.....                       | 10.6       | 10.2                   | 10.7               | 100.9                          | 104.9                                      | 663,622     | 89.8                         | 282,095   | 71.0                         | 135.2                              |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Not reported separately in 1909.  
<sup>3</sup> Number of vines of bearing age.

<sup>4</sup> Number of trees of bearing age.  
<sup>5</sup> Not including red clover seed.

<sup>6</sup> Yield per vine.  
<sup>7</sup> Yield per tree.

# IRRIGATION—COLORADO.

13

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                          |  | THE STATE. | Adams. <sup>1</sup> | Alamosa. <sup>2</sup> | Arapahoe. <sup>1</sup> | Archuleta. | Baca.     | Bent.     | Boulder.  | Chaffee. |
|--------------------------|--|------------|---------------------|-----------------------|------------------------|------------|-----------|-----------|-----------|----------|
| 1                        | Number of all farms in 1920.....   | 59,934     | 1,753               | 302                   | 1,025                  | 420        | 1,858     | 1,056     | 1,420     | 326      |
| 2                        | Number of farms irrigated in 1919.....   | 28,756     | 740                 | 281                   | 477                    | 185        | 23        | 438       | 1,200     | 313      |
| 3                        | Per cent of all farms.....   | 48.0       | 42.2                | 93.0                  | 46.5                   | 44.0       | 1.2       | 41.5      | 84.5      | 96.0     |
| 4                        | Number of farms irrigated in 1909.....   | 25,857     | 726                 |                       | 493                    | 206        | 8         | 404       | 1,118     | 212      |
| 5                        | Per cent of increase, 1909-1919.....   | 11.2       | 1.9                 |                       | -3.2                   | -10.2      |           | 8.4       | 7.3       | 47.6     |
| LAND AND FARM AREA.      |  |            |                     |                       |                        |            |           |           |           |          |
| 6                        | Approximate land area.....acres..  | 66,341,120 | 807,680             | 465,280               | 538,880                | 780,800    | 1,633,280 | 975,360   | 488,960   | 693,120  |
| 7                        | All land in farms.....acres..  | 24,462,014 | 452,115             | 236,847               | 343,005                | 146,028    | 1,051,279 | 433,970   | 221,202   | 65,407   |
| 8                        | Improved land in farms.....acres..   | 7,744,757  | 229,192             | 60,952                | 113,662                | 28,234     | 380,974   | 102,037   | 119,530   | 25,926   |
| 9                        | Area irrigated in 1919.....acres..   | 3,348,385  | 66,407              | 89,805                | 25,674                 | 11,933     | 2,287     | 128,712   | 159,781   | 29,623   |
| 10                       | Per cent of improved land in farms.....  | 43.2       | 29.0                | 147.3                 | 22.6                   | 42.3       | 0.6       | 126.1     | 133.7     | 114.3    |
| 11                       | Area irrigated in 1909.....acres..   | 2,792,032  | 67,339              |                       | 26,341                 | 15,008     | 211       | 59,497    | 112,724   | 16,142   |
| 12                       | Per cent of increase, 1909-1919.....   | 19.9       | -1.4                |                       | -2.5                   | -20.5      | 983.9     | 116.3     | 41.7      | 83.5     |
| 13                       | Area enterprises were capable of irrigating in 1920.....acres..  | 3,855,348  | 68,065              | 168,625               | 26,137                 | 13,289     | 12,020    | 133,372   | 174,736   | 30,113   |
| 14                       | Area enterprises were capable of irrigating in 1910.....acres..  | 3,990,166  | 81,826              |                       | 35,997                 | 23,230     | 351       | 69,497    | 169,040   | 32,883   |
| 15                       | Per cent of increase, 1910-1920.....   | -3.4       | -16.8               |                       | -27.4                  | -42.8      |           | 91.9      | 3.4       | -7.0     |
| 16                       | Area included in enterprises in 1920.....acres..   | 5,220,588  | 114,266             | 186,258               | 62,128                 | 18,188     | 12,500    | 145,866   | 188,485   | 38,277   |
| 17                       | Area included in enterprises in 1910.....acres..   | 5,917,457  | 103,065             |                       | 57,784                 | 24,812     | 959       | 97,731    | 172,235   | 42,605   |
| 18                       | Per cent of increase, 1910-1920.....   | -11.8      | 10.9                |                       | 7.5                    | -26.7      |           | 49.3      | 9.4       | -10.2    |
| 19                       | Area of irrigated land reported as available for settlement.....acres..                                    | 274,282    |                     | 72,000                |                        |            |           | 6,540     |           |          |
| IRRIGATION WORKS.        |  |            |                     |                       |                        |            |           |           |           |          |
| Independent enterprises: |  |            |                     |                       |                        |            |           |           |           |          |
| 20                       | Number, 1920.....  | 6,634      | 59                  | 57                    | 37                     | 97         | 7         | 30        | 151       | 157      |
| 21                       | Number, 1910.....  | 9,065      | 89                  |                       | 62                     | 136        | 8         | 50        | 270       | 203      |
| Main ditches:            |  |            |                     |                       |                        |            |           |           |           |          |
| 22                       | Number, 1920.....  | 8,867      | 41                  | 61                    | 33                     | 116        | 5         | 34        | 157       | 206      |
| 23                       | Number, 1910.....  | 8,405      | 70                  |                       | 38                     | 135        | 1         | 52        | 265       | 187      |
| 24                       | Length, 1920.....miles..   | 19,022     | 238                 | 182                   | 105                    | 179        | 8         | 280       | 1,147     | 392      |
| 25                       | Length, 1910.....miles..   | 17,564     | 174                 |                       | 196                    | 211        | 2         | 240       | 570       | 311      |
| 26                       | Capacity, 1920.....second-feet..   | 119,558    | 2,067               | 2,073                 | 903                    | 369        | 271       | 3,679     | 4,812     | 1,090    |
| 27                       | Capacity, 1910.....second-feet..   | 148,483    | 3,453               |                       | 2,192                  | 767        | 20        | 3,269     | 6,256     | 1,486    |
| Laterals:                |  |            |                     |                       |                        |            |           |           |           |          |
| 28                       | Number, 1920.....  | 6,185      | 63                  | 41                    | 32                     | 128        | 32        | 450       | 205       | 95       |
| 29                       | Number, 1910.....  | 5,612      | 18                  |                       | 8                      | 31         |           | 313       | 49        | 39       |
| 30                       | Length, 1920.....miles..   | 8,571      | 128                 | 173                   | 113                    | 6          | 19        | 830       | 320       | 47       |
| 31                       | Length, 1910.....miles..   | 5,006      | 26                  |                       | 11                     | 28         |           | 929       | 73        | 29       |
| Reservoirs:              |  |            |                     |                       |                        |            |           |           |           |          |
| 32                       | Number, 1920.....  | 979        | 11                  | 2                     | 6                      | 5          | 4         | 17        | 44        | 3        |
| 33                       | Number, 1910.....  | 1,084      | 81                  |                       | 18                     | 4          |           | 15        | 69        | 2        |
| 34                       | Capacity, 1920.....acre-feet..   | 2,406,372  | 68,551              | 12,527                | 73,866                 | 665        | 33,726    | 339,402   | 33,282    | 20       |
| 35                       | Capacity, 1910.....acre-feet..   | 2,646,593  | 38,151              |                       | 796,094                | 627        |           | 181,842   | 30,220    | 5        |
| Flowing wells:           |  |            |                     |                       |                        |            |           |           |           |          |
| 36                       | Number, 1920.....  | 476        | 1                   | 119                   | 2                      |            | 8         |           |           |          |
| 37                       | Number, 1910.....  | 313        | 7                   |                       | 2                      |            |           |           |           |          |
| 38                       | Capacity, 1920.....gallons per minute..  | 20,139     | 40                  | 5,085                 | 130                    |            | 1,725     |           |           |          |
| 39                       | Capacity, 1910.....gallons per minute..  | 41,989     | 703                 |                       | 36                     |            |           |           |           |          |
| Pumped wells:            |  |            |                     |                       |                        |            |           |           |           |          |
| 40                       | Number, 1920.....  | 527        | 28                  |                       | 3                      |            | 4         | 11        | 1         |          |
| 41                       | Number, 1910.....  | 121        | 10                  |                       | 8                      |            | 10        |           |           |          |
| 42                       | Capacity, 1920.....gallons per minute..  | 210,094    | 8,217               |                       | 750                    |            | 52        | 8,250     |           |          |
| 43                       | Capacity, 1910.....gallons per minute..  | 53,564     | 2,097               |                       | 2,425                  |            | 2,882     |           |           |          |
| Pumping plants:          |  |            |                     |                       |                        |            |           |           |           |          |
| 44                       | Number, 1920.....  | 406        | 29                  |                       | 3                      | 2          | 3         | 8         | 2         |          |
| 45                       | Number, 1910.....  | 206        | 10                  |                       | 9                      | 1          | 5         | 1         | 1         |          |
| 46                       | Engine capacity, 1920.....horsepower..   | 8,635      | 168                 |                       | 22                     | 22         |           | 197       | 30        |          |
| 47                       | Engine capacity, 1910.....horsepower..   | 7,969      | 35                  |                       | 145                    | 2          | 50        | 10        | 3         |          |
| 48                       | Pump capacity, 1920.....gallons per minute..   | 299,726    | 8,217               |                       | 750                    | 1,200      | 52        | 8,350     | 1,000     |          |
| 49                       | Pump capacity, 1910.....gallons per minute..   | 296,937    | 2,097               |                       | 8,375                  | 128        | 2,882     | 470       | 200       |          |
| 50                       | Average lift, 1920.....feet..  | 23         | 27                  |                       | 17                     | 85         | 100       | 24        | 8         |          |
| CAPITAL INVESTED.        |  |            |                     |                       |                        |            |           |           |           |          |
| 51                       | Capital invested to Jan. 1, 1920.....dollars..   | 88,302,442 | 2,436,771           | 416,305               | 597,099                | 168,635    | 572,553   | 2,773,601 | 1,774,922 | 261,368  |
| 52                       | Capital invested to July 1, 1910.....dollars..   | 56,636,443 | 1,211,609           |                       | 745,517                | 112,168    | 2,473     | 989,211   | 837,060   | 54,949   |
| 53                       | Per cent of increase, 1910-1920.....   | 55.9       | 101.1               |                       | -19.9                  | 50.3       |           | 180.4     | 112.0     | 375.7    |
| 54                       | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 22.90      | 35.80               | 2.47                  | 22.84                  | 12.69      | 47.63     | 20.80     | 10.16     | 8.68     |
| 55                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 14.19      | 14.81               |                       | 20.71                  | 4.83       | 7.05      | 14.23     | 4.95      | 1.70     |
| ESTIMATED FINAL COST.    |  |            |                     |                       |                        |            |           |           |           |          |
| 56                       | Estimated final cost of existing enterprises in 1920.....dollars..   | 95,198,423 | 2,557,121           | 458,952               | 600,299                | 170,285    | 572,553   | 2,797,201 | 1,850,662 | 285,083  |
| 57                       | Estimated final cost of existing enterprises in 1910.....dollars..   | 76,443,239 | 1,417,109           |                       | 745,517                | 112,168    | 2,473     | 989,211   | 901,143   | 54,949   |
| 58                       | Per cent of increase, 1910-1920.....   | 24.5       | 80.4                |                       | -19.5                  | 51.8       |           | 182.8     | 105.4     | 382.4    |
| 59                       | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 18.24      | 22.38               | 2.46                  | 9.66                   | 9.36       | 45.80     | 19.18     | 9.82      | 6.93     |
| 60                       | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 12.92      | 13.75               |                       | 12.90                  | 4.52       | 2.58      | 10.12     | 5.23      | 1.29     |

<sup>1</sup> Adams and Denver Counties organized from parts of Arapahoe County in 1902; parts of Adams and Arapahoe Counties annexed to Washington County and to Yuma County in 1903; and part of Denver County annexed to Adams County in 1909.  
<sup>2</sup> Alamosa County organized from parts of Conejos and Costilla Counties in 1913.

## IRRIGATION—COLORADO.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |   | Conejos. <sup>1</sup> | Costilla. <sup>1</sup> | Crowley. <sup>2</sup> | Custer. | Delta.    | Denver. <sup>3</sup> | Dolores. | Douglas. | Eagle.    |
|------------------------------|---|-----------------------|------------------------|-----------------------|---------|-----------|----------------------|----------|----------|-----------|
| 1                            | Number of all farms in 1920.....  | 814                   | 443                    | 743                   | 353     | 1,707     | 239                  | 186      | 462      | 301       |
| 2                            | Number of farms irrigated in 1919.....  | 734                   | 431                    | 447                   | 165     | 1,680     | 118                  | 21       | 108      | 277       |
| 3                            | Per cent of all farms.....  | 90.2                  | 97.3                   | 60.2                  | 46.7    | 98.4      | 49.4                 | 11.3     | 23.4     | 92.0      |
| 4                            | Number of farms irrigated in 1909.....  | 737                   | 350                    | .....                 | 142     | 1,709     | 72                   | 30       | 157      | 218       |
| 5                            | Per cent of increase, 1909-1919.....  | .....                 | .....                  | .....                 | 16.2    | -1.7      | .....                | .....    | -31.2    | 27.1      |
| <b>LAND AND FARM AREA.</b>   |   |                       |                        |                       |         |           |                      |          |          |           |
| 6                            | Approximate land area..... acres..  | 801,280               | 758,400                | 517,120               | 478,080 | 768,640   | 37,120               | 667,520  | 540,800  | 1,036,800 |
| 7                            | All land in farms..... acres..  | 231,938               | 434,410                | 263,265               | 197,360 | 109,768   | 4,287                | 57,889   | 362,033  | 80,874    |
| 8                            | Improved land in farms..... acres..   | 128,018               | 46,598                 | 130,645               | 30,896  | 74,473    | 3,672                | 7,278    | 56,701   | 28,507    |
| 9                            | Area irrigated in 1919..... acres..   | 139,504               | 36,771                 | 57,789                | 24,241  | 93,509    | 4,000                | 1,023    | 8,696    | 30,025    |
| 10                           | Per cent of improved land in farms.....   | 109.0                 | 78.9                   | 44.2                  | 65.7    | 125.6     | 103.9                | 14.1     | 15.3     | 105.3     |
| 11                           | Area irrigated in 1909..... acres..   | 138,788               | 57,832                 | .....                 | 29,248  | 62,411    | 1,337                | 1,139    | 13,768   | 22,578    |
| 12                           | Per cent of increase, 1909-1919.....  | .....                 | .....                  | .....                 | -17.1   | 49.8      | 199.2                | -10.2    | -36.8    | 33.0      |
| 13                           | Area enterprises were capable of irrigating in 1920..... acres..  | 152,346               | 43,906                 | 58,735                | 33,548  | 127,469   | 4,000                | 2,361    | 10,391   | 31,073    |
| 14                           | Area enterprises were capable of irrigating in 1910..... acres..  | 262,040               | 100,745                | .....                 | 33,010  | 99,185    | 1,338                | 2,042    | 24,624   | 28,116    |
| 15                           | Per cent of increase, 1910-1920.....  | .....                 | .....                  | .....                 | -0.2    | 28.5      | 199.0                | 15.6     | -57.8    | 10.5      |
| 16                           | Area included in enterprises in 1920..... acres..   | 207,519               | 102,960                | 71,974                | 39,463  | 156,624   | 4,877                | 23,601   | 15,089   | 48,026    |
| 17                           | Area included in enterprises in 1910..... acres..   | 335,253               | 255,485                | .....                 | 34,610  | 174,830   | 1,338                | 2,052    | 25,405   | 32,925    |
| 18                           | Per cent of increase, 1910-1920.....  | .....                 | .....                  | .....                 | 14.0    | -10.4     | 264.5                | .....    | -40.6    | 45.9      |
| 19                           | Area of irrigated land reported as available for settlement..... acres..                                    | .....                 | .....                  | 5,000                 | .....   | 9,040     | .....                | 20,000   | .....    | .....     |
| <b>IRRIGATION WORKS.</b>     |   |                       |                        |                       |         |           |                      |          |          |           |
| Independent enterprises:     |   |                       |                        |                       |         |           |                      |          |          |           |
| 20                           | Number, 1920.....   | 159                   | 46                     | 24                    | 202     | 298       | 4                    | 22       | 94       | 186       |
| 21                           | Number, 1910.....   | 312                   | 70                     | .....                 | 464     | 329       | 10                   | 81       | 145      | 188       |
| Main ditches:                |   |                       |                        |                       |         |           |                      |          |          |           |
| 22                           | Number, 1920.....   | 172                   | 67                     | 23                    | 440     | 309       | 4                    | 25       | 123      | 245       |
| 23                           | Number, 1910.....   | 236                   | 71                     | .....                 | 464     | 291       | 3                    | 31       | 141      | 171       |
| 24                           | Length, 1920..... miles..   | 533                   | 334                    | 93                    | 323     | 738       | 20                   | 56       | 191      | 385       |
| 25                           | Length, 1910..... miles..   | 609                   | 212                    | .....                 | 415     | 819       | 6                    | 33       | 186      | 300       |
| 26                           | Capacity, 1920..... second-feet..   | 5,000                 | 997                    | 2,059                 | 784     | 3,245     | 70                   | 298      | 554      | 885       |
| 27                           | Capacity, 1910..... second-feet..   | 8,542                 | 2,681                  | .....                 | 791     | 3,474     | 20                   | 129      | 764      | 794       |
| Laterals:                    |   |                       |                        |                       |         |           |                      |          |          |           |
| 28                           | Number, 1920.....   | 99                    | 17                     | 93                    | 32      | 222       | .....                | 4        | 9        | 91        |
| 29                           | Number, 1910.....   | 93                    | 47                     | .....                 | 622     | 89        | 4                    | .....    | 8        | 97        |
| 30                           | Length, 1920..... miles..   | 150                   | 203                    | 119                   | 15      | 259       | .....                | 2        | 22       | 62        |
| 31                           | Length, 1910..... miles..   | 320                   | 68                     | .....                 | 106     | 175       | 1                    | .....    | 40       | 43        |
| Reservoirs:                  |   |                       |                        |                       |         |           |                      |          |          |           |
| 32                           | Number, 1920.....   | 5                     | 6                      | 18                    | 1       | 115       | .....                | 4        | 17       | 15        |
| 33                           | Number, 1910.....   | 10                    | 6                      | .....                 | .....   | 123       | .....                | 1        | 14       | 5         |
| 34                           | Capacity, 1920..... acre-feet..   | 34,968                | 132,860                | 8,593                 | 5       | 39,284    | .....                | 10,630   | 4,287    | 1,408     |
| 35                           | Capacity, 1910..... acre-feet..   | 50,693                | 132,248                | .....                 | .....   | 62,883    | 1                    | 40       | 12,025   | 73        |
| Flowing wells:               |   |                       |                        |                       |         |           |                      |          |          |           |
| 36                           | Number, 1920.....   | 2                     | .....                  | 1                     | .....   | .....     | .....                | .....    | .....    | 1         |
| 37                           | Number, 1910.....   | 111                   | 3                      | .....                 | .....   | .....     | .....                | .....    | .....    | .....     |
| 38                           | Capacity, 1920..... gallons per minute..  | 70                    | .....                  | 700                   | .....   | .....     | .....                | .....    | .....    | .....     |
| 39                           | Capacity, 1910..... gallons per minute..  | 24,587                | 1,792                  | .....                 | .....   | .....     | .....                | .....    | .....    | .....     |
| Pumped wells:                |   |                       |                        |                       |         |           |                      |          |          |           |
| 40                           | Number, 1920.....   | .....                 | .....                  | 48                    | .....   | .....     | .....                | .....    | 3        | .....     |
| 41                           | Number, 1910.....   | .....                 | .....                  | .....                 | .....   | .....     | .....                | .....    | 1        | .....     |
| 42                           | Capacity, 1920..... gallons per minute..  | .....                 | .....                  | 22,575                | .....   | .....     | 4                    | .....    | 405      | .....     |
| 43                           | Capacity, 1910..... gallons per minute..  | .....                 | .....                  | .....                 | .....   | .....     | 11                   | .....    | 100      | .....     |
| Pumping plants:              |   |                       |                        |                       |         |           |                      |          |          |           |
| 44                           | Number, 1920.....   | .....                 | .....                  | 25                    | .....   | 6         | .....                | .....    | 3        | 3         |
| 45                           | Number, 1910.....   | .....                 | .....                  | .....                 | .....   | 21        | .....                | .....    | 1        | .....     |
| 46                           | Engine capacity, 1920..... horsepower..   | .....                 | .....                  | 299                   | .....   | 21        | 4                    | .....    | 21       | .....     |
| 47                           | Engine capacity, 1910..... horsepower..   | .....                 | .....                  | .....                 | .....   | 131       | 3                    | .....    | 20       | 33        |
| 48                           | Pump capacity, 1920..... gallons per minute..   | .....                 | .....                  | 23,505                | .....   | 881       | .....                | .....    | 412      | 1,000     |
| 49                           | Pump capacity, 1910..... gallons per minute..   | .....                 | .....                  | .....                 | .....   | 15,242    | 11                   | .....    | 100      | .....     |
| 50                           | Average lift, 1920..... feet..  | .....                 | .....                  | 28                    | .....   | 13        | .....                | .....    | 22       | 45        |
| <b>CAPITAL INVESTED.</b>     |   |                       |                        |                       |         |           |                      |          |          |           |
| 51                           | Capital invested to Jan. 1, 1920..... dollars..   | 1,155,162             | 1,389,816              | 2,587,043             | 75,431  | 4,168,137 | 47,386               | 540,070  | 207,786  | 285,282   |
| 52                           | Capital invested to July 1, 1910..... dollars..   | 927,647               | 2,090,969              | .....                 | 137,565 | 1,568,770 | 21,581               | 12,671   | 581,214  | 133,956   |
| 53                           | Per cent of increase, 1910-1920.....  | .....                 | .....                  | .....                 | -45.2   | 165.7     | 119.6                | .....    | -64.2    | 113.0     |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 7.58                  | 31.65                  | 44.05                 | 2.25    | 32.70     | 11.85                | 232.56   | 20.00    | 9.18      |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 3.54                  | 19.59                  | .....                 | 4.09    | 15.82     | 16.13                | 6.21     | 23.60    | 4.76      |
| <b>ESTIMATED FINAL COST.</b> |   |                       |                        |                       |         |           |                      |          |          |           |
| 56                           | Estimated final cost of existing enterprises in 1920..... dollars..   | 1,156,632             | 1,403,066              | 2,593,508             | 76,596  | 4,320,091 | 47,386               | 729,020  | 208,286  | 307,432   |
| 57                           | Estimated final cost of existing enterprises in 1910..... dollars..   | 1,026,897             | 2,177,966              | .....                 | 137,565 | 2,261,610 | 21,581               | 12,671   | 589,878  | 133,956   |
| 58                           | Per cent of increase, 1910-1920.....  | .....                 | .....                  | .....                 | -44.3   | 91.0      | 119.6                | .....    | -64.7    | 129.5     |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 5.57                  | 13.63                  | 36.03                 | 1.94    | 27.58     | 9.72                 | 30.89    | 13.80    | 6.40      |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 3.06                  | 8.52                   | .....                 | 3.97    | 12.94     | 16.13                | 6.17     | 23.22    | 4.07      |

<sup>1</sup> Parts of Conejos and Costilla Counties taken to form Alamosa County in 1913.<sup>2</sup> Crowley County organized from part of Otero County in 1911.<sup>3</sup> Organized from part of Arapahoe County in 1902. A part of Denver County annexed to Adams County in 1909.

# IRRIGATION—COLORADO.

15

COUNTY TABLE.—ACREAGE IRRIGATED, 1910 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                                 |  | El Paso.  | Elbert.   | Fremont.  | Garfield. | Grand.    | Gunnison. | Hinsdale. | Huerfano. | Jackson. <sup>1</sup> | Jefferson. <sup>2</sup> |
|---------------------------------|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------------------|-------------------------|
| 1                               | Number of all farms in 1920.....   | 1,571     | 1,308     | 1,014     | 930       | 265       | 370       | 40        | 954       | 182                   | 1,440                   |
| 2                               | Number of farms irrigated in 1910.....   | 143       | 12        | 827       | 820       | 237       | 335       | 29        | 418       | 150                   | 1,141                   |
| 3                               | Per cent of all farms.....   | 9.1       | 0.9       | 81.6      | 80.1      | 80.4      | 80.1      | 72.5      | 43.8      | 85.7                  | 78.9                    |
| 4                               | Number of farms irrigated in 1909.....   | 174       | 34        | 839       | 868       | 226       | 261       | 22        | 350       | 103                   | 1,151                   |
| 5                               | Per cent of increase, 1909-1910.....   | -17.8     | -----     | -1.4      | -4.5      | 4.9       | 28.4      | -----     | 19.4      | -4.3                  | -1.0                    |
| <b>LAND AND FARM AREA.</b>      |  |           |           |           |           |           |           |           |           |                       |                         |
| 6                               | Approximate land area.....acres..  | 1,357,440 | 1,188,480 | 996,480   | 1,988,480 | 1,194,240 | 2,034,560 | 621,440   | 960,000   | 1,044,480             | 517,120                 |
| 7                               | All land in farms.....acres..  | 919,013   | 1,011,533 | 229,397   | 211,875   | 119,430   | 121,570   | 10,633    | 380,354   | 234,214               | 249,922                 |
| 8                               | Improved land in farms.....acres..   | 208,517   | 206,021   | 31,484    | 74,214    | 32,766    | 49,351    | 3,742     | 59,130    | 93,408                | 69,625                  |
| 9                               | Area irrigated in 1910.....acres..   | 18,143    | 1,175     | 29,884    | 73,473    | 39,857    | 48,280    | 3,675     | 29,081    | 136,942               | 70,788                  |
| 10                              | Per cent of improved land in farms.....  | 8.7       | 0.6       | 94.9      | 99.0      | 121.0     | 97.8      | 98.2      | 49.2      | 146.5                 | 101.7                   |
| 11                              | Area irrigated in 1909.....acres..   | 21,354    | 7,628     | 24,737    | 61,617    | 42,104    | 55,848    | 2,924     | 28,598    | 151,850               | 57,336                  |
| 12                              | Per cent of increase, 1909-1910.....   | -15.0     | -84.0     | 20.8      | 19.2      | -5.5      | -13.6     | 25.7      | 9.3       | -9.8                  | 23.5                    |
| 13                              | Area enterprises were capable of irrigating in 1920.....acres..  | 22,047    | 1,790     | 35,697    | 93,814    | 43,092    | 52,467    | 3,880     | 32,119    | 149,325               | 73,035                  |
| 14                              | Area enterprises were capable of irrigating in 1910.....acres..  | 28,214    | 11,286    | 37,130    | 95,281    | 77,672    | 59,700    | 3,354     | 35,090    | 199,457               | 142,286                 |
| 15                              | Per cent of increase, 1910-1920.....   | -21.9     | -84.1     | -3.9      | -1.5      | -44.5     | -12.1     | 15.7      | -10.0     | -25.1                 | -48.2                   |
| 16                              | Area included in enterprises in 1920.....acres..   | 35,450    | 6,720     | 44,059    | 117,618   | 85,504    | 67,925    | 4,065     | 43,274    | 229,203               | 77,937                  |
| 17                              | Area included in enterprises in 1910.....acres..   | 41,438    | 20,361    | 42,414    | 133,321   | 98,299    | 73,895    | 5,220     | 66,878    | 244,967               | 293,103                 |
| 18                              | Per cent of increase, 1910-1920.....   | -14.5     | -67.0     | 3.9       | -11.8     | -13.0     | -8.1      | -22.1     | -35.3     | -6.4                  | -73.4                   |
| 19                              | Area of irrigated land reported as available for settlement.....acres..                                    | 2,200     | 1,800     | 4,550     | 6,000     | 800       | -----     | -----     | 2,520     | 27,040                | -----                   |
| <b>IRRIGATION WORKS.</b>        |  |           |           |           |           |           |           |           |           |                       |                         |
| <b>Independent enterprises:</b> |  |           |           |           |           |           |           |           |           |                       |                         |
| 20                              | Number, 1920.....  | 63        | 22        | 179       | 323       | 106       | 382       | 52        | 207       | 145                   | 105                     |
| 21                              | Number, 1910.....  | 99        | 37        | 413       | 440       | 328       | 507       | 41        | 203       | 328                   | 163                     |
| <b>Main ditches:</b>            |  |           |           |           |           |           |           |           |           |                       |                         |
| 22                              | Number, 1920.....  | 72        | 30        | 267       | 392       | 314       | 523       | 52        | 321       | 355                   | 133                     |
| 23                              | Number, 1910.....  | 85        | 30        | 360       | 374       | 326       | 448       | 31        | 266       | 328                   | 164                     |
| 24                              | Length, 1920.....miles..   | 176       | 31        | 228       | 730       | 542       | 702       | 104       | 475       | 779                   | 280                     |
| 25                              | Length, 1910.....miles..   | 193       | 30        | 337       | 870       | 497       | 460       | 28        | 427       | 743                   | 640                     |
| 26                              | Capacity, 1920.....second-feet..   | 863       | 168       | 901       | 2,593     | 2,037     | 4,230     | 519       | 1,907     | 5,129                 | 2,003                   |
| 27                              | Capacity, 1910.....second-feet..   | 1,157     | 427       | 1,058     | 4,401     | 3,508     | 6,934     | 183       | 1,609     | 6,806                 | 4,623                   |
| <b>Laterals:</b>                |  |           |           |           |           |           |           |           |           |                       |                         |
| 28                              | Number, 1920.....  | 44        | 24        | 160       | 283       | 39        | 30        | -----     | 458       | 21                    | 88                      |
| 29                              | Number, 1910.....  | 24        | 60        | 363       | 89        | 173       | 41        | 6         | 187       | 142                   | 31                      |
| 30                              | Length, 1920.....miles..   | 17        | 31        | 101       | 512       | 37        | 34        | -----     | 146       | 43                    | 92                      |
| 31                              | Length, 1910.....miles..   | 14        | 4         | 122       | 54        | 94        | 7         | 2         | 106       | 79                    | 67                      |
| <b>Reservoirs:</b>              |  |           |           |           |           |           |           |           |           |                       |                         |
| 32                              | Number, 1920.....  | 29        | 5         | 31        | 20        | 25        | 6         | 2         | 34        | 9                     | 25                      |
| 33                              | Number, 1910.....  | 15        | 8         | 26        | 14        | 21        | 1         | -----     | 37        | 6                     | 79                      |
| 34                              | Capacity, 1920.....acre-feet..   | 13,103    | 6,755     | 6,972     | 7,564     | 3,137     | 400       | 43,500    | 12,027    | 15,159                | 8,178                   |
| 35                              | Capacity, 1910.....acre-feet..   | 12,247    | 1,456     | 18,879    | 5,049     | 3,344     | 125       | -----     | 12,714    | 2,160                 | 130,510                 |
| <b>Flowing wells:</b>           |  |           |           |           |           |           |           |           |           |                       |                         |
| 36                              | Number, 1920.....  | 3         | -----     | 3         | -----     | -----     | -----     | -----     | -----     | -----                 | -----                   |
| 37                              | Number, 1910.....  | 30        | -----     | 60        | -----     | -----     | -----     | -----     | -----     | -----                 | -----                   |
| 38                              | Capacity, 1920.....gallons per minute..  | 30        | -----     | 115       | -----     | -----     | -----     | -----     | -----     | -----                 | -----                   |
| 39                              | Capacity, 1910.....gallons per minute..  | 1,064     | -----     | 1,371     | -----     | -----     | -----     | -----     | -----     | -----                 | -----                   |
| <b>Pumped wells:</b>            |  |           |           |           |           |           |           |           |           |                       |                         |
| 40                              | Number, 1920.....  | 1         | 3         | 9         | -----     | -----     | -----     | -----     | 2         | -----                 | -----                   |
| 41                              | Number, 1910.....  | 1         | -----     | 5         | -----     | -----     | -----     | -----     | 1         | -----                 | 3                       |
| 42                              | Capacity, 1920.....gallons per minute..  | -----     | 1,200     | 287       | -----     | -----     | -----     | -----     | 70        | -----                 | -----                   |
| 43                              | Capacity, 1910.....gallons per minute..  | 360       | -----     | 1,169     | -----     | -----     | -----     | -----     | 1,200     | -----                 | 365                     |
| <b>Pumping plants:</b>          |  |           |           |           |           |           |           |           |           |                       |                         |
| 44                              | Number, 1920.....  | 1         | 3         | 10        | 2         | -----     | 4         | -----     | 4         | -----                 | 1                       |
| 45                              | Number, 1910.....  | 1         | -----     | 9         | -----     | -----     | 1         | -----     | 1         | -----                 | 7                       |
| 46                              | Engine capacity, 1920.....horsepower..   | -----     | 12        | 309       | 10        | -----     | 112       | -----     | 11        | -----                 | 7                       |
| 47                              | Engine capacity, 1910.....horsepower..   | 8         | -----     | 225       | -----     | -----     | 56        | -----     | 10        | -----                 | 26                      |
| 48                              | Pump capacity, 1920.....gallons per minute..   | -----     | 1,200     | 6,962     | 350       | -----     | 3,800     | -----     | 45        | -----                 | -----                   |
| 49                              | Pump capacity, 1910.....gallons per minute..   | 360       | -----     | 8,921     | -----     | -----     | 3,600     | -----     | 1,200     | -----                 | 929                     |
| 50                              | Average lift, 1920.....feet..  | -----     | 29        | 38        | 29        | -----     | 18        | -----     | 52        | -----                 | 40                      |
| <b>CAPITAL INVESTED.</b>        |  |           |           |           |           |           |           |           |           |                       |                         |
| 51                              | Capital invested to Jan. 1, 1920.....dollars..   | 901,461   | 25,561    | 1,701,518 | 1,134,502 | 534,913   | 462,748   | 395,752   | 1,061,777 | 784,326               | 1,231,205               |
| 52                              | Capital invested to July 1, 1910.....dollars..   | 187,211   | 35,215    | 1,505,440 | 1,458,678 | 432,231   | 207,622   | 11,047    | 257,959   | 275,899               | 4,800,968               |
| 53                              | Per cent of increase, 1910-1920.....   | 381.5     | -27.4     | 17.0      | -22.2     | 23.8      | 122.9     | -----     | 11.6      | 184.3                 | -71.4                   |
| 54                              | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 40.89     | 14.28     | 49.35     | 12.09     | 12.41     | 8.82      | 102.00    | 33.06     | 5.25                  | 16.72                   |
| 55                              | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 6.64      | 3.12      | 40.54     | 15.31     | 5.56      | 3.48      | 3.29      | 7.23      | 1.38                  | 30.23                   |
| <b>ESTIMATED FINAL COST.</b>    |  |           |           |           |           |           |           |           |           |                       |                         |
| 56                              | Estimated final cost of existing enterprises in 1920.....dollars..   | 921,461   | 39,991    | 1,889,558 | 1,170,827 | 547,713   | 472,998   | 395,752   | 1,083,232 | 1,043,820             | 1,268,125               |
| 57                              | Estimated final cost of existing enterprises in 1910.....dollars..   | 187,211   | 35,215    | 1,588,971 | 1,498,678 | 504,664   | 207,622   | 11,047    | 273,959   | 275,899               | 5,170,968               |
| 58                              | Per cent of increase, 1910-1920.....   | 392.2     | 13.5      | 18.9      | -21.9     | 8.5       | 127.8     | -----     | 295.4     | 878.3                 | -75.5                   |
| 59                              | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 25.99     | 5.95      | 42.89     | 9.95      | 6.41      | 6.96      | 97.36     | 25.03     | 4.55                  | 16.27                   |
| 60                              | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 4.52      | 1.73      | 37.46     | 11.24     | 5.13      | 2.81      | 2.12      | 4.10      | 1.18                  | 17.64                   |

<sup>1</sup> Jackson County organized from part of Larimer County in 1909.

<sup>2</sup> Part of Jefferson County annexed to Park County in 1908.

## IRRIGATION—COLORADO.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |   | Kiowa.    | La Plata. | Lake.   | Larimer. <sup>1</sup> | Las Animas. | Logan.    | Mesa.     | Mineral. | Moffat. <sup>2</sup> | Montezuma. |
|------------------------------|---|-----------|-----------|---------|-----------------------|-------------|-----------|-----------|----------|----------------------|------------|
| 1                            | Number of all farms in 1920.....  | 668       | 1,069     | 30      | 1,921                 | 2,286       | 1,874     | 2,207     | 34       | 1,023                | 904        |
| 2                            | Number of farms irrigated in 1919.....  | 12        | 880       | 29      | 1,486                 | 530         | 397       | 2,060     | 28       | 103                  | 616        |
| 3                            | Per cent of all farms.....  | 1.8       | 80.4      | 96.7    | 77.4                  | 23.2        | 21.2      | 93.3      | 82.4     | 10.1                 | 68.1       |
| 4                            | Number of farms irrigated in 1909.....  | 6         | 634       | 43      | 1,491                 | 447         | 272       | 2,238     | 28       | .....                | 516        |
| 5                            | Per cent of increase, 1909-1919.....  | .....     | 35.6      | .....   | -0.3                  | 18.6        | 46.0      | -8.0      | .....    | .....                | 19.4       |
| <b>LAND AND FARM AREA.</b>   |   |           |           |         |                       |             |           |           |          |                      |            |
| 6                            | Approximate land area.....acres.  | 1,150,720 | 1,184,640 | 237,440 | 1,682,500             | 3,077,760   | 1,166,080 | 2,024,320 | 554,240  | 2,981,120            | 1,312,640  |
| 7                            | All land in farms.....acres.  | 430,985   | 305,003   | 12,862  | 730,533               | 1,302,849   | 857,359   | 232,225   | 17,129   | 461,777              | 192,703    |
| 8                            | Improved land in farms.....acres.   | 61,782    | 70,019    | 5,151   | 192,976               | 133,084     | 416,120   | 99,582    | 5,458    | 75,225               | 57,904     |
| 9                            | Area irrigated in 1919.....acres.   | 418       | 63,755    | 6,397   | 169,356               | 40,400      | 85,079    | 102,607   | 6,865    | 17,439               | 44,083     |
| 10                           | Per cent of improved land in farms.....   | 0.7       | 88.9      | 124.2   | 87.8                  | 30.4        | 20.4      | 103.0     | 125.8    | 23.2                 | 76.1       |
| 11                           | Area irrigated in 1909.....acres.   | 1,460     | 40,840    | 10,967  | 170,600               | 26,063      | 63,166    | 71,942    | 7,762    | .....                | 27,176     |
| 12                           | Per cent of increase, 1909-1919.....  | -71.4     | 56.1      | -41.7   | -0.7                  | 54.8        | 34.7      | 42.6      | -11.6    | .....                | 62.2       |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres.  | 2,083     | 78,227    | 7,088   | 188,047               | 43,857      | 105,916   | 140,104   | 9,950    | 24,224               | 44,795     |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres.  | 1,460     | 109,479   | 11,647  | 178,992               | 32,506      | 65,345    | 92,092    | 9,370    | .....                | 62,757     |
| 15                           | Per cent of increase, 1910-1920.....  | 42.7      | -28.5     | -39.1   | 5.1                   | 34.7        | 62.1      | 52.1      | 6.2      | .....                | -28.6      |
| 16                           | Area included in enterprises in 1920.....acres.   | 17,283    | 111,462   | 10,449  | 196,330               | 50,987      | 124,415   | 185,177   | 14,770   | 32,327               | 80,216     |
| 17                           | Area included in enterprises in 1910.....acres.   | 2,310     | 151,387   | 16,380  | 316,992               | 35,149      | 87,301    | 182,942   | 10,590   | .....                | 67,538     |
| 18                           | Per cent of increase, 1910-1920.....  | 648.2     | -26.4     | -36.2   | -38.1                 | 45.1        | 42.5      | 1.2       | 39.5     | .....                | 19.8       |
| 19                           | Area of irrigated land reported as available for settlement.....acres.                                    | .....     | 7,907     | .....   | .....                 | .....       | .....     | 39,200    | .....    | .....                | 13,000     |
| <b>IRRIGATION WORKS.</b>     |   |           |           |         |                       |             |           |           |          |                      |            |
| Independent enterprises:     |   |           |           |         |                       |             |           |           |          |                      |            |
| 20                           | Number, 1920.....   | 6         | 211       | 30      | 171                   | 176         | 39        | 213       | 42       | 127                  | 102        |
| 21                           | Number, 1910.....   | 6         | 262       | 55      | 221                   | 139         | 36        | 275       | 46       | .....                | 141        |
| Main ditches:                |   |           |           |         |                       |             |           |           |          |                      |            |
| 22                           | Number, 1920.....   | 3         | 239       | 59      | 228                   | 184         | 39        | 239       | 45       | 135                  | 123        |
| 23                           | Number, 1910.....   | 4         | 257       | 39      | 217                   | 88          | 35        | 259       | 44       | .....                | 150        |
| 24                           | Length, 1920.....miles.   | 18        | 580       | 52      | 564                   | 373         | 386       | 686       | 60       | 362                  | 265        |
| 25                           | Length, 1910.....miles.   | 7         | 489       | 71      | 758                   | 161         | 215       | 592       | 47       | .....                | 268        |
| 26                           | Capacity, 1920.....second-feet.   | 2,585     | 2,018     | 298     | 6,968                 | 1,618       | 3,376     | 4,721     | 355      | 888                  | 995        |
| 27                           | Capacity, 1910.....second-feet.   | 22        | 2,602     | 530     | 7,176                 | 1,193       | 2,566     | 5,000     | 217      | .....                | 1,590      |
| Laterals:                    |   |           |           |         |                       |             |           |           |          |                      |            |
| 28                           | Number, 1920.....   | 4         | 109       | .....   | 238                   | 41          | 105       | 398       | 59       | 113                  | 39         |
| 29                           | Number, 1910.....   | .....     | 52        | 9       | 136                   | 16          | 8         | 62        | 12       | .....                | 38         |
| 30                           | Length, 1920.....miles.   | 34        | 124       | .....   | 418                   | 28          | 125       | 326       | 22       | 334                  | 159        |
| 31                           | Length, 1910.....miles.   | .....     | 125       | 16      | 368                   | 7           | 23        | 150       | 8        | .....                | 158        |
| Reservoirs:                  |   |           |           |         |                       |             |           |           |          |                      |            |
| 32                           | Number, 1920.....   | 4         | 5         | .....   | 69                    | 21          | 7         | 60        | 2        | 18                   | 9          |
| 33                           | Number, 1910.....   | 1         | 7         | .....   | 84                    | 7           | 4         | 42        | 0        | .....                | 11         |
| 34                           | Capacity, 1920.....acre-feet.   | 32,118    | 15        | .....   | 181,515               | 429,105     | 116,108   | 19,201    | 2,311    | 1,569                | 17,680     |
| 35                           | Capacity, 1910.....acre-feet.   | 1         | 7,456     | .....   | 263,388               | 427         | 1,929     | 10,172    | .....    | .....                | 37,600     |
| Flowing wells:               |   |           |           |         |                       |             |           |           |          |                      |            |
| 36                           | Number, 1920.....   | .....     | 4         | .....   | 1                     | .....       | .....     | .....     | .....    | .....                | .....      |
| 37                           | Number, 1910.....   | .....     | 1         | .....   | .....                 | .....       | .....     | .....     | .....    | .....                | .....      |
| 38                           | Capacity, 1920.....gallons per minute.  | .....     | 100       | .....   | 60                    | .....       | .....     | .....     | .....    | .....                | .....      |
| 39                           | Capacity, 1910.....gallons per minute.  | .....     | 89        | .....   | .....                 | .....       | .....     | .....     | .....    | .....                | .....      |
| Pumped wells:                |   |           |           |         |                       |             |           |           |          |                      |            |
| 40                           | Number, 1920.....   | 6         | .....     | .....   | 28                    | .....       | 40        | .....     | .....    | .....                | .....      |
| 41                           | Number, 1910.....   | 2         | .....     | .....   | 2                     | .....       | 1         | 2         | .....    | .....                | .....      |
| 42                           | Capacity, 1920.....gallons per minute.  | 2,985     | .....     | .....   | 8,095                 | .....       | 6,600     | .....     | .....    | .....                | .....      |
| 43                           | Capacity, 1910.....gallons per minute.  | 4         | .....     | .....   | 857                   | .....       | 600       | 80        | .....    | .....                | .....      |
| Pumping plants:              |   |           |           |         |                       |             |           |           |          |                      |            |
| 44                           | Number, 1920.....   | 5         | .....     | .....   | 22                    | 1           | 10        | 11        | .....    | 4                    | .....      |
| 45                           | Number, 1910.....   | 2         | 2         | .....   | 5                     | .....       | 1         | 31        | .....    | .....                | .....      |
| 46                           | Engine capacity, 1920.....horsepower.   | 57        | .....     | .....   | 374                   | 7           | 241       | 3,299     | .....    | 48                   | .....      |
| 47                           | Engine capacity, 1910.....horsepower.   | 1         | 136       | .....   | 80                    | .....       | 10        | 5,991     | .....    | .....                | .....      |
| 48                           | Pump capacity, 1920.....gallons per minute.   | 2,985     | .....     | .....   | 14,376                | 500         | 11,600    | 16,845    | .....    | 3,200                | .....      |
| 49                           | Pump capacity, 1910.....gallons per minute.   | 4         | 2,716     | .....   | 1,659                 | .....       | 600       | 178,273   | .....    | .....                | .....      |
| 50                           | Average lift, 1920.....feet.  | 20        | .....     | .....   | 21                    | 7           | 15        | 36        | .....    | 15                   | .....      |
| <b>CAPITAL INVESTED.</b>     |   |           |           |         |                       |             |           |           |          |                      |            |
| 51                           | Capital invested to Jan. 1, 1920.....dollars.   | 251,500   | 938,864   | 33,696  | 6,236,866             | 401,720     | 3,593,889 | 7,319,055 | 81,683   | 366,301              | 1,846,679  |
| 52                           | Capital invested to July 1, 1910.....dollars.   | 7,975     | 688,774   | 46,196  | 5,576,639             | 155,583     | 388,862   | 3,024,019 | 19,514   | .....                | 1,026,977  |
| 53                           | Per cent of increase, 1910-1920.....  | .....     | 36.3      | -27.1   | 11.8                  | 158.2       | 824.2     | 142.0     | 318.6    | .....                | 79.8       |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars. | 120.74    | 12.00     | 4.75    | 33.17                 | 9.16        | 33.93     | 52.24     | 8.21     | 15.12                | 41.23      |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars. | 5.46      | 6.29      | 3.97    | 31.16                 | 4.78        | 5.95      | 32.84     | 2.08     | .....                | 16.36      |
| <b>ESTIMATED FINAL COST.</b> |   |           |           |         |                       |             |           |           |          |                      |            |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars.   | 337,200   | 978,214   | 33,696  | 6,473,663             | 455,470     | 3,596,039 | 8,155,335 | 102,243  | 386,226              | 2,446,679  |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars.   | 7,975     | 855,311   | 46,196  | 9,026,639             | 155,583     | 388,862   | 6,745,382 | 19,514   | .....                | 1,091,974  |
| 58                           | Per cent of increase, 1910-1920.....  | .....     | 14.4      | -27.1   | -28.3                 | 192.8       | 824.8     | 20.9      | 423.9    | .....                | 124.1      |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars. | 19.51     | 8.78      | 3.22    | 32.97                 | 8.93        | 28.90     | 44.04     | 6.92     | 11.95                | 30.50      |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars. | 3.45      | 5.65      | 2.82    | 28.48                 | 4.43        | 4.45      | 36.87     | 1.84     | .....                | 16.17      |

<sup>1</sup> Part of Larimer County taken to form Jackson County in 1909.

<sup>2</sup> Moffat County organized from part of Routt County in 1911.



# IRRIGATION—COLORADO.

17

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|  | Montrose. | Morgan.   | Otero. <sup>1</sup> | Ouray. <sup>2</sup> | Park. <sup>3</sup> | Pitkin. | Prowers.  | Pueblo.   | Rio Blanco. | Rio Grande. |
|--|-----------|-----------|---------------------|---------------------|--------------------|---------|-----------|-----------|-------------|-------------|
| 1 Number of all farms in 1920.....   | 1,388     | 1,720     | 1,486               | 180                 | 286                | 179     | 1,469     | 1,826     | 537         | 603         |
| 2 Number of farms irrigated in 1919.....   | 1,294     | 777       | 1,157               | 142                 | 122                | 153     | 660       | 995       | 278         | 584         |
| 3 Per cent of all farms.....   | 94.6      | 45.2      | 77.9                | 78.9                | 42.7               | 85.5    | 44.9      | 54.5      | 51.8        | 96.8        |
| 4 Number of farms irrigated in 1909.....   | 1,042     | 561       | 1,310               | 184                 | 162                | 182     | 546       | 753       | 285         | 517         |
| 5 Per cent of increase, 1909-1919.....   | 24.2      | 38.5      |                     |                     | -24.7              | -15.9   | 20.9      | 32.1      | -2.5        | 13.0        |
| <b>LAND AND FARM AREA.</b>   |           |           |                     |                     |                    |         |           |           |             |             |
| 6 Approximate land area..... acres..   | 1,448,960 | 823,040   | 805,700             | 332,160             | 1,434,880          | 652,160 | 1,043,200 | 1,557,120 | 2,062,720   | 574,720     |
| 7 All land in farms..... acres..   | 218,255   | 555,890   | 334,293             | 73,010              | 239,862            | 49,389  | 669,262   | 993,226   | 223,649     | 199,231     |
| 8 Improved land in farms..... acres..  | 88,096    | 237,374   | 94,201              | 17,098              | 113,452            | 16,345  | 188,230   | 146,972   | 54,900      | 115,044     |
| 9 Area irrigated in 1919..... acres..  | 94,757    | 132,231   | 120,198             | 14,016              | 49,793             | 12,994  | 70,322    | 75,454    | 28,046      | 206,258     |
| 10 Per cent of improved land in farms.....   | 107.6     | 55.7      | 127.6               | 82.0                | 43.9               | 79.5    | 40.5      | 51.3      | 51.1        | 179.3       |
| 11 Area irrigated in 1909..... acres..   | 55,993    | 97,849    | 122,457             | 15,621              | 64,824             | 15,152  | 71,084    | 50,718    | 32,830      | 107,551     |
| 12 Per cent of increase, 1909-1919.....  | 69.2      | 35.1      |                     |                     | -23.2              | -14.2   | 6.5       | 48.8      | -14.6       | 91.8        |
| 13 Area enterprises were capable of irrigating in 1920..... acres..  | 123,905   | 153,796   | 124,879             | 23,092              | 52,029             | 15,172  | 81,508    | 88,699    | 32,742      | 227,167     |
| 14 Area enterprises were capable of irrigating in 1910..... acres..  | 92,194    | 114,933   | 198,460             | 20,337              | 65,384             | 29,719  | 74,632    | 69,442    | 37,353      | 286,021     |
| 15 Per cent of increase, 1910-1920.....  | 34.4      | 33.8      |                     |                     | -20.4              | -48.9   | 9.2       | 27.7      | -12.3       | -23.8       |
| 16 Area included in enterprises in 1920..... acres..   | 173,162   | 166,670   | 183,077             | 24,017              | 55,449             | 21,295  | 99,213    | 142,594   | 45,579      | 293,162     |
| 17 Area included in enterprises in 1910..... acres..   | 254,132   | 259,590   | 250,766             | 25,462              | 68,969             | 39,497  | 130,596   | 174,518   | 53,169      | 353,637     |
| 18 Per cent of increase, 1910-1920.....  | -31.9     | -35.8     |                     |                     | -19.6              | -46.1   | -24.0     | -18.3     | -14.3       | -17.1       |
| 19 Area of irrigated land reported as available for settlement..... acres..                                    | 13,500    |           |                     |                     |                    |         |           | 31,585    |             |             |
| <b>IRRIGATION WORKS.</b>   |           |           |                     |                     |                    |         |           |           |             |             |
| Independent enterprises:   |           |           |                     |                     |                    |         |           |           |             |             |
| 20 Number, 1920.....   | 103       | 39        | 26                  | 96                  | 213                | 76      | 29        | 284       | 189         | 159         |
| 21 Number, 1910.....   | 200       | 49        | 47                  | 137                 | 282                | 165     | 25        | 190       | 202         | 213         |
| Main ditches:  |           |           |                     |                     |                    |         |           |           |             |             |
| 22 Number, 1920.....   | 113       | 34        | 27                  | 124                 | 359                | 96      | 27        | 273       | 299         | 198         |
| 23 Number, 1910.....   | 192       | 48        | 37                  | 138                 | 276                | 124     | 20        | 173       | 191         | 229         |
| 24 Length, 1920..... miles..   | 431       | 308       | 329                 | 213                 | 440                | 191     | 180       | 525       | 458         | 348         |
| 25 Length, 1910..... miles..   | 541       | 537       | 327                 | 252                 | 363                | 253     | 218       | 436       | 354         | 537         |
| 26 Capacity, 1920..... second-feet..   | 2,437     | 3,771     | 5,537               | 642                 | 2,705              | 655     | 1,573     | 5,316     | 2,908       | 3,347       |
| 27 Capacity, 1910..... second-feet..   | 3,983     | 6,454     | 6,553               | 1,085               | 4,241              | 1,002   | 2,286     | 5,181     | 1,129       | 6,755       |
| Laterals:  |           |           |                     |                     |                    |         |           |           |             |             |
| 28 Number, 1920.....   | 187       | 69        | 404                 | 4                   | 53                 | 74      | 153       | 370       | 113         | 184         |
| 29 Number, 1910.....   | 58        | 15        | 53                  | 41                  | 718                | 17      | 82        | 91        | 118         | 187         |
| 30 Length, 1920..... miles..   | 382       | 62        | 429                 |                     | 20                 | 37      | 309       | 371       | 48          | 373         |
| 31 Length, 1910..... miles..   | 164       | 42        | 123                 | 15                  | 185                | 5       | 148       | 109       | 70          | 398         |
| Reservoirs:  |           |           |                     |                     |                    |         |           |           |             |             |
| 32 Number, 1920.....   | 14        | 10        | 10                  |                     | 1                  | 3       | 5         | 61        | 24          | 4           |
| 33 Number, 1910.....   | 15        | 17        | 40                  | 7                   | 1                  | 9       | 7         | 54        | 10          | 1           |
| 34 Capacity, 1920..... acre-feet..   | 8,335     | 86,680    | 36,659              |                     | 8                  | 19      | 53,613    | 109,534   | 4,028       | 30,150      |
| 35 Capacity, 1910..... acre-feet..   | 119,381   | 181,673   | 130,504             | 441                 | 1                  | 1,874   | 183,381   | 106,307   | 384         | 261         |
| Flowing wells:   |           |           |                     |                     |                    |         |           |           |             |             |
| 36 Number, 1920.....   |           |           |                     |                     |                    |         |           | 3         |             | 172         |
| 37 Number, 1910.....   |           |           |                     |                     |                    |         |           | 4         |             | 33          |
| 38 Capacity, 1920..... gallons per minute..  |           |           |                     |                     |                    |         |           | 570       |             | 6,666       |
| 39 Capacity, 1910..... gallons per minute..  |           |           |                     |                     |                    |         |           | 2,168     |             | 7,672       |
| Pumped wells:  |           |           |                     |                     |                    |         |           |           |             |             |
| 40 Number, 1920.....   |           | 23        | 12                  |                     |                    |         | 6         | 132       |             |             |
| 41 Number, 1910.....   | 1         | 3         | 14                  |                     |                    | 1       |           | 3         |             |             |
| 42 Capacity, 1920..... gallons per minute..  |           | 26,590    | 11,088              |                     |                    |         | 1,205     | 37,869    |             |             |
| 43 Capacity, 1910..... gallons per minute..  | 170       | 1,681     | 6,205               |                     |                    | 34      |           | 145       |             |             |
| Pumping plants:  |           |           |                     |                     |                    |         |           |           |             |             |
| 44 Number, 1920.....   | 2         | 17        | 11                  |                     |                    |         | 7         | 66        | 1           |             |
| 45 Number, 1910.....   | 1         | 3         | 15                  |                     |                    | 1       |           | 4         | 9           |             |
| 46 Engine capacity, 1920..... horsepower..   | 41        | 344       | 188                 |                     |                    |         | 30        | 801       | 10          |             |
| 47 Engine capacity, 1910..... horsepower..   | 3         | 25        | 87                  |                     |                    | 1       |           | 9         | 87          |             |
| 48 Pump capacity, 1920..... gallons per minute..   |           | 26,585    | 10,438              |                     |                    |         | 1,470     | 49,505    | 900         |             |
| 49 Pump capacity, 1910..... gallons per minute..   | 170       | 1,581     | 15,185              |                     |                    | 34      |           | 165       | 4,329       |             |
| 50 Average lift, 1920..... feet..  | 34        | 22        | 20                  |                     |                    |         | 18        | 21        | 10          |             |
| <b>CAPITAL INVESTED.</b>   |           |           |                     |                     |                    |         |           |           |             |             |
| 51 Capital invested to Jan. 1, 1920..... dollars..   | 6,788,758 | 2,600,735 | 4,157,535           | 197,689             | 175,670            | 208,324 | 1,160,422 | 3,645,462 | 355,617     | 981,136     |
| 52 Capital invested to July 1, 1910..... dollars..   | 4,769,186 | 4,821,813 | 3,197,415           | 159,091             | 213,233            | 237,523 | 1,453,019 | 1,511,694 | 269,479     | 1,356,578   |
| 53 Per cent of increase, 1910-1920.....  | 42.3      | -46.1     |                     |                     | -17.6              | -12.3   | -20.1     | 141.2     | 32.0        | -27.7       |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 54.79     | 16.91     | 33.29               | 8.56                | 3.38               | 13.73   | 14.24     | 41.10     | 10.86       | 4.32        |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 51.73     | 41.95     | 16.11               | 7.82                | 3.26               | 7.99    | 19.47     | 21.77     | 7.21        | 4.55        |
| <b>ESTIMATED FINAL COST.</b>   |           |           |                     |                     |                    |         |           |           |             |             |
| 56 Estimated final cost of existing enterprises in 1920..... dollars..   | 7,286,466 | 2,604,785 | 4,438,935           | 197,758             | 176,080            | 214,324 | 1,163,412 | 3,919,262 | 372,882     | 982,914     |
| 57 Estimated final cost of existing enterprises in 1910..... dollars..   | 9,751,075 | 6,004,613 | 3,631,587           | 159,091             | 213,233            | 252,554 | 1,453,019 | 1,693,321 | 269,479     | 1,400,313   |
| 58 Per cent of increase, 1910-1920.....  | -25.3     | -56.6     |                     |                     | -17.4              | -15.1   | -19.9     | 131.6     | 35.4        | -29.8       |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 42.08     | 15.63     | 24.25               | 8.23                | 3.18               | 10.06   | 11.73     | 27.49     | 8.18        | 3.35        |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 38.37     | 23.13     | 14.48               | 6.25                | 3.09               | 6.39    | 11.13     | 9.70      | 5.07        | 3.96        |

<sup>1</sup> Part of Otero County taken to form Crowley County in 1911.

<sup>2</sup> Part of San Miguel County annexed to Ouray County in 1917.

<sup>3</sup> Part of Jefferson County annexed to Park County in 1908.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|   | Routt. <sup>1</sup> | Saguache. | San Miguel. <sup>2</sup> | Sedgwick. | Summit. | Teller. | Washington. <sup>3</sup> | Weld.      | Yuma. <sup>3</sup> | All other counties. |
|---|---------------------|-----------|--------------------------|-----------|---------|---------|--------------------------|------------|--------------------|---------------------|
| 1 Number of all farms in 1920.....  | 926                 | 432       | 334                      | 487       | 72      | 250     | 2,057                    | 5,765      | 2,179              | 4,268               |
| 2 Number of farms irrigated in 1919.....  | 428                 | 390       | 154                      | 130       | 67      | 26      | 51                       | 3,398      | 29                 | 35                  |
| 3 Per cent of all farms.....  | 46.2                | 90.3      | 46.1                     | 26.7      | 93.1    | 10.4    | 2.5                      | 58.9       | 1.3                | 0.8                 |
| 4 Number of farms irrigated in 1909.....  | 588                 | 338       | 121                      | 141       | 90      | 32      | 47                       | 2,578      | 23                 | 12                  |
| 5 Per cent of increase, 1909-1919.....  |                     | 15.4      |                          | -7.8      |         |         |                          | 31.8       |                    |                     |
| <b>LAND AND FARM AREA.</b>  |                     |           |                          |           |         |         |                          |            |                    |                     |
| 6 Approximate land area.....acres..   | 1,477,760           | 2,005,120 | 824,320                  | 339,840   | 415,360 | 350,080 | 1,613,440                | 2,574,080  | 1,514,880          | 5,228,160           |
| 7 All land in farms.....acres..   | 360,787             | 436,024   | 128,492                  | 234,537   | 26,155  | 122,631 | 1,088,706                | 1,756,973  | 1,203,781          | 2,758,803           |
| 8 Improved land in farms.....acres..  | 94,596              | 139,856   | 21,344                   | 139,243   | 8,150   | 16,632  | 531,234                  | 878,520    | 591,605            | 726,651             |
| 9 Area irrigated in 1919.....acres..  | 50,735              | 137,581   | 18,634                   | 21,510    | 9,831   | 1,464   | 9,335                    | 382,701    | 8,254              | 794                 |
| 10 Per cent of improved land in farms.....  | 53.5                | 98.4      | 87.3                     | 15.4      | 120.6   | 8.8     | 1.8                      | 43.6       | 1.4                | 0.1                 |
| 11 Area irrigated in 1909.....acres..   | 62,427              | 145,874   | 14,712                   | 22,023    | 8,402   | 1,370   | 5,595                    | 395,514    | 3,890              | 1,041               |
| 12 Per cent of increase, 1909-1919.....   |                     | -5.7      |                          | -2.3      | 17.0    | 6.9     | 66.8                     | -3.2       | 112.2              | -23.7               |
| 13 Area enterprises were capable of irrigating in 1920.....acres..  | 61,123              | 153,391   | 22,811                   | 23,050    | 10,986  | 1,540   | 10,095                   | 395,444    | 10,182             | 1,394               |
| 14 Area enterprises were capable of irrigating in 1910.....acres..  | 110,569             | 150,943   | 20,421                   | 23,260    | 11,739  | 1,435   | 6,027                    | 434,008    | 6,290              | 1,191               |
| 15 Per cent of increase, 1910-1920.....   |                     | 1.6       |                          | -0.9      | -6.4    | 7.3     | 67.5                     | -8.9       | 61.9               | 17.0                |
| 16 Area included in enterprises in 1920.....acres..   | 92,148              | 271,932   | 44,749                   | 24,050    | 15,222  | 1,944   | 10,095                   | 567,392    | 15,242             | 2,324               |
| 17 Area included in enterprises in 1910.....acres..   | 157,298             | 157,568   | 21,653                   | 53,620    | 10,489  | 1,664   | 7,969                    | 629,433    | 8,275              | 1,518               |
| 18 Per cent of increase, 1910-1920.....   |                     | 72.6      |                          | -55.1     | -7.7    | 16.8    | 26.7                     | -9.9       | 84.2               | 53.1                |
| 19 Area of irrigated land reported as available for settlement.....acres..                                    |                     | 8,000     | 3,000                    |           |         |         |                          |            |                    |                     |
| <b>IRRIGATION WORKS.</b>  |                     |           |                          |           |         |         |                          |            |                    |                     |
| Independent enterprises:  |                     |           |                          |           |         |         |                          |            |                    |                     |
| 20 Number, 1920.....  | 310                 | 212       | 67                       | 7         | 79      | 25      | 8                        | 238        | 26                 | 17                  |
| 21 Number, 1910.....  | 433                 | 348       | 95                       | 10        | 151     | 26      | 7                        | 291        | 16                 | 11                  |
| Main ditches:   |                     |           |                          |           |         |         |                          |            |                    |                     |
| 22 Number, 1920.....  | 421                 | 576       | 74                       | 7         | 133     | 35      | 8                        | 204        | 31                 | 14                  |
| 23 Number, 1910.....  | 417                 | 328       | 94                       | 10        | 154     | 21      | 4                        | 263        | 12                 | 9                   |
| 24 Length, 1920.....miles..   | 649                 | 614       | 231                      | 87        | 150     | 42      | 21                       | 1,113      | 64                 | 21                  |
| 25 Length, 1910.....miles..   | 899                 | 414       | 179                      | 139       | 174     | 18      | 5                        | 752        | 32                 | 11                  |
| 26 Capacity, 1920.....second-feet..   | 1,619               | 3,757     | 789                      | 459       | 497     | 60      | 365                      | 9,040      | 599                | 158                 |
| 27 Capacity, 1910.....second-feet..   | 4,502               | 2,597     | 773                      | 1,934     | 571     | 38      | 85                       | 12,611     | 210                | 103                 |
| Laterals:   |                     |           |                          |           |         |         |                          |            |                    |                     |
| 28 Number, 1920.....  | 87                  | 163       | 39                       | 5         | 34      | 36      | 16                       | 240        | 47                 | 11                  |
| 29 Number, 1910.....  | 171                 | 888       | 2                        | 20        | 26      | 2       | 2                        | 250        |                    | 4                   |
| 30 Length, 1920.....miles..   | 38                  | 249       | 182                      | 7         | 7       | 41      | 39                       | 877        | 39                 | 10                  |
| 31 Length, 1910.....miles..   | 106                 | 174       | 5                        | 10        | 12      | 1       | 2                        | 182        |                    | 2                   |
| Reservoirs:   |                     |           |                          |           |         |         |                          |            |                    |                     |
| 32 Number, 1920.....  | 50                  | 14        | 3                        | 2         |         | 1       | 3                        | 103        | 4                  | 7                   |
| 33 Number, 1910.....  | 74                  | 13        | 3                        | 11        | 3       |         | 2                        | 100        | 1                  | 3                   |
| 34 Capacity, 1920.....acre-feet..   | 5,432               | 8,854     | 5,066                    | 27,219    |         | 40      | 268                      | 310,059    | 30                 | 737                 |
| 35 Capacity, 1910.....acre-feet..   | 36,456              | 28        | 1,334                    | 42,020    | 76      |         | 290                      | 73,766     | 3                  | 55                  |
| Flowing wells:  |                     |           |                          |           |         |         |                          |            |                    |                     |
| 36 Number, 1920.....  |                     | 156       |                          |           |         |         |                          |            |                    |                     |
| 37 Number, 1910.....  |                     | 58        |                          |           |         |         |                          |            |                    |                     |
| 38 Capacity, 1920.....gallons per minute..  |                     | 4,848     |                          |           |         |         |                          |            |                    |                     |
| 39 Capacity, 1910.....gallons per minute..  |                     | 2,407     |                          |           |         |         |                          |            |                    |                     |
| Pumped wells:   |                     |           |                          |           |         |         |                          |            |                    |                     |
| 40 Number, 1920.....  |                     | 1         |                          | 1         |         |         | 4                        | 149        |                    | 12                  |
| 41 Number, 1910.....  |                     |           |                          |           |         |         |                          | 47         |                    | 2                   |
| 42 Capacity, 1920.....gallons per minute..  |                     |           |                          | 250       |         |         | 1,920                    | 70,311     |                    | 1,375               |
| 43 Capacity, 1910.....gallons per minute..  |                     |           |                          |           |         |         |                          | 33,263     |                    | 26                  |
| Pumping plants:   |                     |           |                          |           |         |         |                          |            |                    |                     |
| 44 Number, 1920.....  |                     | 1         |                          | 1         |         |         | 2                        | 133        |                    | 3                   |
| 45 Number, 1910.....  |                     | 3         |                          |           |         |         |                          | 54         |                    | 2                   |
| 46 Engine capacity, 1920.....horsepower..   |                     |           |                          | 8         |         |         | 30                       | 1,846      |                    | 37                  |
| 47 Engine capacity, 1910.....horsepower..   |                     | 3         |                          |           |         |         |                          | 686        |                    | 1                   |
| 48 Pump capacity, 1920.....gallons per minute..   |                     |           |                          | 250       |         |         | 1,920                    | 99,953     |                    | 1,475               |
| 49 Pump capacity, 1910.....gallons per minute..   |                     | 7,225     | 170                      |           |         |         |                          | 40,285     |                    | 26                  |
| 50 Average lift, 1920.....feet..  |                     |           |                          | 30        |         |         | 13                       | 22         |                    | 14                  |
| <b>CAPITAL INVESTED.</b>  |                     |           |                          |           |         |         |                          |            |                    |                     |
| 51 Capital invested to Jan. 1, 1920.....dollars..   | 572,873             | 450,609   | 676,100                  | 716,215   | 103,581 | 12,141  | 78,966                   | 16,417,224 | 83,908             | 89,094              |
| 52 Capital invested to July 1, 1910.....dollars..   | 661,203             | 547,870   | 142,552                  | 493,501   | 70,353  | 7,037   | 65,713                   | 7,597,658  | 22,276             | 5,050               |
| 53 Per cent of increase, 1910-1920.....   |                     | -17.8     |                          | 45.1      | 47.2    | 72.5    | 20.2                     | 116.1      | 276.7              |                     |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 9.37                | 2.94      | 29.64                    | 31.07     | 9.43    | 7.88    | 7.82                     | 41.52      | 8.24               | 63.91               |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 5.98                | 3.63      | 6.98                     | 21.22     | 5.99    | 4.90    | 10.90                    | 17.51      | 3.54               | 4.24                |
| <b>ESTIMATED FINAL COST.</b>  |                     |           |                          |           |         |         |                          |            |                    |                     |
| 56 Estimated final cost of existing enterprises in 1920.....dollars..   | 613,908             | 531,614   | 797,700                  | 716,215   | 103,631 | 12,141  | 80,166                   | 18,892,937 | 89,908             | 90,994              |
| 57 Estimated final cost of existing enterprises in 1910.....dollars..   | 1,099,590           | 547,870   | 142,552                  | 1,130,501 | 70,353  | 7,037   | 65,713                   | 9,847,658  | 22,276             | 5,050               |
| 58 Per cent of increase, 1910-1920.....   |                     | -3.0      |                          | -36.6     | 47.3    | 72.5    | 22.0                     | 91.9       | 303.6              |                     |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 6.66                | 1.95      | 17.83                    | 29.78     | 6.81    | 6.25    | 7.94                     | 33.30      | 5.11               | 39.15               |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 6.99                | 3.48      | 6.58                     | 21.08     | 4.27    | 4.23    | 8.25                     | 15.64      | 2.69               | 3.33                |

<sup>1</sup> Part of Routt County taken to form Moffat County in 1911.<sup>2</sup> Part of San Miguel County annexed to Ouray County in 1917.<sup>3</sup> Parts of Adams and Arapahoe Counties annexed to Washington and Yuma Counties in 1903.

# FOURTEENTH CENSUS OF THE UNITED STATES: 1920

DEPARTMENT  
OF COMMERCE

## BULLETIN

BUREAU OF THE CENSUS  
SAM. L. ROGERS, DIRECTOR

### IRRIGATION : IDAHO

#### STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

#### CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 6     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 7     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 7     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 8     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 10    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated and included in enterprises; irrigation works, and capital invested in irrigation enterprises, by counties: 1919 and 1920..... | 11    |
| Acreage by character of enterprise.....                | 5     |  |       |
| Acreage by character of water rights.....              | 5     |  |       |
| Acreage by drainage basins.....                        | 6     |  |       |

#### INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Idaho, collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of show-

ing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

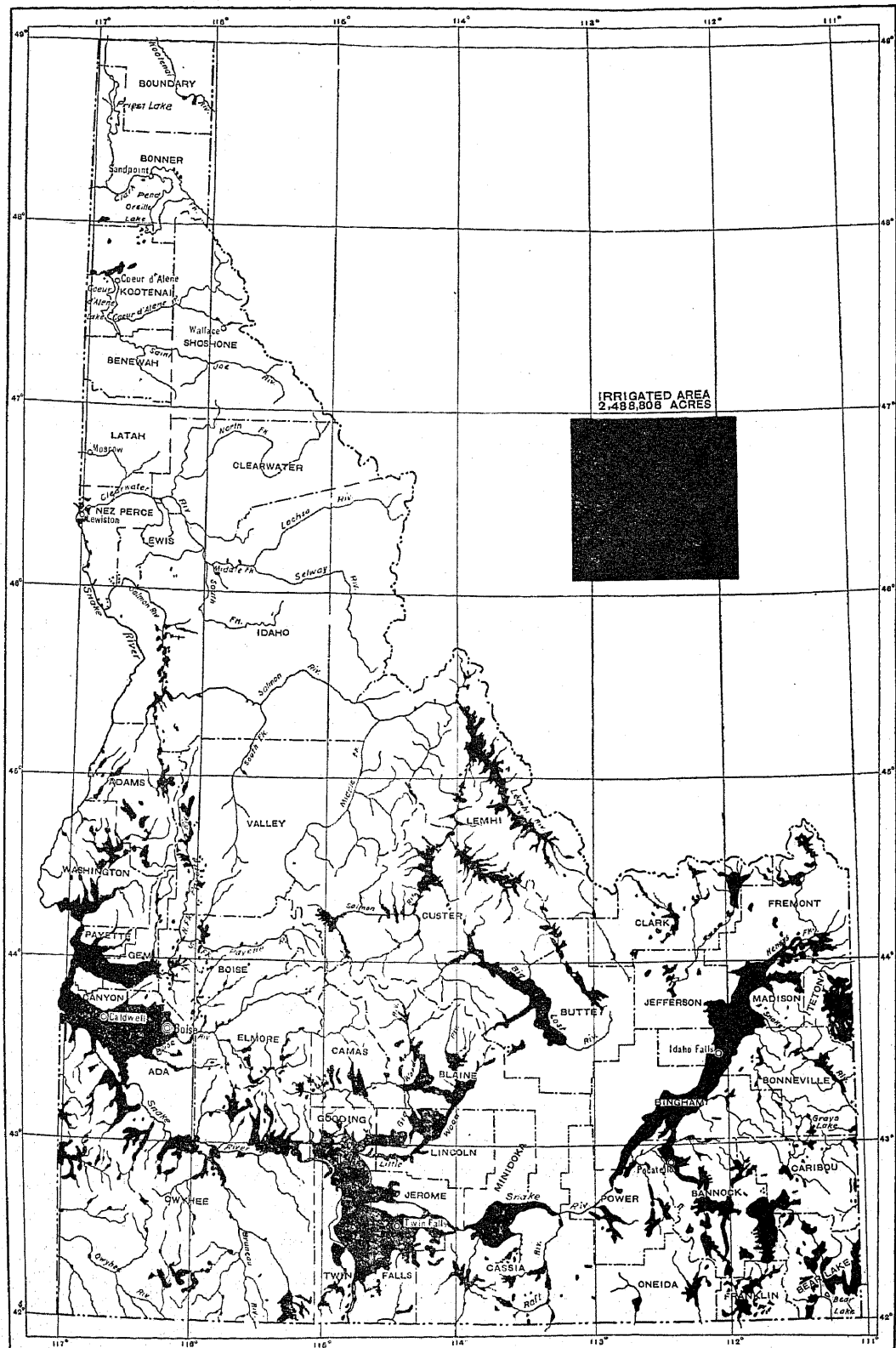
| ITEM.  | CENSUS OF—     |                  | INCREASE. <sup>1</sup> |           |
|--|----------------|------------------|------------------------|-----------|
|  | 1920           | 1910             | Amount.                | Per cent. |
| Number of all farms.....   | 42, 106        | 30, 807          | 11, 299                | 36. 7     |
| Approximate land area of the state..... acres..  | 53, 346, 560   | 53, 346, 560     |                        |           |
| All land in farms..... acres..   | 8, 375, 873    | 5, 283, 604      | 3, 092, 269            | 58. 5     |
| Improved land in farms..... acres..  | 4, 511, 680    | 2, 778, 740      | 1, 732, 940            | 62. 4     |
| Number of farms irrigated.....   | 25, 283        | 16, 439          | 8, 844                 | 53. 8     |
| Area irrigated..... acres..  | 2, 488, 806    | 1, 430, 848      | 1, 057, 958            | 73. 9     |
| Area enterprises were capable of irrigating..... acres..                               | 3, 092, 810    | 2, 388, 959      | 703, 851               | 29. 5     |
| Area included in enterprises..... acres..  | 3, 780, 048    | 3, 549, 573      | 230, 475               | 6. 5      |
| Per cent irrigated:  |                |                  |                        |           |
| Number of all farms.....   | 60. 0          | 53. 4            | 6. 6                   |           |
| Approximate land area of state.....  | 4. 7           | 2. 7             | 2. 0                   |           |
| Land in farms.....   | 29. 7          | 27. 1            | 2. 6                   |           |
| Improved land in farms.....  | 55. 2          | 51. 5            | 3. 7                   |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 604, 004       | 958, 111         | —354, 107              | —37. 0    |
| Excess of area included in enterprises over area irrigated..... acres..                | 1, 291, 242    | 2, 118, 725      | —827, 483              | —39. 1    |
| Area of irrigated land reported as available for settlement..... acres..               | 118, 334       | ( <sup>2</sup> ) |                        |           |
| Capital invested.....  | \$91, 501, 009 | \$40, 977, 688   | \$50, 523, 321         | 123. 3    |
| Average per acre enterprises were capable of irrigating.....                           | \$29. 59       | \$17. 15         | \$12. 44               | 72. 5     |
| Estimated final cost of existing enterprises.....                                      | \$97, 019, 717 | \$58, 451, 106   | \$38, 568, 611         | 66. 0     |
| Average per acre included in enterprises.....  | \$25. 67       | \$16. 47         | \$9. 20                | 55. 9     |
| Average cost of operation and maintenance per acre.....                                | \$1. 17        | \$0. 63          | \$0. 54                | 85. 7     |

<sup>1</sup> A minus sign (—) denotes decrease.

<sup>2</sup> Not reported in 1910.

# IDAHO

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

The climatic conditions determining the necessity for irrigation are the amount and the seasonal distribution of precipitation, especially rainfall. With reference to precipitation Idaho is divided into two quite distinct zones. The southern and southeastern parts of the state are dry, while the northern part is wet. Expressed in another way, the drainage basin of Snake River from the point where this river enters the state on the eastern border to the northern boundary of Washington County, on the western border of the state, is dry, while the remainder of the state, except for a small area on the headwaters of Salmon River, is wet. In Snake River Valley, the normal annual precipitation at the eastern border of the state is about 20 inches; it decreases to the westward, falling below 10 inches in the vicinity of Twin Falls, or about midway of the state, and remaining below 10 inches to the western border of the state. From the vicinity of Caldwell northward the rainfall increases, reaching 20 inches at about the northern boundary of Washington County. A second zone that receives less than 10 inches of annual precipitation extends from Snake River in the vicinity of American Falls northward into the valleys of the headwaters of Salmon River and reaches the mountains forming the boundary between Idaho and Montana. The region, thus described, that receives less than 20 inches of precipitation annually constitutes about two-thirds of the area of the state, and contains most of the irrigated land. Crops are grown without irrigation in this section, on the high lands away from the rivers, where the precipitation is heavier. Throughout this section the period of lowest precipitation is the growing season—June, July, August, and September.

The part of the state receiving more than 20 inches of precipitation annually comprises all of the northern part of the state and the mountainous section extending southward between the dry section in Snake River Valley and that in Salmon River Valley. Small areas are irrigated in this humid part of the state, but generally crops are grown without irrigation.

In 1919 there was a serious deficiency of precipitation during the growing season. There was a pronounced shortage in the spring and summer rains in all sections, and this drouth continued until October. The local representative of the United States Weather Bureau in his annual report speaks of this drouth as follows:

It was without precedent both in duration and intensity and its destructive effects were apparent in the failure of dry farm crops and pastures; the drying up of the range; rapid and stubborn spread of forest fires; the failure of mountain streams, and the shortage, in some districts total failure, of irrigation water.

Aside from shortage of water the season was very favorable, and where water for irrigation was available unusually good crops were harvested.

## WATER SUPPLY FOR IRRIGATION.

In the northern part of the state, where the precipitation is heavy and the acreage irrigated is small, the streams supply far more water than is needed for the irrigation of the small areas that are watered or for any additional areas on which irrigation is likely to be practiced.

With the exception of a small area in the southeast corner of the state, all the southern part of Idaho, from the eastern border to the western border, is watered by Snake River and its tributaries. The South Fork of Snake River rises in lakes in Yellowstone National Park, flows southward into Wyoming, where it passes through Jackson Lake, and continues southward for about 60 miles, then turns westward into Idaho. From that point Snake River forms a long loop extending first southwesterly and then northwesterly, entirely across the state, after which it flows in a northerly direction, forming the western boundary of Idaho for about 200 miles.

From the junction of the North and South Fork to the point where the Snake reaches the western boundary of the state there are no important tributaries from the north. Numerous streams head in the mountains to the north of the river, but their waters are lost before reaching the river. There are, however, large springs discharging into the river from the north, producing quite an increase in the flow of the river. From the south, on the other hand, there are tributaries reaching the river at intervals throughout its course across the state. The most important of these, in order from east to west, are Blackfoot, Port Neuf, Raft, Salmon Falls, Bruneau, and Owyhee Rivers.

Entering Snake River from the east, in that section where it forms the western boundary of the state, are the Boise, Payette, and Weiser Rivers. All of the tributaries are used for irrigation, but the larger part of the irrigated land is supplied with water from Snake River itself.

Water for use in Idaho is stored in Jackson Lake in Wyoming and to some extent in reservoirs in the valley in Idaho. Any large extension of irrigation from Snake River in Idaho will require storage, and plans for such storage are being investigated by the United States Reclamation Service and other agencies.

Large storage reservoirs have been built on the Boise River by the United States Reclamation Service, from which water is supplied to lands in Oregon as well as in Idaho. There is storage on other tributaries also.

The southeastern corner of the state is watered from Bear River and its tributaries. The normal flow of this stream is largely utilized, and large increase in irrigation will require storage. Rights to water from Bear River are in conflict with rights in Utah, and the rights in the two states have been involved in litigation for many years.



## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED: 1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                       |                        | AREA IRRIGATED. |                       |                              |                            |                                     |
|--------------|------------------|-----------------------|------------------------|-----------------|-----------------------|------------------------------|----------------------------|-------------------------------------|
|              | Number.          | Per cent of increase. | Per cent of all farms. | Acres.          | Per cent of increase. | Per cent of total land area. | Per cent of land in farms. | Per cent of improved land in farms. |
| 1920.....    | 25,283           | 53.8                  | 60.0                   | 2,488,806       | 73.9                  | 4.7                          | 29.7                       | 55.2                                |
| 1910.....    | 16,439           | 78.9                  | 53.4                   | 1,430,848       | 135.1                 | 2.7                          | 27.1                       | 51.5                                |
| 1900.....    | 9,188            | 112.5                 | 52.6                   | 608,718         | 180.5                 | 1.1                          | 19.0                       | 43.1                                |
| 1890.....    | 4,323            | .....                 | 68.5                   | 217,005         | .....                 | 0.4                          | 16.7                       | 35.8                                |

TABLE 3.—ACREAGE CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Number of enterprises. | Area included in enterprises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                     | Area enterprises were capable of irrigating in 1920 (acres). |
|--------------------|------------------------|---|-------------------------|-------------------------------------|--|
|                    |                        |   | Acres.                  | Per cent of acreage in enterprises. |  |
| Total.....         | 3,629                  | 3,780,048                                   | 2,488,806               | 65.8                                | 3,092,810  |
| Before 1860.....   | 10                     | 2,374                                       | 931                     | 39.2                                | 1,271  |
| 1860-1869.....     | 86                     | 69,496                                      | 48,536                  | 69.8                                | 51,143   |
| 1870-1879.....     | 277                    | 139,670                                     | 144,031                 | 78.4                                | 157,604  |
| 1880-1889.....     | 1,013                  | 998,737                                     | 755,633                 | 75.6                                | 880,378  |
| 1890-1899.....     | 420                    | 567,955                                     | 383,053                 | 67.4                                | 520,759  |
| 1900-1904.....     | 368                    | 775,464                                     | 619,677                 | 79.9                                | 716,405  |
| 1905-1909.....     | 372                    | 775,786                                     | 354,143                 | 45.7                                | 544,265  |
| 1910-1914.....     | 316                    | 202,003                                     | 90,870                  | 43.9                                | 116,582  |
| 1915-1919.....     | 149                    | 45,684                                      | 60,355                  | 29.9                                | 67,699   |
| Not reported.....  | 149                    | 45,684                                      | 31,677                  | 69.3                                | 36,774   |

TABLE 4.—ACREAGE CLASSIFIED BY SOURCE OF WATER SUPPLY.

| CLASS.                                  | AREA IRRIGATED (ACRES). |                  |                        |           | Area enterprises were capable of irrigating, 1920 (acres). | Area included in enterprises, 1920 (acres). |
|---|-------------------------|------------------|------------------------|-----------|--|---|
|   | 1919                    | 1909             | Increase. <sup>1</sup> |           |  |   |
|   |                         |                  | Acres.                 | Per cent. |  |   |
| Total.....                              | 2,488,806               | 1,430,848        | 1,057,958              | 73.9      | 3,092,810  | 3,780,048                                   |
| Stream, gravity.....                    | 2,274,959               | 1,383,718        | 891,241                | 64.4      | 2,800,479  | 3,351,426                                   |
| Stream, pumped.....                     | 107,181                 | 18,685           | 88,496                 | 47.3      | 131,559  | 158,026                                     |
| Stream, pumped and gravity.....         | 1,870                   | ( <sup>2</sup> ) | .....                  | .....     | 4,470  | 5,670                                       |
| Wells, pumped.....                      | 414                     | -705             | -291                   | -41.3     | 513  | 903   |
| Wells, flowing.....                     | 1,131                   | -1,172           | -41                    | -3.5      | 1,241  | 3,492                                       |
| Lake, gravity.....                      | 2,492                   | -4,622           | -2,130                 | -46.1     | 4,030  | 33,773                                      |
| Lake, pumped.....                       | 4,912                   | 1,535            | 3,377                  | 220.0     | 9,206  | 11,991                                      |
| Springs.....                            | 33,337                  | 19,679           | 13,658                 | 69.4      | 48,461   | 80,566                                      |
| Stored storm water.....                 | 2,590                   | 782              | 1,858                  | 253.8     | 4,420  | 9,480                                       |
| Sewage.....                             | 80                      | ( <sup>2</sup> ) | .....                  | .....     | 150  | 150   |
| Stream, gravity, and pumped wells.....  | 357                     | ( <sup>2</sup> ) | .....                  | .....     | 358  | 383   |
| Stream, gravity, and flowing wells..... | 1,927                   | ( <sup>2</sup> ) | .....                  | .....     | 1,967  | 2,388                                       |
| Other mixed.....                        | 54,601                  | ( <sup>2</sup> ) | .....                  | .....     | 82,906   | 118,590                                     |
| Other and not reported                  | 2,955                   | ( <sup>2</sup> ) | .....                  | .....     | 3,050  | 3,210                                       |

<sup>1</sup> A minus sign (—) denotes decrease. <sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

The original irrigation district law in Idaho was enacted in 1895, and it has been amended from time to time since that date. Generally, in Idaho, irrigation districts have not built irrigation works, but have been organized to take over works built by other agencies. Some of the larger commercial enterprises

reported in 1910 have been taken over by districts, and this accounts for the decrease in the acreage reported for commercial enterprises. Much of the land served by the United States Reclamation Service has been organized into districts, but the acreage is credited to the Reclamation Service because the Government constructed the works and still controls them to a large extent. The Reclamation Service also supplies stored water to about 650,000 acres of land in other enterprises under the terms of the "Warren Act" (act of Congress, Feb. 21, 1911) and other special arrangements.

The state of Idaho accepted the terms of the Federal Carey Act (act of Congress, Aug. 18, 1894) in 1895, and this law has been amended from time to time. Some enterprises originally begun under this act have been reorganized in other forms and are reported under these in Table 5.

The small acreage credited to the state belongs to a state institution, and does not represent a scheme of state construction of irrigation works.

TABLE 5.—ACREAGE CLASSIFIED BY CHARACTER OF ENTERPRISE.

| ITEM AND CLASS.                                 | CENSUS OF— |           | INCREASE. <sup>1</sup> |          |
|---|------------|-----------|------------------------|----------|
|   | 1920       | 1910      | Amount.                | Percent. |
| ACREAGE IRRIGATED.                              |            |           |                        |          |
| Total.....                                      | 2,488,806  | 1,430,848 | 1,057,958              | 73.9     |
| Individual and partnership.....                 | 513,350    | 403,600   | 109,750                | 27.2     |
| Cooperative.....                                | 938,421    | 628,102   | 310,319                | 49.4     |
| Irrigation district.....                        | 355,995    | 140,930   | 215,065                | 152.6    |
| Carey act.....                                  | 383,833    | 162,418   | 221,415                | 136.3    |
| Commercial.....                                 | 6,503      | 44,872    | -38,369                | -85.5    |
| U. S. Reclamation Service.....                  | * 283,759  | 47,500    | 236,259                | 494.2    |
| U. S. Indian Service.....                       | 36,775     | 3,426     | 33,349                 | 975.4    |
| State.....                                      | 10         | (*)       | 10                     | .....    |
| City.....                                       | 160        | (*)       | 160                    | .....    |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |            |           |                        |          |
| Total.....                                      | 3,092,810  | 2,388,959 | 703,851                | 29.5     |
| Individual and partnership.....                 | 639,002    | 483,946   | 155,056                | 32.0     |
| Cooperative.....                                | 1,190,422  | 782,603   | 407,819                | 52.1     |
| Irrigation district.....                        | 400,352    | 177,900   | 222,452                | 125.1    |
| Carey Act.....                                  | 523,090    | 742,618   | -219,528               | -29.6    |
| Commercial.....                                 | 7,747      | 67,352    | -59,605                | -88.5    |
| U. S. Reclamation Service.....                  | * 289,992  | 113,000   | 176,992                | 156.6    |
| U. S. Indian Service.....                       | 42,005     | 21,540    | 20,465                 | 95.0     |
| State.....                                      | 10         | (*)       | 10                     | .....    |
| City.....                                       | 160        | (*)       | 160                    | .....    |
| ACREAGE IN ENTERPRISES.                         |            |           |                        |          |
| Total.....                                      | 3,780,048  | 3,549,573 | 230,475                | 6.5      |
| Individual and partnership.....                 | 850,215    | 678,508   | 171,707                | 25.7     |
| Cooperative.....                                | 1,442,477  | 993,746   | 448,731                | 45.2     |
| Irrigation district.....                        | 463,339    | 329,766   | 133,573                | 40.6     |
| Carey Act.....                                  | 664,404    | 1,098,661 | -434,257               | -39.5    |
| Commercial.....                                 | 8,551      | 104,322   | -95,771                | -91.8    |
| U. S. Reclamation Service.....                  | * 295,992  | 295,000   | 992                    | 0.3      |
| U. S. Indian Service.....                       | 54,240     | 51,540    | 2,700                  | 5.2      |
| State.....                                      | 10         | (*)       | 10                     | .....    |
| City.....                                       | 320        | (*)       | 320                    | .....    |

<sup>1</sup> A minus sign (—) denotes decrease.

<sup>2</sup> Does not include about 650,000 acres to which stored water is supplied under "Warren Act."

<sup>3</sup> Not included in classification in 1910.

## ACREAGE BY CHARACTER OF WATER RIGHTS.

The territory of Idaho was organized under the act of March 3, 1863, and the state was admitted to the Union in 1890.

Rights to water from streams and other sources are subject to control by the state. The laws of Idaho



relating to water rights are summarized in the following paragraphs:

During the territorial period, in 1881, a law was passed recognizing the right to take or "appropriate" water from streams for useful or beneficial purposes, and providing that the appropriator must post a notice of the intended appropriation at the point of diversion and must file a copy of the notice in the county records. Laws passed in 1895 and 1899 retained this provision for posting and filing, and the act of 1899 provided further that all claimants to water must file statements of their claims within six months after the passage of the act. These provisions were in effect until 1903.

The act of March 11, 1903, provided that any party wishing to acquire a right to water must apply to the state engineer for a permit, and must, later, submit proof of having built works and put the water to use in accordance with the terms of the permit, and that, if the applicant complied with the terms of the permit the state engineer should issue a certificate of completion of works, and a license defining the rights acquired. This law is still in effect.

The act of March 11, 1903, provided, further, for the appointment of state officials to distribute water to those entitled to its use, and for the bringing of suits by these officials for the defining of rights to water, that is for adjudication of rights by the courts. The latter provision of the law was declared unconstitutional (*Bear Lake v. Budge*, 9 Idaho, 703). Rights are adjudicated in ordinary suits between claimants but can be begun only by the claimants.

Article 15 of the state constitution, adopted August 6, 1889, provides that "the right to divert and appropriate the unappropriated waters of any natural stream to beneficial uses shall never be denied."

Riparian rights are not recognized in Idaho.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED.

| CLASS.                                 | 1919      |                    | 1909               |
|--|-----------|--------------------|--------------------|
|  | Acres.    | Per cent of total. | Per cent of total. |
| Total.....                             | 2,488,806 | 100                | 100                |
| Appropriation and use.....             | 130,774   | 5.3                | 13.0               |
| Notice filed and posted.....           | 238,637   | 0.6                | 25.4               |
| Adjudicated by court.....              | 1,104,607 | 44.4               | 30.9               |
| Permit from state.....                 | 490,979   | 19.6               | 18.6               |
| Certificate or license from state..... | 338,958   | 13.6               | 0.1                |
| Riparian rights.....                   | 18,389    | 0.6                | 0.1                |
| Underground.....                       | 1,834     | ( <sup>1</sup> )   | ( <sup>2</sup> )   |
| Other and mixed.....                   | 55,595    | 2.3                | ( <sup>2</sup> )   |
| Not reported.....                      | 100,033   | 4.6                | ( <sup>2</sup> )   |

<sup>1</sup> Less than one-tenth of 1 per cent.

<sup>2</sup> This class was not included in the tabulation in 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

#### ACREAGE BY DRAINAGE BASINS.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASINS.

| DRAINAGE BASIN.                          | AREA IRRIGATED (ACRES). |                  |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|--|-------------------------|------------------|------------------------------------|---|--|
|  | 1919                    | 1902             | Per cent of increase. <sup>1</sup> |   |  |
| The state.....                           | 2,488,806               | 713,595          | 248.8                              | 3,780,048                                   | 3,092,810  |
| Bear River and tributaries.....          | 214,106                 | 99,691           | 114.8                              | 321,804                                     | 247,106  |
| Bear River direct.....                   | 107,063                 | 15,912           | 572.8                              | 149,901                                     | 127,642  |
| Thomas Fork.....                         | 8,905                   | 6,116            | 45.6                               | 8,929                                       | 8,905  |
| Mill Creek.....                          | 2,973                   | 6,561            | -54.7                              | 10,028                                      | 8,238  |
| Little Malad Creek.....                  | 16,679                  | 9,024            | 84.8                               | 43,404                                      | 17,128   |
| Other tributaries of Bear River.....     | 78,486                  | 262,078          | 26.4                               | 109,542                                     | 88,253   |
| S Snake River and tributaries.....       | 2,163,892               | 569,286          | 280.1                              | 3,102,573                                   | 2,660,920  |
| S Snake River direct.....                | 716,908                 | 64,832           | .....                              | 889,892                                     | 849,610  |
| Henry's Fork.....                        | 208,534                 | 85,793           | 143.1                              | 325,114                                     | 286,514  |
| South Fork of Snake River.....           | 151,597                 | 52,326           | 189.7                              | 207,292                                     | 192,473  |
| Blackfoot River.....                     | 53,910                  | 9,035            | 496.7                              | 77,255                                      | 60,225   |
| Port Neuf River.....                     | 37,996                  | 18,528           | 105.1                              | 75,923                                      | 59,270   |
| Raft River.....                          | 23,620                  | 23,793           | -0.7                               | 42,906                                      | 26,436   |
| Salmon Falls River.....                  | 41,330                  | ( <sup>3</sup> ) | .....                              | 87,260                                      | 49,020   |
| Little Wood River.....                   | 30,153                  | ( <sup>3</sup> ) | .....                              | 97,867                                      | 55,475   |
| Big Wood River.....                      | 117,748                 | 33,961           | 246.7                              | 203,795                                     | 178,497  |
| Bruneau River.....                       | 21,301                  | 12,865           | 65.6                               | 35,043                                      | 23,511   |
| Owyhee River.....                        | 10,903                  | ( <sup>3</sup> ) | .....                              | 17,241                                      | 11,760   |
| Boise River.....                         | 328,395                 | 84,438           | 288.9                              | 388,313                                     | 368,854  |
| Payette River.....                       | 123,072                 | 50,893           | 141.8                              | 165,142                                     | 117,011  |
| Weiser River.....                        | 58,869                  | 20,769           | 119.9                              | 79,925                                      | 69,718   |
| Salmon River.....                        | 115,108                 | 46,243           | 148.9                              | 224,527                                     | 163,036  |
| Clearwater River.....                    | 4,623                   | 1,944            | 137.8                              | 5,777                                       | 5,545  |
| Coeur d'Alene Lake and River.....        | 4,161                   | ( <sup>3</sup> ) | .....                              | 10,469                                      | 5,681  |
| Other tributaries of Snake River.....    | 115,664                 | 257,866          | 99.0                               | 168,832                                     | 137,393  |
| Other tributaries of Columbia River..... | 895                     | 2607             | 47.4                               | 2,420                                       | 1,904  |
| Independent streams.....                 | 109,913                 | 44,011           | 149.7                              | 353,251                                     | 182,811  |
| Camas Creek.....                         | 17,490                  | 4,107            | 325.9                              | 95,199                                      | 46,190   |
| Beaver Creek.....                        | 1,502                   | 2,330            | -35.5                              | 2,590                                       | 1,970  |
| Medicine Lodge.....                      | 5,019                   | 3,225            | 55.6                               | 12,445                                      | 8,390  |
| Little Lost River.....                   | 11,552                  | 6,825            | 69.3                               | 31,452                                      | 18,732   |
| Big Lost River.....                      | 72,788                  | 23,547           | 200.1                              | 204,845                                     | 105,727  |
| Other independent streams.....           | 1,562                   | 23,977           | -60.7                              | 6,720                                       | 1,802  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when it is not more than 1.000.

<sup>2</sup> Includes springs and wells.

<sup>3</sup> Not reported separately in 1902.

#### CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                                    |
|--------------|--------------|-----------------------|-------------------|------------------------------------|
|              |              |                       | Amount.           | Per cent of increase. <sup>1</sup> |
| 1920.....    | \$91,501,009 | 123.3                 | 29.59             | 72.5                               |
| 1910.....    | 40,977,688   | 700.3                 | 17.15             | 352.5                              |
| 1900.....    | 5,120,399    | 397.6                 | 3.79              | -20.0                              |
| 1890.....    | 1,029,000    | .....                 | 4.74              | .....                              |

<sup>1</sup> A minus sign (-) denotes decrease.

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE.             | Amount.      | Per cent of total. | Average per acre. |
|-------------------|--------------|--------------------|-------------------|
| Total.....        | \$91,501,009 | 100.0              | \$29.59           |
| Before 1880.....  | 3,137        | .....              | 2.47              |
| 1880-1889.....    | 881,963      | 1.0                | 17.25             |
| 1870-1879.....    | 1,024,629    | 1.1                | 6.50              |
| 1880-1889.....    | 13,791,700   | 15.1               | 15.67             |
| 1890-1899.....    | 9,088,738    | 9.9                | 17.45             |
| 1900-1904.....    | 25,892,006   | 28.3               | 36.14             |
| 1905-1909.....    | 34,081,217   | 37.3               | 62.62             |
| 1910-1914.....    | 3,795,869    | 4.1                | 32.58             |
| 1915-1919.....    | 2,227,426    | 2.4                | 32.95             |
| Not reported..... | 714,324      | 0.8                | 19.42             |

**TABLE 10.—CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE, CLASSIFIED BY SOURCE OF WATER SUPPLY.**

NOTE.—When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.

| CLASS.                                  | CAPITAL INVESTED. |                    |                   | OPERATION AND MAINTENANCE.               |                        |
|---|-------------------|--------------------|-------------------|--|------------------------|
|   | Amount.           | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. |
| Total.....                              | \$91,501,009      | 100.0              | \$29.59           | 2,105,336                                | \$1.17                 |
| Stream, gravity.....                    | 81,823,379        | 89.4               | 29.22             | 1,920,057                                | 1.02                   |
| Stream, pumped.....                     | 5,108,912         | 5.6                | 38.83             | 99,378                                   | 3.43                   |
| Stream, pumped and gravity.....         | 168,200           | 0.2                | 37.03             | 1,320                                    | 8.30                   |
| Wells, pumped.....                      | 24,935            | ( <sup>1</sup> )   | 48.61             | 250                                      | 5.35                   |
| Wells, flowing.....                     | 33,652            | ( <sup>1</sup> )   | 27.12             | 271                                      | 0.85                   |
| Lake, pumped.....                       | 544,981           | 0.6                | 59.20             | 3,412                                    | 6.72                   |
| Lake, gravity.....                      | 276,837           | 0.3                | 68.69             | 2,162                                    | 1.76                   |
| Springs.....                            | 980,189           | 1.1                | 20.23             | 24,889                                   | 0.80                   |
| Stored storm water.....                 | 246,257           | 0.3                | 55.71             | 2,245                                    | 0.89                   |
| Sewage.....                             | 200               | ( <sup>1</sup> )   | 1.33              | 80                                       | 0.31                   |
| Stream, gravity and wells, pumped.....  | 59,700            | 0.1                | 166.76            | 4  | 1.00                   |
| Stream, gravity and wells, flowing..... | 39,150            | ( <sup>1</sup> )   | 19.90             | 1,745                                    | 0.47                   |
| Other mixed.....                        | 2,181,887         | 2.4                | 26.32             | 46,068                                   | 1.99                   |
| Other and not reported.....             | 12,730            | .....              | 4.17              | 2,855                                    | 0.41                   |

<sup>1</sup> Less than one-tenth of 1 per cent.**TABLE 11.—CAPITAL INVESTED, 1920 AND 1902, CLASSIFIED BY DRAINAGE BASINS.**

| DRAINAGE BASIN.                          | 1920         | 1902             | INCREASE. <sup>1</sup> |           |
|--|--------------|------------------|------------------------|-----------|
|  |              |                  | Amount.                | Per cent. |
| Total.....                               | \$91,501,009 | \$6,190,071      | \$85,310,938           | .....     |
| Bear River and tributaries.....          | 3,328,007    | 594,511          | 2,823,496              | 559.7     |
| Bear River direct.....                   | 2,066,991    | 98,080           | 1,968,911              | .....     |
| Thomas Fork.....                         | 25,389       | 16,210           | 9,179                  | 56.6      |
| Mill Creek.....                          | 21,012       | 18,640           | 2,372                  | 12.7      |
| Little Malad Creek.....                  | 332,175      | 30,945           | 301,230                | 973.4     |
| Other tributaries of Bear River.....     | 882,440      | * 340,636        | 541,804                | 159.1     |
| S Snake River and tributaries.....       | 84,317,216   | 5,529,005        | 78,788,211             | .....     |
| Snake River direct.....                  | 35,847,491   | 553,796          | 35,293,695             | .....     |
| Henrys Fork.....                         | 2,001,841    | 428,430          | 1,573,411              | 367.3     |
| South Fork of Snake River.....           | 6,193,701    | 633,698          | 5,560,003              | 877.4     |
| Blackfoot River.....                     | 1,022,276    | 43,690           | 978,586                | .....     |
| Port Neuf River.....                     | 1,141,528    | 58,255           | 1,083,273              | .....     |
| Raft River.....                          | 100,928      | 46,635           | 54,293                 | 116.4     |
| Salmon Falls River.....                  | 4,152,745    | ( <sup>2</sup> ) | 4,152,745              | .....     |
| Little Wood River.....                   | 1,016,699    | ( <sup>2</sup> ) | 1,016,699              | .....     |
| Big Wood River.....                      | 5,395,133    | 239,228          | 5,155,905              | .....     |
| Bruneau River.....                       | 532,745      | 234,250          | 298,495                | 127.4     |
| Owyhee River.....                        | 64,467       | ( <sup>2</sup> ) | 64,467                 | .....     |
| Boise River.....                         | 16,013,734   | 1,674,583        | 14,339,151             | 856.3     |
| Payette River.....                       | 2,915,780    | 685,232          | 2,230,548              | 325.5     |
| Weiser River.....                        | 2,018,450    | 116,601          | 1,901,849              | .....     |
| Salmon River.....                        | 1,175,362    | 212,668          | 962,694                | 452.7     |
| Clearwater River.....                    | 298,755      | 90,585           | 208,170                | 229.8     |
| Coeur d'Alene Lake and River.....        | 576,674      | ( <sup>2</sup> ) | 576,674                | .....     |
| Other tributaries of Snake River.....    | 3,848,907    | * 511,854        | 3,337,053              | 652.7     |
| Other tributaries of Columbia River..... | 27,180       | 5,395            | 21,785                 | 403.8     |
| Independent streams.....                 | 3,826,606    | 151,160          | 3,675,446              | .....     |
| Camas Creek.....                         | 578,627      | 6,263            | 572,364                | .....     |
| Beaver Creek.....                        | 7,259        | 4,290            | 2,969                  | 69.2      |
| Medicine Lodge.....                      | 31,690       | 3,800            | 27,890                 | 773.9     |
| Little Lost River.....                   | 474,465      | 32,710           | 441,755                | .....     |
| Big Lost River.....                      | 2,709,698    | 79,717           | 2,629,981              | .....     |
| Other independent streams.....           | 26,867       | * 24,380         | 2,487                  | 10.2      |

<sup>1</sup> Per cent not shown when it is more 1,000.<sup>2</sup> Includes springs and wells.<sup>3</sup> Not reported separately in 1902.

In classifying capital invested by type of enterprise (Table 12) the average capital invested per acre is not presented, for the reason that it is not possible to compute this correctly. The United States Reclamation Service supplies stored water to enterprises controlled by agencies of most of the other classes shown in the table and a part of its expenditure is properly

chargeable to those lands; but it is not possible to tell how much should be so charged or how it should be distributed among the various classes.

**TABLE 12.—CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE, CLASSIFIED BY CHARACTER OF ENTERPRISE.**

NOTE.—When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.

| CLASS.                          | CAPITAL INVESTED. |                    | OPERATION AND MAINTENANCE.               |                        |
|---------------------------------|-------------------|--------------------|--|------------------------|
|                                 | Amount.           | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. |
| Total.....                      | \$91,501,009      | 100.0              | 2,105,336                                | \$1.17                 |
| Individual and partnership..... | 5,747,094         | 6.3                | 383,430                                  | 0.75                   |
| Cooperative.....                | 36,576,664        | 40.0               | 780,006                                  | 0.72                   |
| Irrigation district.....        | 11,954,046        | 13.1               | 287,415                                  | 2.11                   |
| Commercial.....                 | 698,179           | 0.8                | 5,533                                    | 2.68                   |
| Carey Act.....                  | 17,772,590        | 19.4               | 360,063                                  | 1.23                   |
| U. S. Reclamation Service.....  | 17,804,839        | 19.6               | 253,759                                  | 1.98                   |
| U. S. Indian Service.....       | 932,387           | 0.8                | 35,000                                   | 1.55                   |
| City.....                       | 14,300            | ( <sup>1</sup> )   | 160                                      | 1.56                   |
| State.....                      | 1,000             | .....              | .....                                    | .....                  |

<sup>1</sup> Less than one-tenth of 1 per cent.**DRAINAGE OF IRRIGATED LAND.**

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

**TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE.**

|  |         |
|--|---------|
| Number of enterprises reporting land drained or needing drainage.....  | 206     |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 734,405 |
| Acreage for which drains have been installed.....  | 81,187  |
| Additional acreage needing drainage.....   | 94,934  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises, reporting drainage.....                                | 11.1    |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 2.1     |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 4.7     |

**QUANTITY OF WATER USED.**

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

**TABLE 14.—QUANTITY OF WATER USED IN 1919.**

| ITEMS.   | Total.     | Measured. | Not measured. |
|--|------------|-----------|---------------|
| Average volume entering canals.....second-feet.. | 43,481     | 35,689    | 7,812         |
| Area irrigated in 1919.....acres..               | 1,750,265  | 1,472,586 | 277,679       |
| Average number of acres per second-foot..        | 40         | 41        | 36            |
| Total quantity entering canals.....acre-feet..   | 11,142,792 | 9,571,753 | 1,571,039     |
| Area irrigated in 1919.....acres..               | 1,724,581  | 1,465,482 | 259,099       |
| Average quantity per acre.....acre-feet..        | 6.5        | 6.5       | 6.1           |
| Total quantity delivered.....acre-feet..         | 2,269,233  | 2,045,769 | 223,464       |
| Area irrigated in 1919.....acres..               | 936,689    | 841,667   | 95,022        |
| Average quantity per acre.....acre-feet..        | 2.4        | 2.4       | 2.4           |

## IRRIGATION—IDAHO.

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE.             | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|-------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                   |                           |                         | Number.       | Capacity (second-foot). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....        | 2,872                     | 288                     | 4,553         | 86,273                  | 11,144          | 5,265            | 6,154           | 249         | 3,493,511             |
| Before 1860.....  | 5                         | 2                       | 10            | 33                      | 13              | 29               | 7               | 8           | 551                   |
| 1860-1869.....    | 144                       | 22                      | 147           | 1,863                   | 279             | 98               | 119             | 2           | 1,206                 |
| 1870-1879.....    | 268                       | 10                      | 376           | 4,348                   | 666             | 245              | 208             | 15          | 5,278                 |
| 1880-1889.....    | 917                       | 46                      | 1,304         | 28,264                  | 3,287           | 1,141            | 1,188           | 25          | 34,526                |
| 1890-1899.....    | 490                       | 38                      | 850           | 16,320                  | 2,099           | 688              | 855             | 32          | 213,793               |
| 1900-1904.....    | 282                       | 43                      | 507           | 14,326                  | 1,423           | 261              | 1,555           | 39          | 1,540,723             |
| 1905-1909.....    | 270                       | 49                      | 447           | 13,412                  | 1,816           | 2,130            | 1,843           | 55          | 1,408,308             |
| 1910-1914.....    | 226                       | 38                      | 452           | 4,498                   | 859             | 325              | 237             | 41          | 104,507               |
| 1915-1919.....    | 179                       | 36                      | 287           | 2,276                   | 470             | 247              | 95              | 25          | 184,064               |
| Not reported..... | 91                        | 4                       | 173           | 933                     | 252             | 71               | 47              | 7           | 25                    |

| DATE.             | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|-------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                   |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                   |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
|                   |                             |                |                                |               |                                |                 |                                |         |                                |
| Total.....        | 180.6                       | 142            | 15,133                         | 53            | 17,749                         | 143             | 28,364                         | 232     | 1,397,681                      |
| Before 1860.....  |                             | 2              | 150                            |               |                                |                 |                                |         |                                |
| 1860-1869.....    | 21.4                        | 4              | 186                            |               |                                | 1               | 5                              | 1       | 450                            |
| 1870-1879.....    | 0.3                         | 34             | 5,115                          |               |                                | 1               | 10                             | 1       | 600                            |
| 1880-1889.....    | 7.8                         | 8              | 1,090                          |               |                                | 7               | 786                            | 7       | 30,000                         |
| 1890-1899.....    | 7.2                         | 16             | 2,276                          | 2             | 125                            | 7               | 64                             | 9       | 2,435                          |
| 1900-1904.....    | 31.3                        | 15             | 2,909                          | 1             | 27                             | 10              | 9,505                          | 43      | 850,812                        |
| 1905-1909.....    | 35.9                        | 9              | 1,206                          | 4             | 1,290                          | 28              | 3,276                          | 43      | 170,909                        |
| 1910-1914.....    | 25.7                        | 20             | 211                            | 18            | 11,250                         | 33              | 12,880                         | 61      | 206,651                        |
| 1915-1919.....    | 18.8                        | 28             | 1,900                          | 27            | 5,057                          | 49              | 1,544                          | 60      | 128,822                        |
| Not reported..... | 34.2                        | 6              | 90                             | 1             |                                | 7               | 294                            | 7       | 7,002                          |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE, 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-foot). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 2,872                     | 288                     | 4,553         | 86,273                  | 11,144          | 5,265            | 6,154           | 249         | 3,493,511             |
| Individual and partnership..... | 2,445                     | 187                     | 3,945         | 23,946                  | 5,505           | 2,198            | 821             | 164         | 41,247                |
| Cooperative.....                | 341                       | 70                      | 481           | 37,081                  | 8,251           | 1,249            | 2,181           | 56          | 1,076,464             |
| Irrigation district.....        | 48                        | 10                      | 79            | 10,051                  | 927             | 186              | 698             | 9           | 169,500               |
| Carey Act.....                  | 27                        | 12                      | 31            | 10,802                  | 1,047           | 221              | 1,655           | 9           | 479,600               |
| Commercial.....                 | 5                         | 3                       | 6             | 144                     | 18              | 56               | 85              | 3           | 33,000                |
| U. S. Reclamation Service.....  | 4                         | 5                       | 6             | 3,487                   | 336             | 1,290            | 604             | 6           | 1,493,700             |
| U. S. Indian Service.....       | 1                         | 1                       | 3             | 728                     | 57              | 40               | 150             | 2           | 200,000               |
| State.....                      |                           |                         |               |                         |                 |                  |                 |             |                       |
| Other and not reported.....     | 1                         |                         | 2             | 34                      | 3               | 25               | 10              |             |                       |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                                 |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
|                                 |                             |                |                                |               |                                |                 |                                |         |                                |
| Total.....                      | 180.6                       | 142            | 15,133                         | 53            | 17,749                         | 143             | 28,364                         | 225     | 1,397,681                      |
| Individual and partnership..... |                             |                |                                |               |                                |                 |                                |         |                                |
| Cooperative.....                | 67.1                        | 135            | 12,682                         | 50            | 8,689                          | 96              | 1,297                          | 97      | 124,982                        |
| Irrigation district.....        | 52.3                        | 7              | 2,451                          |               |                                | 22              | 4,621                          | 46      | 162,220                        |
| Carey Act.....                  | 38.8                        |                |                                | 2             | 9,000                          | 21              | 13,190                         | 44      | 260,319                        |
| Commercial.....                 | 8.9                         |                |                                |               |                                | 1               | 746                            | 25      |                                |
| U. S. Reclamation Service.....  | 1.7                         |                |                                |               |                                |                 |                                |         |                                |
| U. S. Indian Service.....       | 8.9                         |                |                                |               |                                | 2               | 8,500                          | 12      | 850,000                        |
| State.....                      | 0.8                         |                |                                |               |                                |                 |                                |         |                                |
| Other and not reported.....     | 0.1                         |                |                                | 1             | 60                             | 1               | 10                             | 1       | 160                            |
|                                 | 2.0                         |                |                                |               |                                |                 |                                |         |                                |

## 9

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASINS, 1920.

| DRAINAGE BASIN.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|  |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                               | 2,872                     | 288                     | 4,553         | 86,273                  | 11,144          | 5,265            | 6,154           | 249         | 3,493,511             |
| Bear River and tributaries.....          | 498                       | 80                      | 429           | 5,030                   | 1,697           | 375              | 379             | 33          | 28,358                |
| Bear River direct.....                   | 59                        | 6                       | 80            | 2,094                   | 245             | 122              | 199             | 9           | 3,650                 |
| Thomas Fork.....                         | 25                        | -----                   | 29            | 203                     | 63              | -----            | -----           | -----       | -----                 |
| Mill Creek.....                          | 4                         | -----                   | 8             | 27                      | 38              | 4                | 2               | -----       | -----                 |
| Little Malad Creek.....                  | 190                       | 58                      | 12            | 400                     | 788             | 49               | 49              | 4           | 12,788                |
| Other tributaries of Bear River.....     | 220                       | 16                      | 300           | 2,306                   | 563             | 200              | 129             | 20          | 11,911                |
| Snake River and tributaries.....         | 2,055                     | 190                     | 3,676         | 74,625                  | 8,571           | 4,350            | 5,483           | 201         | 3,320,425             |
| Snake River direct.....                  | 58                        | 9                       | 132           | 18,257                  | 845             | 1,253            | 2,431           | 6           | 1,790,000             |
| Henrys Fork.....                         | 226                       | 25                      | 274           | 12,693                  | 750             | 340              | 437             | 20          | 8,462                 |
| South Fork of Snake River.....           | 112                       | 7                       | 146           | 8,609                   | 451             | 161              | 620             | 7           | 15,332                |
| Blackfoot River.....                     | 43                        | 3                       | 45            | 1,214                   | 152             | 136              | 172             | 3           | 200,060               |
| Port Neuf River.....                     | 101                       | 7                       | 149           | 1,274                   | 345             | 58               | 76              | 10          | 59,226                |
| Raft River.....                          | 101                       | 2                       | 99            | 642                     | 133             | 42               | 250             | -----       | -----                 |
| Salmon Falls River.....                  | 46                        | 6                       | 48            | 1,857                   | 102             | 56               | 80              | 6           | 208,600               |
| Little Wood River.....                   | 89                        | 9                       | 107           | 1,883                   | 234             | 22               | 7               | 2           | 40,000                |
| Big Wood River.....                      | 138                       | 15                      | 234           | 4,765                   | 421             | 108              | 443             | 13          | 191,993               |
| Bruneau River.....                       | 110                       | 17                      | 132           | 771                     | 172             | 133              | 86              | 11          | 10,722                |
| Owyhee River.....                        | 71                        | 17                      | 105           | 428                     | 62              | 10               | 5               | 9           | 7,100                 |
| Boise River.....                         | 70                        | 14                      | 193           | 6,669                   | 801             | 744              | 191             | 18          | 573,203               |
| Payette River.....                       | 51                        | 12                      | 267           | 4,450                   | 645             | 63               | 140             | 17          | 63,284                |
| Weiser River.....                        | 30                        | 9                       | 134           | 1,822                   | 389             | 31               | 89              | 10          | 95,796                |
| Salmon River.....                        | 363                       | 12                      | 980           | 4,747                   | 1,423           | 898              | 270             | 14          | 2,183                 |
| Clearwater River.....                    | 2                         | 2                       | 13            | 69                      | 23              | 8                | 1               | 6           | 4                     |
| Coeur d'Alene Lake and River.....        | 19                        | 3                       | 15            | 110                     | 19              | 18               | 22              | 5           | 600                   |
| Other tributaries of Snake River.....    | 387                       | 31                      | 598           | 4,255                   | 1,564           | 219              | 243             | 44          | 55,860                |
| Other tributaries of Columbia River..... | 16                        | 1                       | 19            | 190                     | 9               | 50               | 4               | 1           | 416                   |
| Independent streams.....                 | 303                       | 17                      | 429           | 6,428                   | 867             | 490              | 283             | 14          | 144,312               |
| Camas Creek.....                         | 81                        | 6                       | 97            | 3,042                   | 165             | 159              | 112             | 5           | 65,179                |
| Beaver Creek.....                        | 27                        | 1                       | 34            | 72                      | 23              | 2                | 4               | 1           | 35                    |
| Medicine Lodge.....                      | 62                        | 1                       | 72            | 266                     | 61              | 127              | 44              | 2           | 412                   |
| Little Lost River.....                   | 33                        | 2                       | 59            | 774                     | 101             | 15               | 7               | 2           | 22,000                |
| Big Lost River.....                      | 98                        | 7                       | 160           | 2,237                   | 491             | 183              | 119             | 4           | 56,686                |
| Other independent streams.....           | 2                         | -----                   | 7             | 37                      | 26              | 4                | 2               | -----       | -----                 |

[illegible]

## IRRIGATION—IDAHO.

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE, 1919 AND 1909.

NOTE.—Totals for the state, used in making comparisons, are reported in state bulletin on agriculture.

| CROP.                                  | AREA HARVESTED. |                              |                  |                              |                                    | QUANTITY HARVESTED. |           |                              |                  |                              |                                    |
|--|-----------------|------------------------------|------------------|------------------------------|------------------------------------|---------------------|-----------|------------------------------|------------------|------------------------------|------------------------------------|
|  | 1919            |                              | 1909             |                              | Per cent of increase. <sup>1</sup> | Unit.               | 1919      |                              | 1909             |                              | Per cent of increase. <sup>1</sup> |
|  | Acres.          | Per cent of total for state. | Acres.           | Per cent of total for state. |                                    |                     | Amount.   | Per cent of total for state. | Amount.          | Per cent of total for state. |                                    |
| <b>Cereals:</b>                        |                 |                              |                  |                              |                                    |                     |           |                              |                  |                              |                                    |
| 1 Corn.....                            | 10,994          | 47.2                         | 2,041            | 22.2                         | 438.7                              | Bu.....             | 383,740   | 59.9                         | 68,490           | 21.5                         | 460.3                              |
| 2 Oats.....                            | 42,487          | 30.0                         | 147,827          | 48.8                         | -71.3                              | Bu.....             | 1,232,895 | 40.2                         | 5,667,718        | 50.0                         | -78.2                              |
| 3 Winter wheat.....                    | 20,306          | 4.6                          | 106,923          | 26.8                         | 199.0                              | Bu.....             | 360,211   | 5.8                          | 2,860,976        | 27.9                         | 170.0                              |
| 4 Spring wheat.....                    | 299,360         | 42.5                         | 13,287           | 10.0                         | 48.0                               | Bu.....             | 7,364,943 | 63.1                         | 428,775          | 9.3                          | 26.1                               |
| 5 Barley.....                          | 19,667          | 29.0                         | 355              | 11.1                         | 561.4                              | Bu.....             | 540,749   | 40.1                         | 4,688            | 11.6                         | 321.3                              |
| 6 Rye.....                             | 2,414           | 20.2                         |                  |                              |                                    | Bu.....             | 19,751    | 24.1                         |                  |                              |                                    |
| <b>Other grains and seeds:</b>         |                 |                              |                  |                              |                                    |                     |           |                              |                  |                              |                                    |
| 7 Red clover seed.....                 | 14,814          | 87.0                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 57,195    | 91.1                         | ( <sup>2</sup> ) |                              |                                    |
| 8 Other clover and alfalfa seed.....   | 8,955           | 66.8                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 33,442    | 74.9                         | ( <sup>2</sup> ) |                              |                                    |
| 9 Timothy seed.....                    | 537             | 16.6                         | 215              | 14.3                         | 149.8                              | Bu.....             | 1,286     | 11.4                         | 1,387            | 13.9                         | -7.3                               |
| 10 Dry beans, navy, etc.....           | 10,150          | 29.9                         | 298              | 15.6                         |                                    | Bu.....             | 188,086   | 54.6                         | 2,983            | 8.8                          |                                    |
| 11 Dry peas, Canada.....               | 9,443           | 53.5                         | 68               | 29.1                         |                                    | Bu.....             | 153,017   | 60.9                         | 1,850            | 37.9                         |                                    |
| <b>Hay and forage:</b>                 |                 |                              |                  |                              |                                    |                     |           |                              |                  |                              |                                    |
| 12 Timothy alone.....                  | 17,686          | 21.4                         | 24,842           | 24.2                         | -28.8                              | Ton....             | 22,360    | 30.8                         | 47,386           | 33.8                         | -52.8                              |
| 13 Timothy and clover mixed.....       | 48,603          | 47.6                         | 33,418           | 61.9                         | 45.4                               | Ton....             | 62,010    | 52.2                         | 63,068           | 63.2                         | -1.7                               |
| 14 Clover alone.....                   | 14,715          | 72.2                         | 6,978            | 79.0                         | 110.9                              | Ton....             | 23,743    | 78.2                         | 18,697           | 89.3                         | 27.0                               |
| 15 Alfalfa.....                        | 515,301         | 79.1                         | 276,460          | 89.5                         | 86.4                               | Ton....             | 1,510,380 | 86.7                         | 903,291          | 93.6                         | 67.2                               |
| 16 Other tame grasses.....             | 8,762           | 41.5                         | 18,803           | 47.3                         | -53.4                              | Ton....             | 13,066    | 52.0                         | 39,739           | 55.2                         | -67.1                              |
| 17 Grain cut green.....                | 13,402          | 8.0                          | 7,395            | 7.6                          | 81.2                               | Ton....             | 17,056    | 12.2                         | 8,857            | 6.3                          | 92.6                               |
| 18 Wild, salt, or prairie grasses..... | 53,371          | 44.1                         | 86,329           | 71.7                         | -38.2                              | Ton....             | 53,515    | 46.0                         | 108,869          | 76.7                         | -50.8                              |
| 19 Corn cut for forage.....            | 1,527           | 18.6                         | ( <sup>2</sup> ) |                              |                                    | Ton....             | 4,969     | 29.9                         | ( <sup>2</sup> ) |                              |                                    |
| 20 Silage crops.....                   | 4,453           | 52.2                         | ( <sup>2</sup> ) |                              |                                    | Ton....             | 37,908    | 68.6                         | ( <sup>2</sup> ) |                              |                                    |
| 21 Annual legumes cut for hay.....     | 544             | 14.0                         | ( <sup>2</sup> ) |                              |                                    | Ton....             | 762       | 21.8                         | ( <sup>2</sup> ) |                              |                                    |
| <b>Vegetables:</b>                     |                 |                              |                  |                              |                                    |                     |           |                              |                  |                              |                                    |
| 22 Potatoes.....                       | 32,044          | 74.2                         | 1,011            | 87.8                         |                                    | Bu.....             | 5,409,108 | 85.8                         | 66,351           | 68.3                         |                                    |
| 23 Sugar beets.....                    | 32,270          | 86.4                         | 4,123            | 92.8                         | 682.7                              | Ton....             | 222,128   | 85.3                         | 47,175           | 95.1                         | 370.9                              |
| <b>Fruits:</b>                         |                 |                              |                  |                              |                                    |                     |           |                              |                  |                              |                                    |
| 24 Grapes.....                         | 10,809          | 14.6                         | ( <sup>2</sup> ) |                              |                                    | Lb.....             | 104,156   | 20.0                         | ( <sup>2</sup> ) |                              |                                    |
| 25 Apples.....                         | 852,307         | 35.8                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 1,211,790 | 33.2                         | ( <sup>2</sup> ) |                              |                                    |
| 26 Peaches.....                        | 71,890          | 40.3                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 138,442   | 49.6                         | ( <sup>2</sup> ) |                              |                                    |
| 27 Pears.....                          | 20,290          | 26.9                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 15,455    | 32.3                         | ( <sup>2</sup> ) |                              |                                    |
| 28 Plums and prunes.....               | 273,303         | 49.5                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 291,495   | 60.1                         | ( <sup>2</sup> ) |                              |                                    |
| 29 Cherries.....                       | 31,136          | 26.5                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 19,769    | 22.0                         | ( <sup>2</sup> ) |                              |                                    |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when it is more than 1,000.<sup>2</sup> Not reported separately in 1909.<sup>3</sup> Number of vines of bearing age.<sup>4</sup> Number of trees of bearing age.<sup>5</sup> Yield per vine.<sup>6</sup> Yield per tree.

# IRRIGATION—IDAHO.

11

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1919 AND 1920.

[A minus sign (—) denotes decrease.]

|   | THE STATE.   | Ada.        | Adams. <sup>1</sup> | Bannock. <sup>2</sup> | Bear Lake. | Bingham. <sup>3</sup> | Blaine. <sup>4</sup> |
|---|--------------|-------------|---------------------|-----------------------|------------|-----------------------|----------------------|
| 1 Number of all farms in 1920.....  | 42, 106      | 2, 198      | 484                 | 1, 719                | 825        | 2, 144                | 473                  |
| 2 Number of farms irrigated in 1919.....  | 25, 283      | 1, 938      | 267                 | 1, 095                | 635        | 1, 831                | 347                  |
| 3 Per cent of all farms.....  | 60.0         | 88.2        | 55.2                | 63.7                  | 77.0       | 85.4                  | 73.4                 |
| 4 Number of farms irrigated in 1909.....  | 16, 439      | 1, 315      | 981                 | 679                   | 679        | 1, 883                | 550                  |
| 5 Per cent of increase, 1909-1919.....  | 63.8         | 47.4        | —                   | —                     | —6.5       | —                     | —                    |
| <b>LAND AND FARM AREA.</b>  |              |             |                     |                       |            |                       |                      |
| 6 Approximate land area of the state..... acres..   | 53, 346, 560 | 738, 560    | 874, 240            | 1, 175, 680           | 627, 200   | 1, 397, 760           | 1, 790, 080          |
| 7 All land in farms..... acres..  | 8, 375, 873  | 203, 651    | 156, 849            | 453, 710              | 202, 890   | 284, 924              | 134, 100             |
| 8 Improved land in farms..... acres..   | 4, 511, 680  | 131, 464    | 59, 984             | 270, 179              | 108, 466   | 169, 103              | 55, 491              |
| 9 Area irrigated in 1919..... acres..   | 2, 488, 806  | 121, 493    | 30, 900             | 137, 266              | 67, 202    | 177, 296              | 52, 090              |
| 10 Per cent of improved land in farms.....  | 55.2         | 62.4        | 57.2                | 50.8                  | 62.0       | 104.8                 | 93.9                 |
| 11 Area irrigated in 1909..... acres..  | 1, 430, 848  | 86, 494     | —                   | 86, 648               | 58, 731    | 193, 741              | 68, 112              |
| 12 Per cent of increase, 1909-1919.....   | 73.9         | 40.5        | —                   | —                     | 14.4       | —                     | —                    |
| 13 Area enterprises were capable of irrigating in 1920..... acres..                                       | 3, 092, 810  | 133, 768    | 32, 676             | 185, 316              | 72, 893    | 217, 200              | 77, 391              |
| 14 Area enterprises were capable of irrigating in 1910..... acres..                                       | 2, 388, 959  | 87, 511     | —                   | 112, 288              | 59, 829    | 310, 903              | 87, 689              |
| 15 Per cent of increase, 1910-1920.....   | 29.5         | 52.9        | —                   | —                     | 21.8       | —                     | —                    |
| 16 Area included in enterprises in 1920..... acres..  | 3, 780, 048  | 136, 790    | 42, 786             | 227, 586              | 83, 890    | 232, 923              | 97, 801              |
| 17 Area included in enterprises in 1910..... acres..  | 3, 549, 573  | 147, 330    | —                   | 156, 037              | 74, 427    | 302, 034              | 203, 592             |
| 18 Per cent of increase, 1910-1920.....   | 6.5          | —7.2        | —                   | —                     | 12.7       | —                     | —                    |
| 19 Area of irrigated land reported as available for settlement..... acres..                               | 118, 334     | 800         | —                   | 16, 000               | —          | 12, 688               | 500                  |
| <b>IRRIGATION WORKS.</b>  |              |             |                     |                       |            |                       |                      |
| Independent enterprises:  |              |             |                     |                       |            |                       |                      |
| 20 Number, 1920.....  | 3, 629       | 50          | 121                 | 242                   | 95         | 68                    | 129                  |
| 21 Number, 1910.....  | 3, 092       | 46          | —                   | 261                   | 112        | 116                   | 254                  |
| Main ditches:   |              |             |                     |                       |            |                       |                      |
| 22 Number, 1920.....  | 4, 553       | 54          | 147                 | 303                   | 158        | 53                    | 155                  |
| 23 Number, 1910.....  | 3, 209       | 43          | —                   | 252                   | 131        | 124                   | 257                  |
| 24 Length, 1920..... miles..  | 11, 144      | 255         | 206                 | 654                   | 343        | 416                   | 271                  |
| 25 Length, 1910..... miles..  | 7, 662       | 213         | —                   | 631                   | 394        | 591                   | 620                  |
| 26 Capacity, 1920..... second-feet..  | 86, 273      | 2, 567      | 1, 015              | 3, 038                | 1, 522     | 5, 688                | 2, 716               |
| 27 Capacity, 1910..... second-feet..  | 80, 458      | 4, 257      | —                   | 4, 036                | 2, 192     | 10, 383               | 4, 363               |
| Laterals:   |              |             |                     |                       |            |                       |                      |
| 28 Number, 1920.....  | 5, 265       | 264         | 50                  | 127                   | 161        | 95                    | —                    |
| 29 Number, 1910.....  | 3, 359       | 121         | —                   | 137                   | 37         | 205                   | 256                  |
| 30 Length, 1920..... miles..  | 6, 154       | 43          | 57                  | 294                   | 57         | 176                   | —                    |
| 31 Length, 1910..... miles..  | 5, 097       | 199         | —                   | 261                   | 29         | 351                   | 376                  |
| Reservoirs:   |              |             |                     |                       |            |                       |                      |
| 32 Number, 1920.....  | 249          | 10          | 3                   | 17                    | 13         | 6                     | 1                    |
| 33 Number, 1910.....  | 243          | 5           | —                   | 14                    | 14         | 8                     | 14                   |
| 34 Capacity, 1920..... acre-feet..  | 3, 493, 511  | 150, 536    | 1, 205              | 141, 216              | 5, 677     | 123, 610              | —                    |
| 35 Capacity, 1910..... acre-feet..  | 1, 742, 303  | 8, 059      | —                   | 176, 259              | 1, 158     | 4, 409                | 205, 835             |
| Flowing wells:  |              |             |                     |                       |            |                       |                      |
| 36 Number, 1920.....  | 142          | 7           | —                   | —                     | —          | —                     | 2                    |
| 37 Number, 1910.....  | 62           | 9           | —                   | 1                     | —          | —                     | —                    |
| 38 Capacity, 1920..... gallons per minute..   | 15, 133      | 45          | —                   | —                     | —          | —                     | —                    |
| 39 Capacity, 1910..... gallons per minute..   | 7, 200       | 370         | —                   | 30                    | —          | —                     | 75                   |
| Pumped wells:   |              |             |                     |                       |            |                       |                      |
| 40 Number, 1920.....  | 53           | 2           | —                   | —                     | —          | 1                     | —                    |
| 41 Number, 1910.....  | 24           | —           | —                   | —                     | —          | —                     | 1                    |
| 42 Capacity, 1920..... gallons per minute..   | 17, 749      | 900         | —                   | —                     | —          | 440                   | —                    |
| 43 Capacity, 1910..... gallons per minute..   | 2, 826       | —           | —                   | —                     | —          | —                     | 600                  |
| Pumping plants:   |              |             |                     |                       |            |                       |                      |
| 44 Number, 1920.....  | 143          | 6           | —                   | 2                     | —          | 2                     | —                    |
| 45 Number, 1910.....  | 58           | 2           | —                   | —                     | —          | —                     | 1                    |
| 46 Engine capacity, 1920..... horsepower..  | 28, 364      | 168         | —                   | 23                    | —          | 10                    | —                    |
| 47 Engine capacity, 1910..... horsepower..  | 7, 065       | 10          | —                   | —                     | —          | —                     | 4                    |
| 48 Pump capacity, 1920..... gallons per minute..  | 1, 397, 681  | 2, 250      | —                   | —                     | —          | 1, 440                | —                    |
| 49 Pump capacity, 1910..... gallons per minute..  | 278, 569     | 308         | —                   | —                     | —          | —                     | 600                  |
| 50 Average lift, 1920..... feet..   | 29           | 32          | —                   | 14                    | —          | 18                    | —                    |
| <b>CAPITAL INVESTED.</b>  |              |             |                     |                       |            |                       |                      |
| 51 Capital invested to Jan. 1, 1920..... dollars..  | 91, 501, 009 | 5, 669, 338 | 394, 000            | 3, 106, 000           | 397, 393   | 3, 201, 889           | 736, 713             |
| 52 Capital invested to July 1, 1910..... dollars..  | 40, 977, 688 | 2, 404, 008 | —                   | 806, 960              | 301, 672   | 3, 001, 533           | 2, 058, 383          |
| 53 Per cent of increase, 1910-1920.....   | 123.3        | 135.8       | —                   | —                     | 31.7       | —                     | —                    |
| 54 Average per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 29.59        | 42.38       | 12.06               | 16.76                 | 5.45       | 14.74                 | 9.52                 |
| 55 Average per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 17.15        | 27.47       | —                   | 7.19                  | 5.04       | 9.65                  | 23.47                |
| <b>ESTIMATED FINAL COST.</b>  |              |             |                     |                       |            |                       |                      |
| 56 Estimated final cost of existing enterprises in 1920..... dollars..                                    | 97, 019, 717 | 5, 669, 338 | 395, 910            | 3, 573, 940           | 430, 093   | 3, 654, 189           | 1, 120, 113          |
| 57 Estimated final cost of existing enterprises in 1910..... dollars..                                    | 58, 451, 106 | 5, 349, 208 | —                   | 903, 812              | 304, 162   | 3, 088, 835           | 3, 797, 813          |
| 58 Per cent of increase, 1910-1920.....   | 66.0         | 6.0         | —                   | —                     | 41.4       | —                     | —                    |
| 59 Average per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 25.67        | 41.45       | 9.25                | 15.70                 | 5.13       | 15.69                 | 11.45                |
| 60 Average per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 16.47        | 36.31       | —                   | 5.79                  | 4.09       | 8.53                  | 18.65                |

<sup>1</sup> Organized from part of Washington in 1911.

<sup>2</sup> Part annexed to Franklin in 1918; part taken to form Caribou in 1919.

<sup>3</sup> Part annexed to Fremont in 1905; part taken to form Bonneville in 1911; part taken to form part of Power in 1911; part taken to form part of Butte in 1917.

<sup>4</sup> Part annexed to Elmore in 1911; part taken to form part of Power in 1913; parts taken to form Camas and part of Butte in 1917.

## IRRIGATION : KANSAS

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 6     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 6     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 6     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 7     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 9     |
| FARMS AND ACREAGE IRRIGATED.....                       | 4     | COUNTY TABLE.—Acreage irrigated and included in enterprises; irrigation works; and capital invested in irrigation enterprises, by counties: 1920 and 1919..... | 10    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 5     |  |       |
| Acreage, by drainage basins.....                       | 5     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Kansas collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of show-

ing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.   | CENSUS OF—  |             | INCREASE. <sup>1</sup> |           |
|---|-------------|-------------|------------------------|-----------|
|   | 1920        | 1910        | Amount.                | Per cent. |
| Number of all farms.....  | 165,286     | 177,841     | -12,555                | -7.1      |
| Approximate land area of the state.....acres..  | 52,335,360  | 52,335,360  |                        |           |
| All land in farms.....acres..   | 45,425,179  | 43,384,799  | 2,040,380              | 4.7       |
| Improved land in farms.....acres..  | 30,600,760  | 29,904,067  | 696,693                | 2.3       |
| Number of farms irrigated.....  | 504         | 1,006       | -502                   | -49.9     |
| Area irrigated.....acres..  | 47,312      | 37,479      | 9,833                  | 26.2      |
| Area enterprises were capable of irrigating.....acres..                               | 67,853      | 139,995     | -72,142                | -51.5     |
| Area included in enterprises.....acres..  | 102,562     | 161,300     | -58,738                | -36.4     |
| Per cent irrigated:   |             |             |                        |           |
| Number of all farms.....  | 0.3         | 0.6         | -0.3                   |           |
| Approximate land area of state.....   | 0.1         | 0.1         |                        |           |
| Land in farms.....  | 0.1         | 0.1         |                        |           |
| Improved land in farms.....   | 0.2         | 0.1         | 0.1                    |           |
| Excess of area enterprises were capable of irrigating over area irrigated.....acres.. | 20,541      | 102,516     | -81,975                | -80.0     |
| Excess of area included in enterprises over area irrigated.....acres..                | 55,250      | 123,821     | -68,571                | -55.4     |
| Capital invested.....   | \$2,067,381 | \$1,365,563 | \$701,818              | 51.4      |
| Average per acre enterprises were capable of irrigating.....                          | \$30.47     | \$9.75      | \$20.72                | 212.5     |
| Estimated final cost of existing enterprises.....                                     | \$2,195,981 | \$1,365,563 | \$830,418              | 60.8      |
| Average per acre included in enterprises.....   | \$21.41     | \$8.47      | \$12.94                | 152.8     |
| Average cost of operation and maintenance of irrigation works per acre.....           | \$3.29      | \$1.59      | \$1.70                 | 106.9     |

<sup>1</sup> A minus sign (—) denotes decrease.



## IRRIGATION—IDAHO.

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1919 AND 1920—Continued.

[A minus sign (—) denotes decrease.]

|                          |   | Jerome. <sup>1</sup> | Kootenai. <sup>2</sup> | Lemhi. <sup>3</sup> | Lincoln. <sup>4</sup> | Madison. <sup>5</sup> | Minidoka. <sup>6</sup> | Nez Perce. <sup>7</sup> | Oneida. <sup>8</sup> |
|--------------------------|---|----------------------|------------------------|---------------------|-----------------------|-----------------------|------------------------|-------------------------|----------------------|
| 1                        | Number of all farms in 1920.....  | 685                  | 1,396                  | 535                 | 418                   | 928                   | 1,024                  | 1,291                   | 1,041                |
| 2                        | Number of farms irrigated in 1919.....  | 652                  | 195                    | 509                 | 397                   | 665                   | 901                    | 184                     | 415                  |
| 3                        | Per cent of all farms.....  | 95.2                 | 14.0                   | 95.1                | 95.0                  | 71.7                  | 88.0                   | 14.3                    | 39.9                 |
| 4                        | Number of farms irrigated in 1909.....  |                      | 185                    | 317                 | 1,433                 |                       |                        | 99                      | 836                  |
| 5                        | Per cent of increase, 1909-1919.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| LAND AND FARM AREA.      |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 6                        | Approximate land area of the State..... acres..   | 387,840              | 801,920                | 2,942,080           | 760,320               | 307,840               | 483,840                | 544,640                 | 773,760              |
| 7                        | All land in farms..... acres..  | 76,488               | 221,151                | 159,192             | 64,784                | 217,591               | 91,028                 | 417,461                 | 308,414              |
| 8                        | Improved land in farms..... acres..   | 62,229               | 79,017                 | 77,423              | 42,899                | 155,145               | 68,051                 | 190,875                 | 176,774              |
| 9                        | Area irrigated in 1919..... acres..   | 85,000               | 4,000                  | 66,905              | 69,620                | 54,637                | 55,259                 | 5,018                   | 20,314               |
| 10                       | Per cent of improved land in farms.....   | 136.6                | 5.1                    | 86.4                | 162.3                 | 35.2                  | 81.2                   | 2.6                     | 11.5                 |
| 11                       | Area irrigated in 1909..... acres..   |                      | 2,984                  | 37,916              | 82,684                |                       |                        | 5,860                   | 43,855               |
| 12                       | Per cent of increase, 1909-1919.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| 13                       | Area enterprises were capable of irrigating in 1920..... acres..  | 110,000              | 5,495                  | 96,451              | 121,304               | 60,784                | 65,228                 | 5,901                   | 21,625               |
| 14                       | Area enterprises were capable of irrigating in 1910..... acres..  |                      | 10,126                 | 41,108              | 456,852               |                       |                        | 9,317                   | 45,282               |
| 15                       | Per cent of increase, 1910-1920.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| 16                       | Area included in enterprises in 1920..... acres..   | 110,000              | 10,214                 | 136,052             | 125,376               | 68,257                | 65,228                 | 6,135                   | 48,782               |
| 17                       | Area included in enterprises in 1910..... acres..   |                      | 18,125                 | 61,677              | 514,955               |                       |                        | 29,896                  | 93,023               |
| 18                       | Per cent of increase, 1910-1920.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| 19                       | Area of irrigated land reported as available for settlement..... acres..                                    | 17,647               |                        | 3,650               | 26,250                |                       | 176                    |                         |                      |
| IRRIGATION WORKS.        |   |                      |                        |                     |                       |                       |                        |                         |                      |
| Independent enterprises: |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 20                       | Number, 1920.....   | 1                    | 19                     | 404                 | 44                    | 37                    | 1                      | 59                      | 68                   |
| 21                       | Number, 1910.....   |                      | 20                     | 247                 | 100                   |                       |                        | 50                      | 106                  |
| Main ditches:            |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 22                       | Number, 1920.....   | 1                    | 13                     | 584                 | 42                    | 44                    | 2                      | 31                      | 13                   |
| 23                       | Number, 1910.....   |                      | 17                     | 272                 | 105                   |                       |                        | 49                      | 104                  |
| 24                       | Length, 1920..... miles.....  | 22                   | 15                     | 825                 | 170                   | 132                   | 29                     | 33                      | 1,391                |
| 25                       | Length, 1910..... miles.....  |                      | 33                     | 411                 | 407                   |                       |                        | 42                      | 340                  |
| 26                       | Capacity, 1920..... second-feet.....  | 2,072                | 98                     | 2,691               | 3,027                 | 2,768                 | 480                    | 75                      | 1,000                |
| 27                       | Capacity, 1910..... second-feet.....  |                      | 129                    | 1,363               | 7,000                 |                       |                        | 127                     | 1,323                |
| Laterals:                |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 28                       | Number, 1920.....   | 220                  | 18                     | 596                 | 73                    | 51                    | 330                    | 15                      | 74                   |
| 29                       | Number, 1910.....   |                      | 28                     | 64                  | 645                   |                       |                        | 12                      | 53                   |
| 30                       | Length, 1920..... miles.....  | 485                  | 22                     | 244                 | 406                   | 87                    | 309                    | 3                       | 59                   |
| 31                       | Length, 1910..... miles.....  |                      | 32                     | 32                  | 1,293                 |                       |                        | 33                      | 102                  |
| Reservoirs:              |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 32                       | Number, 1920.....   | 1                    | 1                      | 4                   | 1                     | 1                     | 2                      | 6                       | 10                   |
| 33                       | Number, 1910.....   |                      | 2                      | 1                   | 8                     |                       |                        | 11                      | 25                   |
| 34                       | Capacity, 1920..... acre-feet.....  | 850,000              | 600                    | 397                 | 190,000               | 8,000                 | 499,733                | 4                       | 19,391               |
| 35                       | Capacity, 1910..... acre-feet.....  |                      |                        | 1                   | 379,024               |                       |                        | 30,033                  | 26,000               |
| Flowing wells:           |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 36                       | Number, 1920.....   |                      |                        |                     |                       |                       |                        | 3                       | 57                   |
| 37                       | Number, 1910.....   |                      |                        |                     |                       |                       |                        |                         | 9                    |
| 38                       | Capacity, 1920..... gallons per minute.....   |                      |                        |                     |                       |                       |                        |                         | 7,488                |
| 39                       | Capacity, 1910..... gallons per minute.....   |                      |                        |                     |                       |                       |                        | 400                     | 1,487                |
| Pumped wells:            |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 40                       | Number, 1920.....   |                      |                        |                     | 1                     |                       |                        | 27                      |                      |
| 41                       | Number, 1910.....   |                      | 2                      |                     |                       |                       |                        | 12                      | 2                    |
| 42                       | Capacity, 1920..... gallons per minute.....   |                      |                        |                     | 2,500                 |                       |                        | 2,690                   |                      |
| 43                       | Capacity, 1910..... gallons per minute.....   |                      | 180                    |                     |                       |                       |                        | 1,290                   | 6                    |
| Pumping plants:          |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 44                       | Number, 1920.....   | 3                    | 6                      | 1                   | 1                     |                       | 1                      | 33                      |                      |
| 45                       | Number, 1910.....   |                      | 10                     | 1                   |                       |                       |                        | 14                      | 2                    |
| 46                       | Engine capacity, 1920..... horsepower.....  | 1,290                | 992                    | 5                   | 2                     |                       | 5,200                  | 404                     |                      |
| 47                       | Engine capacity, 1910..... horsepower.....  |                      | 979                    | 139                 |                       |                       |                        | 59                      | 2                    |
| 48                       | Pump capacity, 1920..... gallons per minute.....  | 62,956               | 50,041                 | 75                  | 50                    |                       | 520,000                | 9,935                   |                      |
| 49                       | Pump capacity, 1910..... gallons per minute.....  |                      | 34,270                 | 5,400               |                       |                       |                        | 1,410                   | 6                    |
| 50                       | Average lift, 1920..... feet.....   | 50                   | 51                     | 19                  | 10                    |                       | 16                     | 22                      |                      |
| CAPITAL INVESTED.        |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 51                       | Capital invested to Jan. 1, 1920..... dollars..   | 11,663,236           | 561,842                | 720,647             | 4,258,895             | 667,126               | 3,090,849              | 313,781                 | 471,910              |
| 52                       | Capital invested to July 1, 1910..... dollars..   |                      | 771,904                | 199,731             | 10,265,589            |                       |                        | 837,603                 | 1,585,759            |
| 53                       | Per cent of increase, 1910-1920.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| 54                       | Average per acre based on area enterprises were capable of supplying with water in 1920..... dollars..      | 106.03               | 102.25                 | 7.47                | 35.11                 | 10.98                 | 47.39                  | 53.17                   | 21.82                |
| 55                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. |                      | 76.23                  | 4.86                | 22.47                 |                       |                        | 89.90                   | 35.02                |
| ESTIMATED FINAL COST.    |   |                      |                        |                     |                       |                       |                        |                         |                      |
| 56                       | Estimated final cost of existing enterprises in 1920..... dollars..   | 11,663,236           | 811,842                | 744,797             | 4,259,215             | 699,726               | 3,090,849              | 717,171                 | 471,910              |
| 57                       | Estimated final cost of existing enterprises in 1910..... dollars..   |                      | 771,904                | 203,216             | 11,776,546            |                       |                        | 1,614,603               | 1,817,103            |
| 58                       | Per cent of increase, 1910-1920.....  |                      |                        |                     |                       |                       |                        |                         |                      |
| 59                       | Average per acre based on estimated final cost and area included in enterprises in 1920..... dollars..      | 106.03               | 79.48                  | 5.47                | 33.97                 | 10.25                 | 47.39                  | 116.90                  | 9.67                 |
| 60                       | Average per acre based on estimated final cost and area included in enterprises in 1910..... dollars..      |                      | 42.59                  | 3.29                | 22.87                 |                       |                        | 54.01                   | 19.53                |

<sup>1</sup> Organized from parts of Gooding, Lincoln, and Minidoka in 1919.<sup>2</sup> Part taken to form Bonner in 1907; part taken to form Benewah in 1915.<sup>3</sup> Boundary between Lemhi and Idaho changed in 1911.<sup>4</sup> Parts taken to form Gooding and Minidoka in 1913; part taken to form part of Jerome in 1919.<sup>5</sup> Organized from part of Fremont in 1914; part taken to form Teton in 1915.<sup>6</sup> Organized from part of Lincoln in 1913; part taken to form part of Jerome in 1919.<sup>7</sup> Part of Shoshone annexed in 1905; parts of Nez Perce taken to form Clearwater and Lewis in 1911.<sup>8</sup> Part taken to form Franklin in 1913; part taken to form part of Power in 1913; part annexed to Power in 1916.

# IRRIGATION—IDAHO.

15

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1919 AND 1920—Continued.

[A minus sign (—) denotes decrease.]

|  | Owyhee.   | Payette. <sup>1</sup> | Power. <sup>2</sup> | Teton. <sup>3</sup> | Twin Falls. | Valley. <sup>4</sup> | Washing-<br>ton. <sup>5</sup> | Other<br>counties. |
|--|-----------|-----------------------|---------------------|---------------------|-------------|----------------------|-------------------------------|--------------------|
| 1 Number of all farms in 1920.....   | 785       | 763                   | 784                 | 541                 | 2,746       | 309                  | 1,119                         | 5,126              |
| 2 Number of farms irrigated in 1919.....   | 642       | 700                   | 179                 | 318                 | 2,609       | 107                  | 610                           | 91                 |
| 3 Per cent of all farms.....   | 81.8      | 91.7                  | 22.8                | 58.8                | 95.0        | 34.6                 | 54.5                          | 1.8                |
| 4 Number of farms irrigated in 1909.....   | 247       |                       |                     |                     | 1,203       |                      | 716                           | 30                 |
| 5 Per cent of increase, 1909-1919.....   | 159.9     |                       |                     |                     | 116.9       |                      |                               |                    |
| <b>LAND AND FARM AREA.</b>   |           |                       |                     |                     |             |                      |                               |                    |
| 6 Approximate land area of the state..... acres..  | 5,091,840 | 264,960               | 890,240             | 296,320             | 1,252,480   | 2,418,560            | 946,560                       | 6,714,880          |
| 7 All land in farms..... acres..   | 140,464   | 72,254                | 311,571             | 130,756             | 276,179     | 87,038               | 299,526                       | 1,006,271          |
| 8 Improved land in farms..... acres..  | 64,682    | 41,054                | 217,046             | 84,354              | 232,533     | 49,278               | 122,633                       | 483,865            |
| 9 Area irrigated in 1919..... acres..  | 62,933    | 52,428                | 11,264              | 41,385              | 261,622     | 15,591               | 41,423                        | 1,185              |
| 10 Per cent of improved land in farms.....   | 97.3      | 127.7                 | 5.2                 | 49.1                | 112.5       | 31.6                 | 33.8                          | 2                  |
| 11 Area irrigated in 1909..... acres..   | 21,771    |                       |                     |                     | 100,545     |                      | 57,299                        | 895                |
| 12 Per cent of increase, 1909-1919.....  | 189.1     |                       |                     |                     | 160.2       |                      |                               |                    |
| 13 Area enterprises were capable of irrigating in 1920..... acres..  | 74,494    | 30,653                | 17,186              | 57,422              | 271,443     | 24,148               | 52,065                        | 2,221              |
| 14 Area enterprises were capable of irrigating in 1910..... acres..  | 44,240    |                       |                     |                     | 246,625     |                      | 71,445                        | 901                |
| 15 Per cent of increase, 1910-1920.....  | 68.4      |                       |                     |                     | 10.1        |                      |                               |                    |
| 16 Area included in enterprises in 1920..... acres..   | 119,061   | 71,455                | 19,496              | 62,459              | 312,121     | 31,984               | 59,610                        | 2,806              |
| 17 Area included in enterprises in 1910..... acres..   | 162,111   |                       |                     |                     | 384,590     |                      | 124,964                       | 1,907              |
| 18 Per cent of increase, 1910-1920.....  | -26.6     |                       |                     |                     | -18.8       |                      |                               |                    |
| 19 Area of irrigated land reported as available for settlement..... acres..                                    | 3,958     | 5,356                 |                     |                     | 7,430       |                      | 1,500                         |                    |
| <b>IRRIGATION WORKS.</b>   |           |                       |                     |                     |             |                      |                               |                    |
| Independent enterprises:   |           |                       |                     |                     |             |                      |                               |                    |
| 20 Number, 1920.....   | 259       | 40                    | 53                  | 99                  | 85          | 73                   | 89                            | 30                 |
| 21 Number, 1910.....   | 146       |                       |                     |                     | 37          |                      | 286                           | 19                 |
| Main ditches:  |           |                       |                     |                     |             |                      |                               |                    |
| 22 Number, 1920.....   | 426       | 41                    | 57                  | 103                 | 132         | 79                   | 97                            | 26                 |
| 23 Number, 1910.....   | 137       |                       |                     |                     | 32          |                      | 299                           | 21                 |
| 24 Length, 1920..... miles..   | 583       | 268                   | 97                  | 154                 | 219         | 120                  | 326                           | 17                 |
| 25 Length, 1910..... miles..   | 302       |                       |                     |                     | 172         |                      | 423                           | 11                 |
| 26 Capacity, 1920..... second-feet..   | 2,338     | 1,497                 | 325                 | 1,498               | 6,046       | 572                  | 1,158                         | 204                |
| 27 Capacity, 1910..... second-feet..   | 2,249     |                       |                     |                     | 4,924       |                      | 1,818                         | 166                |
| Laterals:  |           |                       |                     |                     |             |                      |                               |                    |
| 28 Number, 1920.....   | 193       | 9                     | 31                  | 200                 | 72          | 9                    | 36                            | 50                 |
| 29 Number, 1910.....   | 158       |                       |                     |                     | 257         |                      | 99                            | 11                 |
| 30 Length, 1920..... miles..   | 142       | 13                    | 27                  | 129                 | 993         | 2                    | 35                            | 4                  |
| 31 Length, 1910..... miles..   | 66        |                       |                     |                     | 762         |                      | 86                            | 4                  |
| Reservoirs:  |           |                       |                     |                     |             |                      |                               |                    |
| 32 Number, 1920.....   | 22        | 7                     | 12                  | 1                   | 6           | 2                    | 8                             | 5                  |
| 33 Number, 1910.....   | 14        |                       |                     |                     | 2           |                      | 12                            | 8                  |
| 34 Capacity, 1920..... acre-feet..   | 20,324    | 63,050                | 712                 | 40                  | 206,600     | 205                  | 94,596                        | 416                |
| 35 Capacity, 1910..... acre-feet..   | 50,779    |                       |                     |                     | 492,000     |                      | 13,354                        | 2                  |
| Flowing wells:   |           |                       |                     |                     |             |                      |                               |                    |
| 36 Number, 1920.....   | 61        |                       |                     |                     | 3           |                      |                               |                    |
| 37 Number, 1910.....   | 9         |                       |                     |                     | 5           |                      |                               |                    |
| 38 Capacity, 1920..... gallons per minute..  | 2,954     |                       |                     |                     | 1,900       |                      |                               |                    |
| 39 Capacity, 1910..... gallons per minute..  | 80        |                       |                     |                     | 2,970       |                      |                               |                    |
| Pumped wells:  |           |                       |                     |                     |             |                      |                               |                    |
| 40 Number, 1920.....   | 1         | 3                     |                     |                     |             |                      |                               | 1                  |
| 41 Number, 1910.....   |           |                       |                     |                     |             |                      |                               |                    |
| 42 Capacity, 1920..... gallons per minute..  | 27        | 9,000                 |                     |                     |             |                      |                               | 60                 |
| 43 Capacity, 1910..... gallons per minute..  |           |                       |                     |                     |             |                      |                               |                    |
| Pumping plants:  |           |                       |                     |                     |             |                      |                               |                    |
| 44 Number, 1920.....   | 18        | 10                    | 1                   |                     | 4           |                      | 6                             | 1                  |
| 45 Number, 1910.....   | 5         |                       |                     |                     |             |                      | 4                             |                    |
| 46 Engine capacity, 1920..... horsepower..   | 9,526     | 606                   | 40                  |                     | 1,552       |                      | 748                           | 10                 |
| 47 Engine capacity, 1910..... horsepower..   | 118       |                       |                     |                     |             |                      | 103                           |                    |
| 48 Pump capacity, 1920..... gallons per minute..   | 169,213   | 18,256                | 110                 |                     | 23,840      |                      | 32,230                        | 160                |
| 49 Pump capacity, 1910..... gallons per minute..   | 4,615     |                       |                     |                     |             |                      | 4,505                         |                    |
| 50 Average lift, 1920..... feet..  | 45        | 30                    | 40                  |                     | 39          |                      | 56                            | 50                 |
| <b>CAPITAL INVESTED.</b>   |           |                       |                     |                     |             |                      |                               |                    |
| 51 Capital invested to Jan. 1, 1920..... dollars..   | 2,309,967 | 1,209,175             | 270,888             | 157,976             | 8,984,389   | 147,110              | 1,774,135                     | 47,847             |
| 52 Capital invested to July 1, 1910..... dollars..   | 1,274,833 |                       |                     |                     | 6,653,172   |                      | 581,099                       | 16,567             |
| 53 Per cent of increase, 1910-1920.....  | 81.2      |                       |                     |                     | 35.0        |                      |                               |                    |
| 54 Average per acre based on area enterprises were capable of sup-<br>plying with water in 1920..... dollars.. | 31.01     | 39.45                 | 15.76               | 2.75                | 33.10       | 6.09                 | 34.08                         | 21.54              |
| 55 Average per acre based on area enterprises were capable of sup-<br>plying with water in 1910..... dollars.. | 28.82     |                       |                     |                     | 26.98       |                      | 8.13                          |                    |
| <b>ESTIMATED FINAL COST.</b>   |           |                       |                     |                     |             |                      |                               |                    |
| 56 Estimated final cost of existing enterprises in 1920..... dollars..   | 2,535,156 | 1,209,375             | 287,138             | 163,176             | 9,166,578   | 177,160              | 1,874,135                     | 53,022             |
| 57 Estimated final cost of existing enterprises in 1910..... dollars..   | 4,034,943 |                       |                     |                     | 7,415,142   |                      | 584,084                       | 16,567             |
| 58 Per cent of increase, 1910-1920.....  | -37.2     |                       |                     |                     | 23.6        |                      |                               |                    |
| 59 Average per acre based on estimated final cost and area in-<br>cluded in enterprises in 1920..... dollars.. | 21.29     | 16.92                 | 14.73               | 2.61                | 29.37       | 5.54                 | 31.44                         | 18.90              |
| 60 Average per acre based on estimated final cost and area in-<br>cluded in enterprises in 1910..... dollars.. | 24.89     |                       |                     |                     | 19.28       |                      | 4.67                          | 8.69               |

<sup>1</sup> Organized from part of Canyon in 1917.

<sup>2</sup> Organized from parts of Bingham, Blaine, Cassia, and Oneida in 1913; part of Oneida annexed in 1916.

<sup>3</sup> Organized from part of Madison in 1915.

<sup>4</sup> Organized from parts of Boise and Idaho in 1917.

<sup>5</sup> Part taken to form Adams in 1911.

## IRRIGATION—IDAHO.

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES, IRRIGATION WORKS AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1919 AND 1920—Continued.

[A minus sign (—) denotes decrease.]

|  | Boise. <sup>1</sup> | Bonneville. <sup>2</sup> | Butte. <sup>3</sup> | Camas. <sup>4</sup> | Canyon. <sup>5</sup> | Caribou. <sup>6</sup> | Cassia. <sup>7</sup> | Clark. <sup>8</sup> |
|--|---------------------|--------------------------|---------------------|---------------------|----------------------|-----------------------|----------------------|---------------------|
| 1 Number of all farms in 1920.....   | 238                 | 1,480                    | 432                 | 354                 | 2,660                | 368                   | 1,568                | 398                 |
| 2 Number of farms irrigated in 1919.....   | 143                 | 1,080                    | 327                 | 97                  | 2,477                | 91                    | 1,257                | 99                  |
| 3 Per cent of all farms.....   | 60.1                | 73.0                     | 75.7                | 27.4                | 93.1                 | 24.7                  | 80.2                 | 24.9                |
| 4 Number of farms irrigated in 1909.....   | 242                 |                          |                     |                     | 2,238                |                       | 582                  |                     |
| 5 Per cent of increase, 1909-1919.....   |                     |                          |                     |                     |                      |                       |                      |                     |
| <b>LAND AND FARM AREA.</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 6 Approximate land area of the state..... acres..  | 1,177,600           | 1,218,560                | 1,310,720           | 684,800             | 378,880              | 808,320               | 1,660,800            | 1,137,920           |
| 7 All land in farms..... acres..   | 81,636              | 286,877                  | 80,851              | 132,963             | 199,427              | 122,803               | 285,214              | 183,006             |
| 8 Improved land in farms..... acres..  | 16,452              | 176,091                  | 50,911              | 72,308              | 157,486              | 52,783                | 178,879              | 55,673              |
| 9 Area irrigated in 1919..... acres..  | 7,608               | 110,953                  | 39,563              | 13,272              | 201,718              | 23,825                | 113,537              | 18,851              |
| 10 Per cent of improved land in farms.....   | 46.2                | 63.0                     | 77.7                | 18.4                | 128.1                | 45.1                  | 63.5                 | 33.9                |
| 11 Area irrigated in 1909..... acres..   | 25,052              |                          |                     |                     | 133,046              |                       | 59,510               |                     |
| 12 Per cent of increase, 1909-1919.....  |                     |                          |                     |                     |                      |                       |                      |                     |
| 13 Area enterprises were capable of irrigating in 1920..... acres..  | 8,569               | 123,043                  | 66,140              | 14,516              | 228,032              | 25,908                | 129,619              | 26,467              |
| 14 Area enterprises were capable of irrigating in 1910..... acres..  | 32,359              |                          |                     |                     | 182,585              |                       | 94,244               |                     |
| 15 Per cent of increase, 1910-1920.....  |                     |                          |                     |                     |                      |                       |                      |                     |
| 16 Area included in enterprises in 1920..... acres..   | 14,239              | 135,021                  | 184,858             | 21,284              | 234,582              | 29,102                | 149,035              | 45,704              |
| 17 Area included in enterprises in 1910..... acres..   | 41,488              |                          |                     |                     | 356,722              |                       | 163,561              |                     |
| 18 Per cent of increase, 1910-1920.....  |                     |                          |                     |                     |                      |                       |                      |                     |
| 19 Area of irrigated land reported as available for settlement..... acres..                                    | 193                 |                          |                     |                     |                      |                       | 3,181                | 3,120               |
| <b>IRRIGATION WORKS.</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| <b>Independent enterprises:</b>  |                     |                          |                     |                     |                      |                       |                      |                     |
| 20 Number, 1920.....   | 111                 | 85                       | 76                  | 58                  | 29                   | 61                    | 157                  | 100                 |
| 21 Number, 1910.....   | 180                 |                          |                     |                     | 109                  |                       | 171                  |                     |
| <b>Main ditches:</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 22 Number, 1920.....   | 172                 | 115                      | 107                 | 105                 | 30                   | 91                    | 201                  | 190                 |
| 23 Number, 1910.....   | 202                 |                          |                     |                     | 103                  |                       | 176                  |                     |
| 24 Length, 1920..... miles..   | 224                 | 352                      | 296                 | 71                  | 388                  | 150                   | 411                  | 200                 |
| 25 Length, 1910..... miles..   | 251                 |                          |                     |                     | 533                  |                       | 286                  |                     |
| 26 Capacity, 1920..... second-feet..   | 508                 | 4,553                    | 1,509               | 196                 | 3,619                | 1,139                 | 2,039                | 2,100               |
| 27 Capacity, 1910..... second-feet..   | 933                 |                          |                     |                     | 7,159                |                       | 3,085                |                     |
| <b>Laterals:</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 28 Number, 1920.....   | 14                  | 49                       | 132                 | 12                  | 462                  | 154                   | 378                  | 287                 |
| 29 Number, 1910.....   | 76                  |                          |                     |                     | 247                  |                       | 354                  |                     |
| 30 Length, 1920..... miles..   | 6                   | 259                      | 72                  | 1                   | 144                  | 48                    | 385                  | 133                 |
| 31 Length, 1910..... miles..   | 34                  |                          |                     |                     | 427                  |                       | 424                  |                     |
| <b>Reservoirs:</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 32 Number, 1920.....   | 10                  | 6                        | 5                   | 6                   | 1                    | 5                     | 5                    | 5                   |
| 33 Number, 1910.....   | 18                  |                          |                     |                     | 13                   |                       | 7                    |                     |
| 34 Capacity, 1920..... acre-feet..   | 27                  | 147                      | 103,680             | 708                 | 422,257              | 163                   | 442,767              | 36,947              |
| 35 Capacity, 1910..... acre-feet..   | 80                  |                          |                     |                     | 186,244              |                       | 73,055               |                     |
| <b>Flowing wells:</b>  |                     |                          |                     |                     |                      |                       |                      |                     |
| 36 Number, 1920.....   | 1                   |                          |                     |                     | 1                    |                       | 11                   |                     |
| 37 Number, 1910.....   |                     |                          |                     |                     | 12                   |                       |                      |                     |
| 38 Capacity, 1920..... gallons per minute..  | 42                  |                          |                     |                     | 30                   |                       | 2,700                |                     |
| 39 Capacity, 1910..... gallons per minute..  |                     |                          |                     |                     | 276                  |                       |                      |                     |
| <b>Pumped wells:</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 40 Number, 1920.....   |                     |                          |                     |                     | 2                    |                       |                      |                     |
| 41 Number, 1910.....   |                     |                          |                     |                     |                      |                       |                      |                     |
| 42 Capacity, 1920..... gallons per minute..  |                     |                          |                     |                     | 60                   |                       |                      |                     |
| 43 Capacity, 1910..... gallons per minute..  |                     |                          |                     |                     |                      |                       |                      |                     |
| <b>Pumping plants:</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 44 Number, 1920.....   | 1                   |                          |                     |                     | 3                    |                       | 1                    |                     |
| 45 Number, 1910.....   |                     |                          |                     |                     | 4                    |                       | 1                    |                     |
| 46 Engine capacity, 1920..... horsepower..   | 2                   |                          |                     |                     | 156                  |                       | 3,800                |                     |
| 47 Engine capacity, 1910..... horsepower..   |                     |                          |                     |                     | 17                   |                       | 5,400                |                     |
| 48 Pump capacity, 1920..... gallons per minute..   |                     |                          |                     |                     | 7,400                |                       | 330,000              |                     |
| 49 Pump capacity, 1910..... gallons per minute..   |                     |                          |                     |                     | 185                  |                       | 225,000              |                     |
| 50 Average lift, 1920..... feet..  | 15                  |                          |                     |                     | 27                   |                       | 14                   |                     |
| <b>CAPITAL INVESTED.</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 51 Capital invested to Jan. 1, 1920..... dollars..   | 148,484             | 3,045,291                | 3,034,313           | 117,177             | 10,223,513           | 236,538               | 4,610,590            | 138,592             |
| 52 Capital invested to July 1, 1910..... dollars..   | 160,487             |                          |                     |                     | 4,507,866            |                       | 2,408,681            |                     |
| 53 Per cent of increase, 1910-1920.....  |                     |                          |                     |                     |                      |                       |                      |                     |
| 54 Average per acre based on area enterprises were capable of supplying with water in 1920..... dollars..      | 17.33               | 24.75                    | 45.88               | 8.07                | 44.83                | 9.13                  | 35.57                | 5.24                |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 4.96                |                          |                     |                     | 24.69                |                       | 25.50                |                     |
| <b>ESTIMATED FINAL COST.</b>   |                     |                          |                     |                     |                      |                       |                      |                     |
| 56 Estimated final cost of existing enterprises in 1920..... dollars..   | 150,519             | 3,130,091                | 4,846,413           | 117,777             | 10,223,513           | 238,188               | 4,618,640            | 140,318             |
| 57 Estimated final cost of existing enterprises in 1910..... dollars..   | 160,487             |                          |                     |                     | 8,855,666            |                       | 4,074,524            |                     |
| 58 Per cent of increase, 1910-1920.....  |                     |                          |                     |                     |                      |                       |                      |                     |
| 59 Average per acre based on estimated final cost and area included in enterprises in 1920..... dollars..      | 10.57               | 23.18                    | 26.22               | 5.53                | 43.58                | 8.18                  | 30.99                | 3.06                |
| 60 Average per acre based on estimated final cost and area included in enterprises in 1910..... dollars..      | 3.87                |                          |                     |                     | 24.83                |                       | 24.91                |                     |

<sup>1</sup> Part taken to form part of Gem in 1915; part taken to form part of Valley in 1917.

<sup>2</sup> Organized from part of Bingham in 1911.

<sup>3</sup> Organized from parts of Bingham, Blaine, and Jefferson in 1917.

<sup>4</sup> Organized from part of Blaine in 1917.

<sup>5</sup> Part taken to form part of Gem in 1915; part taken to form Payette in 1917.

<sup>6</sup> Organized from part of Bannock in 1919.

<sup>7</sup> Part taken to form Twin Falls in 1907; part taken to form part of Power in 1913.

<sup>8</sup> Organized from part of Fremont in 1919.

# IRRIGATION—IDAHO.

13

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES, IRRIGATION WORKS AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1919 AND 1920—Continued.

[A minus sign (—) denotes decrease.]

|                              |   | Custer.   | Elmore. <sup>1</sup> | Franklin. <sup>2</sup> | Fremont. <sup>3</sup> | Gem. <sup>4</sup> | Gooding. <sup>5</sup> | Idaho. <sup>6</sup> | Jefferson. <sup>7</sup> |
|------------------------------|---|-----------|----------------------|------------------------|-----------------------|-------------------|-----------------------|---------------------|-------------------------|
| 1                            | Number of all farms in 1920.....  | 370       | 502                  | 910                    | 1,101                 | 770               | 874                   | 1,667               | 1,071                   |
| 2                            | Number of farms irrigated in 1919.....  | 349       | 313                  | 737                    | 635                   | 599               | 819                   | 85                  | 888                     |
| 3                            | Per cent of all farms.....  | 92.1      | 62.4                 | 81.0                   | 57.7                  | 77.8              | 93.7                  | 5.1                 | 82.9                    |
| 4                            | Number of farms irrigated in 1909.....  | 277       | 276                  | —                      | 2,221                 | —                 | —                     | 129                 | —                       |
| 5                            | Per cent of increase, 1909-1919.....  | 26.0      | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| <b>LAND AND FARM AREA.</b>   |   |           |                      |                        |                       |                   |                       |                     |                         |
| 6                            | Approximate land area of the state.....acres..  | 3,149,440 | 1,787,120            | 355,840                | 1,183,360             | 362,880           | 473,600               | 5,464,960           | 700,160                 |
| 7                            | All land in farms.....acres..   | 99,985    | 121,880              | 173,790                | 278,768               | 143,144           | 104,491               | 604,468             | 160,948                 |
| 8                            | Improved land in farms.....acres..  | 49,461    | 38,958               | 104,241                | 172,073               | 56,134            | 75,379                | 218,562             | 99,744                  |
| 9                            | Area irrigated in 1919.....acres..  | 80,141    | 28,844               | 37,460                 | 130,044               | 51,007            | 45,408                | 2,593               | 149,151                 |
| 10                           | Per cent of improved land in farms.....   | 162.0     | 74.0                 | 35.9                   | 75.6                  | 90.9              | 60.2                  | 1.2                 | 149.5                   |
| 11                           | Area irrigated in 1909.....acres..  | 41,889    | 17,781               | —                      | 303,163               | —                 | —                     | 3,372               | —                       |
| 12                           | Per cent of increase, 1909-1919.....  | 91.3      | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..                                       | 112,244   | 37,641               | 39,279                 | 191,572               | 55,836            | 83,662                | 3,103               | 211,515                 |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..                                       | 54,505    | 27,403               | —                      | 409,757               | —                 | —                     | 3,990               | —                       |
| 15                           | Per cent of increase, 1910-1920.....  | 105.9     | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 16                           | Area included in enterprises in 1920.....acres..  | 144,041   | 60,252               | 54,967                 | 222,235               | 59,852            | 91,523                | 3,843               | 258,608                 |
| 17                           | Area included in enterprises in 1910.....acres..  | 75,788    | 105,688              | —                      | 466,112               | —                 | —                     | 5,546               | —                       |
| 18                           | Per cent of increase, 1910-1920.....  | 90.1      | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                               | 1,475     | 2,185                | —                      | —                     | —                 | —                     | —                   | 12,225                  |
| <b>IRRIGATION WORKS.</b>     |   |           |                      |                        |                       |                   |                       |                     |                         |
| Independent enterprises:     |   |           |                      |                        |                       |                   |                       |                     |                         |
| 20                           | Number, 1920.....   | 284       | 138                  | 77                     | 108                   | 42                | 79                    | 86                  | 72                      |
| 21                           | Number, 1910.....   | 192       | 134                  | —                      | 384                   | —                 | —                     | 122                 | —                       |
| Main ditches:                |   |           |                      |                        |                       |                   |                       |                     |                         |
| 22                           | Number, 1920.....   | 331       | 150                  | 79                     | 143                   | 37                | 55                    | 119                 | 62                      |
| 23                           | Number, 1910.....   | 215       | 134                  | —                      | 410                   | —                 | —                     | 126                 | —                       |
| 24                           | Length, 1920.....miles..  | 785       | 283                  | 212                    | 527                   | 135               | 167                   | 103                 | 344                     |
| 25                           | Length, 1910.....miles..  | 549       | 266                  | —                      | 1,071                 | —                 | —                     | 116                 | —                       |
| 26                           | Capacity, 1920.....second-feet..  | 3,202     | 1,117                | 859                    | 9,597                 | 2,109             | 2,756                 | 151                 | 8,364                   |
| 27                           | Capacity, 1910.....second-feet..  | 2,112     | 838                  | —                      | 21,720                | —                 | —                     | 281                 | —                       |
| Laterals:                    |   |           |                      |                        |                       |                   |                       |                     |                         |
| 28                           | Number, 1920.....   | 358       | 217                  | 40                     | 106                   | 31                | 150                   | 3                   | 198                     |
| 29                           | Number, 1910.....   | 160       | 119                  | —                      | 291                   | —                 | —                     | 29                  | —                       |
| 30                           | Length, 1920.....miles..  | 78        | 108                  | 89                     | 252                   | 119               | 282                   | —                   | 591                     |
| 31                           | Length, 1910.....miles..  | 112       | 38                   | —                      | 428                   | —                 | —                     | 8                   | —                       |
| Reservoirs:                  |   |           |                      |                        |                       |                   |                       |                     |                         |
| 32                           | Number, 1920.....   | 7         | 18                   | 6                      | 19                    | 1                 | 5                     | 5                   | 6                       |
| 33                           | Number, 1910.....   | 13        | 22                   | —                      | 32                    | —                 | —                     | —                   | —                       |
| 34                           | Capacity, 1920.....acre-feet..  | 18,708    | 35,109               | 7,903                  | 8,422                 | 3                 | 6,405                 | 79                  | 35,874                  |
| 35                           | Capacity, 1910.....acre-feet..  | 3,417     | 51,053               | —                      | 41,535                | —                 | —                     | —                   | —                       |
| Flowing wells:               |   |           |                      |                        |                       |                   |                       |                     |                         |
| 36                           | Number, 1920.....   | —         | 1                    | —                      | —                     | 1                 | —                     | —                   | —                       |
| 37                           | Number, 1910.....   | —         | 11                   | —                      | —                     | —                 | —                     | —                   | —                       |
| 38                           | Capacity, 1920.....gallons per minute..   | —         | —                    | —                      | —                     | 36                | —                     | —                   | —                       |
| 39                           | Capacity, 1910.....gallons per minute..   | —         | 1,470                | —                      | —                     | —                 | —                     | —                   | —                       |
| Pumped wells:                |   |           |                      |                        |                       |                   |                       |                     |                         |
| 40                           | Number, 1920.....   | —         | 17                   | —                      | —                     | —                 | —                     | —                   | —                       |
| 41                           | Number, 1910.....   | —         | 5                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 42                           | Capacity, 1920.....gallons per minute..   | —         | 2,132                | —                      | —                     | —                 | —                     | —                   | —                       |
| 43                           | Capacity, 1910.....gallons per minute..   | —         | 690                  | —                      | —                     | —                 | —                     | —                   | —                       |
| Pumping plants:              |   |           |                      |                        |                       |                   |                       |                     |                         |
| 44                           | Number, 1920.....   | 1         | 22                   | 6                      | —                     | —                 | 3                     | —                   | 11                      |
| 45                           | Number, 1910.....   | —         | 12                   | —                      | 1                     | —                 | —                     | 1                   | —                       |
| 46                           | Engine capacity, 1920.....horsepower..  | 33        | 2,397                | 568                    | —                     | —                 | 706                   | —                   | 626                     |
| 47                           | Engine capacity, 1910.....horsepower..  | —         | 9                    | —                      | 200                   | —                 | —                     | 25                  | —                       |
| 48                           | Pump capacity, 1920.....gallons per minute..  | 10,800    | 13,966               | 14,915                 | —                     | —                 | 33,794                | —                   | 96,250                  |
| 49                           | Pump capacity, 1910.....gallons per minute..  | —         | 1,045                | —                      | 1,000                 | —                 | —                     | 225                 | —                       |
| 50                           | Average lift, 1920.....feet..   | 94        | 23                   | 10                     | —                     | —                 | 50                    | —                   | 11                      |
| <b>CAPITAL INVESTED.</b>     |   |           |                      |                        |                       |                   |                       |                     |                         |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..  | 778,848   | 1,806,335            | 822,981                | 1,712,611             | 1,492,559         | 6,960,473             | 109,506             | 6,308,032               |
| 52                           | Capital invested to July 1, 1910.....dollars..  | 305,140   | 1,008,403            | —                      | 1,759,082             | —                 | —                     | 74,316              | —                       |
| 53                           | Per cent of increase, 1910-1920.....  | 155.2     | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 54                           | Average per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 6.94      | 42.38                | 20.95                  | 8.94                  | 26.73             | 83.20                 | 35.29               | 29.82                   |
| 55                           | Average per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 5.60      | 36.80                | —                      | 4.29                  | —                 | —                     | 18.63               | —                       |
| <b>ESTIMATED FINAL COST.</b> |   |           |                      |                        |                       |                   |                       |                     |                         |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..                                    | 813,848   | 1,876,777            | 834,781                | 1,964,211             | 1,695,559         | 7,028,095             | 109,506             | 6,463,412               |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..                                    | 308,340   | 1,508,403            | —                      | 1,791,082             | —                 | —                     | 74,316              | —                       |
| 58                           | Per cent of increase, 1910-1920.....  | 163.9     | —                    | —                      | —                     | —                 | —                     | —                   | —                       |
| 59                           | Average per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 5.65      | 31.15                | 15.19                  | 8.84                  | 28.33             | 76.79                 | 28.49               | —                       |
| 60                           | Average per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 4.07      | 14.27                | —                      | 3.84                  | —                 | —                     | 13.40               | 24.99                   |

<sup>1</sup> Part of Blaine annexed in 1911.

<sup>2</sup> Organized from part of Oneida in 1913; part of Bannock annexed in 1918.

<sup>3</sup> Parts taken to form Jefferson and Madison in 1914; part taken to form Clark in 1919.

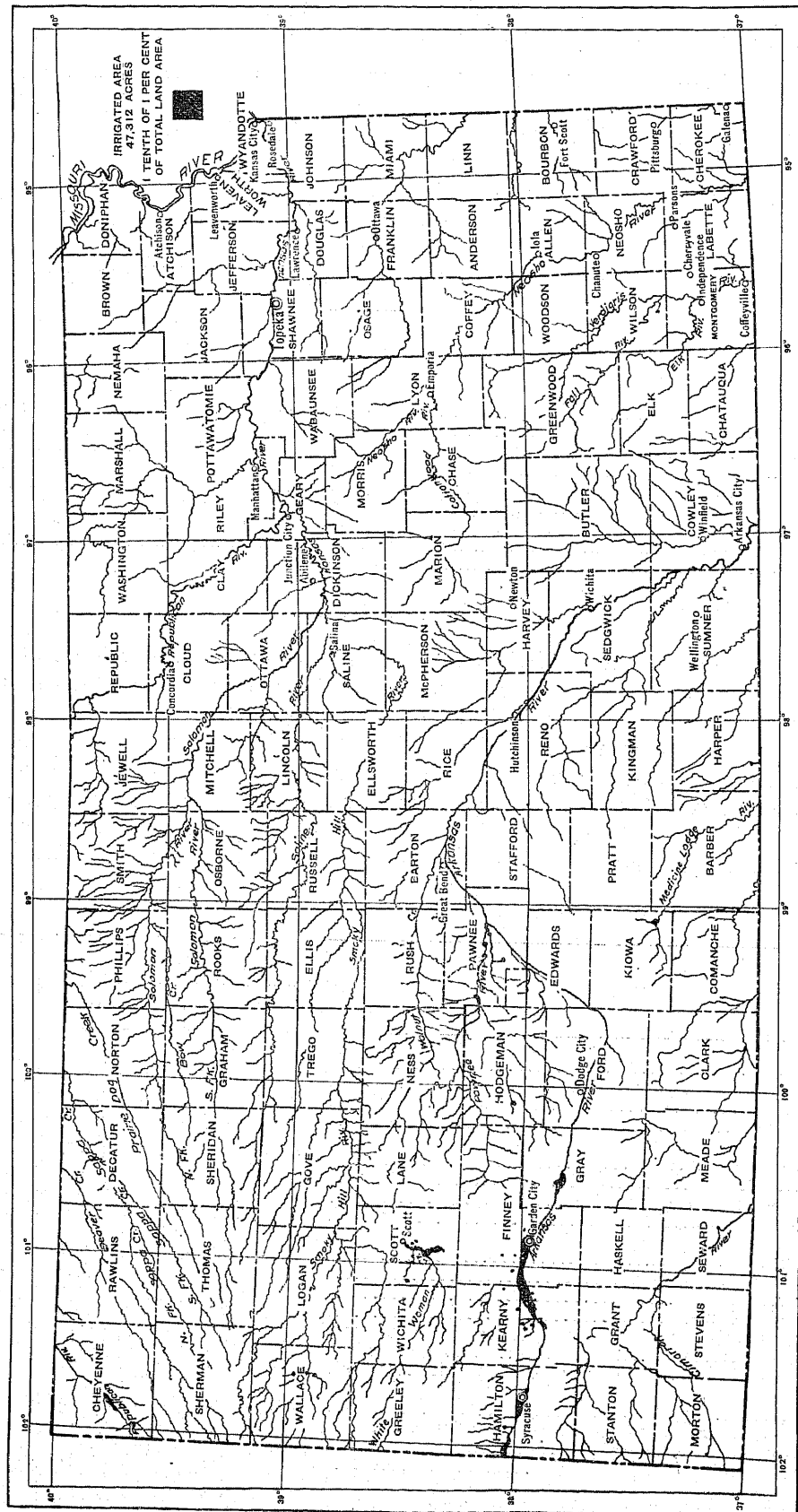
<sup>4</sup> Organized from parts of Boise and Canyon in 1915.

<sup>5</sup> Organized from part of Lincoln in 1913; part taken to form part of Jerome in 1919.

<sup>6</sup> Boundary between Idaho and Lemhi changed in 1911; part of Idaho taken to form part of Valley in 1917.

<sup>7</sup> Organized from part of Fremont in 1914; part taken to form part of Butte in 1917.

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

*"Appropriation and use"* includes all rights acquired without formalities of any kind that have not been defined by the courts.

*"Notice filed and posted"* includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

*"Adjudicated by court"* includes all rights that have been defined by the courts.

*"Permit from state"* includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

*"Certificate or license from the state"* includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

*"Riparian rights"* includes rights based on the ownership of riparian land.

*"Underground"* represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

The usual climatic conditions determining the necessity for irrigation are the amount and the seasonal distribution of precipitation. In Kansas the wind movement also must be taken into consideration, because of its effect on evaporation.

Precipitation decreases with remarkable regularity from 42 inches in the southeastern counties of the state to just a little more than 15 inches at the Colorado line.

About 75 per cent of the annual precipitation falls during the six crop-growing months, April to September. In the western part of the state, during the late summer, the large amount of sunshine and the hot drying winds cause a rapid evaporation that increases the water requirements of vegetation and the necessity for irrigation.

The precipitation in the western part of the state in 1919 was above the normal and it is probable that some land was not irrigated that would be in a drier season.

## WATER SUPPLY FOR IRRIGATION.

In the eastern part of Kansas the rainfall is sufficient for the growing of crops, and the streams carry an abundance of water. In the western part of the state the streams, with the exception of the Arkansas River, rise on the plains, and depend mostly on local precipitation for their summer flow, consequently they carry little water except during storms.

The Arkansas River rises in the main range of the Rocky Mountains and receives water from melting snows, but losses from evaporation and seepage and diversions in Colorado exhaust the summer flow of the river, except such as comes from local precipitation and seepage from irrigated land in Colorado. None of the streams in the part of the state where irrigation is needed affords any large supply of water during the summer, but the streams afford a good supply in the spring. There is opportunity for storage of the winter and flood flow, but little storage has been provided.

In the stream valleys there is abundant ground water at shallow depths, and more than one-fourth of the land irrigated in the state is supplied from this source. On the high plains there is ground water, but it occurs at such great depths that the cost of pumping is too great to permit of a large use of water from wells.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                                     |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|-------------------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. <sup>1</sup> | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 504              | -49.9                               | 0.3                    | 47,312          | 26.2                   | 0.1                          | 0.1                        | 0.2                                  |
| 1910.....    | 1,006            | 8.3                                 | 0.6                    | 37,479          | 58.7                   | 0.1                          | 0.1                        | 0.1                                  |
| 1900.....    | 929              | 79.0                                | 0.5                    | 23,620          | 13.5                   | ( <sup>2</sup> )             | 0.1                        | 0.1                                  |
| 1890.....    | 519              |                                     | ( <sup>2</sup> )       | 20,818          |                        | ( <sup>2</sup> )             | 0.1                        | 0.1                                  |

<sup>1</sup> A minus sign (-) denotes decrease.    <sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF  
ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area in-cluded in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                       | Area enter-prises were ca-pable of irrigating in 1920 (acres). |
|--------------------|--------------------------|---|-------------------------|---------------------------------------|--|
|                    |                          |   | Acres.                  | Per cent of acre-age in enter-prises. |  |
| Total.....         | 209                      | 102,562                                       | 47,312                  | 46.1                                  | 67,853   |
| 1870-1879.....     | 2                        | 145   | 80                      | 55.2                                  | 145  |
| 1880-1889.....     | 7                        | 23,380  | 15,413                  | 65.9                                  | 23,386   |
| 1890-1899.....     | 7                        | 15,786  | 13,226                  | 83.8                                  | 15,786   |
| 1900-1909.....     | 30                       | 13,103  | 3,617                   | 27.6                                  | 5,317  |
| 1910-1914.....     | 62                       | 7,027   | 3,719                   | 52.9                                  | 6,485  |
| 1915-1919.....     | 78                       | 38,452  | 7,109                   | 18.5                                  | 11,405   |
| Not reported.....  | 23                       | 5,663   | 4,148                   | 73.2                                  | 5,329  |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                 | AREA IRRIGATED (ACRES). |        |                        |           | Area enter-prises were capable of irrigating in 1920 (acres). | Area included in enter-prises, 1920 (acres). |
|--|-------------------------|--------|------------------------|-----------|---|--|
|  | 1919                    | 1909   | Increase. <sup>1</sup> |           |   |  |
|  |                         |        | Acres.                 | Per cent. |   |  |
| Total.....                             | 47,312                  | 37,479 | 9,833                  | 26.2      | 67,853  | 102,562                                      |
| Stream, gravity.....                   | 30,807                  | 35,469 | -4,662                 | -13.1     | 41,603  | 41,435                                       |
| Stream, pumped.....                    | 730                     | 20     | 710                    | .....     | 1,641   | 2,105  |
| Stream, pumped and gravity.....        | 600                     | .....  | 600                    | .....     | 850   | 850  |
| Wells, pumped.....                     | 13,235                  | 1,950  | 11,276                 | 575.6     | 20,519  | 54,974                                       |
| Wells, flowing and pumped.....         | 50                      | 2      | 48                     | .....     | 60  | 60   |
| Lake, pumped.....                      | .....                   | .....  | .....                  | .....     | 100   | 100  |
| Springs.....                           | .....                   | 27     | — 27                   | .....     | .....   | .....  |
| Stored storm water.....                | .....                   | 2      | — 2                    | .....     | .....   | .....  |
| Stream, gravity, and pumped wells..... | 1,540                   | .....  | 1,540                  | .....     | 2,830   | 2,618  |
| Other mixed.....                       | 350                     | .....  | 350                    | .....     | 350   | 420  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when base is less than 100



## ACREAGE, BY CHARACTER OF ENTERPRISE.

Kansas enacted an irrigation district law in 1891 but no districts are reported in the state.

The state has never accepted the conditions of the Federal Carey Act (act of Aug. 18, 1894).

The United States Reclamation Service undertook one project in Kansas, but this has been disposed of.

The small acreage credited to the state in Table 5 belongs to a state institution, and does not represent a scheme of state construction.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920 AND 1910.

| ITEM AND CLASS.  | CENSUS OF— |         | INCREASE. <sup>1</sup> |           |
|--|------------|---------|------------------------|-----------|
|  | 1920       | 1910    | Amount.                | Per cent. |
| <b>ACREAGE IRRIGATED.</b>                              |            |         |                        |           |
| Total.....   | 47,312     | 37,479  | 9,833                  | 26.2      |
| Individual and partnership.....                        | 14,546     | 3,154   | 11,392                 | 361.2     |
| Cooperative.....                                       | 32,516     | 27,372  | 5,144                  | 18.8      |
| Commercial.....  | 150        | —       | 150                    | —         |
| U. S. Reclamation Service.....                         | —          | 6,953   | -6,953                 | -100.0    |
| State.....   | 100        | (?)     | 100                    | —         |
| <b>ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING.</b> |            |         |                        |           |
| Total.....   | 67,853     | 139,995 | -72,142                | -51.5     |
| Individual and partnership.....                        | 26,614     | 4,795   | 21,819                 | 455.0     |
| Cooperative.....                                       | 40,719     | 135,200 | -94,481                | -69.9     |
| Commercial.....  | 320        | —       | 320                    | —         |
| U. S. Reclamation Service.....                         | —          | —       | —                      | —         |
| State.....   | 200        | (?)     | 200                    | —         |
| <b>ACREAGE INCLUDED IN ENTERPRISES.</b>                |            |         |                        |           |
| Total.....   | 102,562    | 161,300 | -58,738                | -36.4     |
| Individual and partnership.....                        | 36,643     | 6,423   | 30,220                 | 470.5     |
| Cooperative.....                                       | 65,399     | 141,200 | -75,801                | -54.6     |
| Commercial.....  | 320        | —       | 320                    | —         |
| U. S. Reclamation Service.....                         | —          | 10,677  | -10,677                | —         |
| State.....   | 200        | (?)     | 200                    | —         |

<sup>1</sup> A minus sign (—) denotes decrease. \* Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of the state of Kansas relating to water rights are summarized in the following paragraphs:

The state of Kansas enacted in 1886 a law declaring that rights to the use of water may be acquired by appropriation, and that between appropriations the first in time is the first in right. This law required any party wishing to appropriate water to post a notice at the point of intended diversion and file a copy of the notice with the county clerk.

A law enacted in 1891 contained the following sections relating to water rights:

"In all that portion of the state of Kansas situated west of the ninety-ninth meridian, all natural waters, whether standing or running, and whether surface or subterranean, shall be devoted, first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses, and secondly to other industrial purposes, and may be diverted from natural beds, basins, or channels for such purposes and uses. *Provided*, That no such diversion shall interfere with, diminish, or divest any prior vested right of appropriation for the same or a higher purpose than that for which such diversion is sought to be made, without due legal condemnation of, and compensation for the same; and natural lakes and ponds of surface water having no outlets shall be deemed parcel of the lands wherein the same may be situated, and only the proprietors of such land shall be entitled to draw off the same.

"Waters flowing in well-defined subterranean channels and courses, or flowing or standing in subterranean sheets, shall be subject to appropriation with the same effect as water of superficial channels."

This law prescribes no procedure for acquiring rights, or for recording them, and the law of 1886 requiring posting and filing of claims is still in effect.

Conflicting rights are defined in ordinary suits between rival claimants.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                       | 1919   |                       | 1909,<br>per cent<br>of total. |
|------------------------------|--------|-----------------------|--------------------------------|
|                              | Acres. | Per cent<br>of total. |                                |
| Total.....                   | 47,312 | 100.0                 | 100.0                          |
| Appropriation and use.....   | 26,435 | 55.9                  | 73.6                           |
| Notice filed and posted..... | 4,218  | 8.9                   | 26.3                           |
| Adjudicated by court.....    | 458    | 0.9                   | —                              |
| Riparian rights.....         | 30     | 0.1                   | 0.1                            |
| Underground.....             | 13,480 | 28.5                  | (?)                            |
| Other and mixed.....         | 938    | 2.0                   | (?)                            |
| Not reported.....            | 1,753  | 3.7                   | (?)                            |

<sup>1</sup> This class was not included in the tabulation for 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

## ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.                          | AREA IRRIGATED (ACRES). |          |   | Area in-<br>cluded in enter-<br>prises, 1920<br>(acres). | Area enter-<br>prises were<br>capable of irri-<br>gating in 1902<br>(acres). |
|--|-------------------------|----------|---|--|--|
|  | 1919                    | 1902     | Per cent of in-<br>crease. <sup>1</sup> |  |  |
| Total.....                               | 47,312                  | 28,922   | 63.6                                    | 102,562  | 67,853   |
| Tributaries of Kansas River.....         | 773                     | 2,792    | -72.3                                   | 3,580  | 3,396  |
| Republican River.....                    | 510                     | 1,470    | -65.3                                   | 2,090  | 2,090  |
| Smoky Hill River.....                    | 248                     | 770      | -67.8                                   | 1,420  | 1,236  |
| Other tributaries of Kansas River.....   | 15                      | 552      | -97.3                                   | 70   | 70   |
| Arkansas River and tributaries.....      | 46,539                  | * 26,130 | 78.1                                    | 98,982   | 64,457   |
| Arkansas River direct.....               | 30,130                  | 22,253   | 35.4                                    | 38,533   | 38,533   |
| Chimarron River.....                     | —                       | 1,910    | —                                       | 210  | 210  |
| Other tributaries of Arkansas River..... | 16,409                  | * 1,967  | 734.2                                   | 60,239   | 25,714   |

<sup>1</sup> A minus sign (—) denotes decrease.

\* Includes springs and wells.

### CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.     | Per cent of increase. | AVERAGE PER ACRE. |                                    |
|--------------|-------------|-----------------------|-------------------|------------------------------------|
|              |             |                       | Amount.           | Per cent of increase. <sup>1</sup> |
| 1890.....    | \$2,067,381 | 51.4                  | \$30.47           | 212.5                              |
| 1910.....    | 1,365,563   | 157.8                 | 9.75              | -56.5                              |
| 1900.....    | 529,755     | 525.2                 | 22.43             | 451.1                              |
| 1890.....    | 84,729      |                       | 4.07              |                                    |

<sup>1</sup> A minus sign (—) denotes decrease.

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.     | Per cent of total. | Average per acre. |
|--------------------|-------------|--------------------|-------------------|
| Total.....         | \$2,067,381 | 100.0              | \$30.47           |
| 1870-1879.....     | 736         | ( <sup>1</sup> )   | 5.08              |
| 1880-1889.....     | 1,058,982   | 51.2               | 45.28             |
| 1890-1899.....     | 88,719      | 4.3                | 5.62              |
| 1900-1909.....     | 200,085     | 9.7                | 37.63             |
| 1910-1914.....     | 176,286     | 8.5                | 27.18             |
| 1915-1919.....     | 407,876     | 19.7               | 35.76             |
| Not reported.....  | 134,697     | 6.5                | 25.28             |

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                 | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|--|-------------------------|--------------------|-------------------|--|-------------------------------------|
|  | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                             | \$2,067,381             | 100.0              | \$30.47           | 28,583                                   | \$3.20                              |
| Stream, gravity.....                   | 1,184,674               | 57.3               | 28.48             | 17,957                                   | 0.92                                |
| Stream, pumped.....                    | 22,142                  | 1.1                | 14.37             | 645                                      | 7.57                                |
| Stream, pumped and gravity.....        | 50,000                  | 2.4                | 58.82             | 600                                      | 20.00                               |
| Wells, pumped.....                     | 741,583                 | 35.9               | 36.14             | 8,481                                    | 6.96                                |
| Wells, flowing and pumped.....         | 4,000                   | 0.2                | 66.67             |  |                                     |
| Lake, gravity.....                     | 1,000                   | ( <sup>2</sup> )   | 10.00             | 50                                       | 1.00                                |
| Stream, gravity, and pumped wells..... | 50,532                  | 2.4                | 17.86             | 620                                      | 1.55                                |
| Other mixed.....                       | 13,450                  | 0.7                | 38.43             | 230                                      | 1.83                                |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                          | 1920        | 1902      | INCREASE. <sup>1</sup> |           |
|--|-------------|-----------|------------------------|-----------|
|  |             |           | Amount.                | Per cent. |
| Total.....                               | \$2,067,381 | \$599,098 | \$1,468,283            | 245.1     |
| Tributaries of Kansas River.....         | 50,311      | 139,742   | -89,431                | -64.0     |
| Republican River.....                    | 15,816      | 107,450   | -91,634                | -85.3     |
| Smoky Hill River.....                    | 33,753      | 3,410     | 30,343                 | 899.8     |
| Other tributaries of Kansas River.....   | 742         | 28,882    | -28,140                | -97.4     |
| Arkansas River and tributaries.....      | 2,017,070   | * 459,356 | 1,557,714              | 339.1     |
| Arkansas River direct.....               | 1,153,205   | 368,775   | 784,430                | 212.7     |
| Cimarron River.....                      | 15,000      | 21,100    | -6,100                 | -28.9     |
| Other tributaries of Arkansas River..... | 848,865     | * 69,481  | 779,384                |           |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$2,067,381             | 100.0              | 28,583                                   | \$3.20                              |
| Individual and partnership..... | 775,095                 | 37.5               | 8,817                                    | 6.07                                |
| Cooperative.....                | 1,289,737               | 62.4               | 19,666                                   | 1.99                                |
| Commercial.....                 | 1,549                   | 0.1                |  |                                     |
| State.....                      | 1,000                   | ( <sup>2</sup> )   | 100                                      | 12.00                               |

<sup>1</sup> Based on area irrigated in 1919.

<sup>2</sup> Less than one-tenth of 1 per cent.

### DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |       |
|--|-------|
| Number of enterprises reporting land drained or needing drainage.....  | 5     |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 3,610 |
| Acreage for which drains have been installed.....  | 250   |
| Additional acreage needing drainage.....   | 1,320 |
| Per cent that area for which drains have been installed is of total area included in enterprises reporting drainage.....                                 | 6.9   |
| Per cent that area for which drains have been installed is of total area included in irrigation enterprises in the state.....                            | 0.2   |
| Per cent that area for which drains have been installed plus that needing drainage is of total area included in irrigation enterprises in the state..... | 1.5   |

### QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.  | Total. | Measured. | Not measured. |
|--|--------|-----------|---------------|
| Average volume entering canals.....second-feet.....        | 455    | 354       | 101           |
| Area irrigated in 1919.....acres.....                      | 20,900 | 19,925    | 975           |
| Average number of acres per second-foot.....               | 46     | 56        | 9             |
| Total quantity of water entering canals.....acre-feet..... | 35,139 | 18,402    | 16,737        |
| Area irrigated in 1919.....acres.....                      | 21,210 | 20,235    | 975           |
| Average quantity per acre.....acre-feet.....               | 1.7    | 0.9       | 17.2          |
| Total quantity of water delivered.....acre-feet.....       | 14,275 | 13,718    | 557           |
| Area irrigated in 1919.....acres.....                      | 20,855 | 20,055    | 800           |
| Average quantity per acre.....acre-feet.....               | 0.7    | 0.7       | 0.7           |

# IRRIGATION—KANSAS.

7

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                    |                           |                         | Number.       | Capacity (second-foot). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
|                    | 10                        | 13                      | 139           | 1,667                   | 271             | 374              | 147             | 36          | 391                   |
|                    | 2                         | 1                       | 2             | 2                       | 2               | 8                | 1               |             |                       |
|                    | 3                         |                         | 7             | 489                     | 107             | 48               | 45              |             |                       |
|                    | 3                         | 1                       | 7             | 326                     | 51              | 12               | 3               | 2           | 40                    |
|                    |                           |                         | 15            | 271                     | 34              | 52               | 4               | 10          | 24                    |
|                    |                           | 5                       | 55            | 202                     | 36              | 134              | 61              | 11          | 122                   |
|                    | 2                         | 6                       | 51            | 368                     | 26              | 114              | 32              | 12          | 205                   |
|                    |                           |                         | 2             | 9                       | 15              | 6                | 1               | 1           |                       |

| DATE OF BEGINNING. | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                               |         |                                |
|--------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|-------------------------------|---------|--------------------------------|
|                    |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horsepower). | Pumps.  |                                |
|                    |                             |                |                                |               |                                |                 |                               | Number. | Capacity (gallons per minute). |
|                    | 28                          | 6              | 500                            | 710           | 266,797                        | 198             | 6,946                         | 288     | 297,975                        |
|                    | 0.3                         | 6              | 500                            | 116           | 26,665                         | 1               |                               | 2       |                                |
|                    | 0.3                         |                |                                | 158           | 60,884                         | 29              | 1,483                         | 67      | 30,635                         |
|                    | 0.4                         |                |                                | 313           | 104,742                        | 65              | 1,701                         | 85      | 78,409                         |
|                    | 1.8                         |                |                                | 122           | 74,506                         | 79              | 3,222                         | 108     | 114,825                        |
|                    |                             |                |                                |               |                                | 24              | 540                           | 26      | 74,106                         |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.        | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|               |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
|               | 10                        | 13                      | 139           | 1,667                   | 271             | 374              | 147             | 36          | 391                   |
| 1 partnership | 7                         | 6                       | 129           | 817                     | 112             | 288              | 81              | 30          | 386                   |
|               | 3                         | 6                       | 8             | 774                     | 154             | 71               | 58              | 6           | 5                     |
|               |                           | 1                       | 1             | 6                       | 1               |                  |                 |             |                       |
|               |                           | 1                       | 1             | 70                      | 4               | 15               | 8               |             |                       |

| CLASS.        | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                               |         |                                |
|---------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|-------------------------------|---------|--------------------------------|
|               |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horsepower). | Pumps.  |                                |
|               |                             |                |                                |               |                                |                 |                               | Number. | Capacity (gallons per minute). |
|               | 2.8                         | 6              | 500                            | 710           | 266,797                        | 198             | 6,945                         | 288     | 297,975                        |
| 1 partnership | 2.7                         | 6              | 500                            | 687           | 245,297                        | 194             | 5,411                         | 269     | 272,275                        |
|               |                             |                |                                | 17            | 19,000                         | 2               | 1,450                         | 17      | 19,000                         |
|               |                             |                |                                |               |                                | 1               | 25                            | 1       | 2,500                          |
|               | 0.1                         |                |                                | 6             | 2,500                          | 1               | 60                            | 1       | 4,200                          |

## IRRIGATION—KANSAS.

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|  |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                               | 10                        | 13                      | 139           | 1,667                   | 271             | 374              | 147             | 36          | 391                   |
| Tributaries of Kansas River.....         | 5                         | 1                       | 14            | 50                      | 18              | 14               | 1               |             |                       |
| Republican River.....                    |                           |                         | 4             | 34                      | 12              |                  |                 |             |                       |
| Smoky Hill River.....                    | 5                         | 1                       | 9             | 15                      | 6               | 14               | 1               |             |                       |
| Other tributaries of Kansas River.....   |                           |                         | 1             | 1                       |                 |                  |                 |             |                       |
| Arkansas River and tributaries.....      | 5                         | 12                      | 125           | 1,617                   | 253             | 360              | 146             | 36          | 391                   |
| Arkansas River direct.....               | 3                         |                         | 8             | 774                     | 154             | 54               | 48              |             |                       |
| Cimarron River.....                      |                           | 1                       | 18            | 8                       | 6               |                  |                 | 2           | 3                     |
| Other tributaries of Arkansas River..... | 2                         | 11                      | 99            | 835                     | 93              | 306              | 98              | 34          | 388                   |

| DRAINAGE BASIN.                          | Pipelines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|--|----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|  |                            | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  | Average lift (feet).           |
|  |                            |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....                               | 2.8                        | 6              | 500                            | 710           | 266,797                        | 198             | 6,946                          | 288     | 297,975                        |
| Tributaries of Kansas River.....         |                            |                |                                | 32            | 2,600                          | 8               | 383                            | 23      | 6,700                          |
| Republican River.....                    |                            |                |                                | 1             | 500                            | 1               | 60                             | 1       | 500                            |
| Smoky Hill River.....                    |                            |                |                                | 31            | 2,100                          | 6               | 303                            | 21      | 5,350                          |
| Other tributaries of Kansas River.....   |                            |                |                                |               |                                | 1               | 20                             | 1       | 850                            |
| Arkansas River and tributaries.....      | 2.8                        | 6              | 500                            | 678           | 264,197                        | 190             | 6,563                          | 265     | 291,275                        |
| Arkansas River direct.....               |                            |                |                                | 1             |                                | 1               | 10                             | 1       |                                |
| Cimarron River.....                      |                            | 6              | 500                            | 5             | 2,800                          | 3               | 156                            | 3       | 2,800                          |
| Other tributaries of Arkansas River..... | 2.8                        |                |                                | 672           | 261,397                        | 186             | 6,397                          | 261     | 288,475                        |

# IRRIGATION—KANSAS.

9

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP. |                                       | AREA HARVESTED. |                              |                  |                              |                                     | QUANTITY HARVESTED. |         |                              |                  |                              |                                     |  |
|-------|---------------------------------------|-----------------|------------------------------|------------------|------------------------------|-------------------------------------|---------------------|---------|------------------------------|------------------|------------------------------|-------------------------------------|--|
|       |                                       | 1919            |                              | 1909             |                              | Per cent of in-crease. <sup>1</sup> | Unit.               | 1919    |                              | 1909             |                              | Per cent of in-crease. <sup>1</sup> |  |
|       |                                       | Acres.          | Per cent of total for state. | Acres.           | Per cent of total for state. |                                     |                     | Amount. | Per cent of total for state. | Amount.          | Per cent of total for state. |                                     |  |
| 1     | Cereals:                              |                 |                              |                  |                              |                                     |                     |         |                              |                  |                              |                                     |  |
| 2     | Corn.....                             | 238             | ( <sup>2</sup> )             | 745              | ( <sup>2</sup> )             | -68.1                               | Bu.....             | 4,090   | ( <sup>2</sup> )             | 16,892           | ( <sup>2</sup> )             | -75.8                               |  |
| 3     | Oats.....                             | 1,238           | 0.1                          | 487              | 0.1                          | 154.2                               | Bu.....             | 24,022  | 0.1                          | 10,525           | ( <sup>2</sup> )             | 128.2                               |  |
| 4     | Winter wheat.....                     | 4,029           | ( <sup>2</sup> )             | 930              | ( <sup>2</sup> )             | 358.4                               | Bu.....             | 45,340  | ( <sup>2</sup> )             | 19,121           | ( <sup>2</sup> )             | 150.7                               |  |
| 5     | Spring wheat.....                     | 234             | 1.0                          |                  |                              |                                     | Bu.....             | 2,592   | 1.3                          |                  |                              |                                     |  |
| 6     | Barley.....                           | 1,370           | 0.3                          | 356              | 0.2                          | 284.8                               | Bu.....             | 18,483  | 0.2                          | 6,145            | 0.3                          | 200.8                               |  |
| 7     | Hay and forage:                       |                 |                              |                  |                              |                                     |                     |         |                              |                  |                              |                                     |  |
| 8     | Alfalfa.....                          | 14,962          | 1.1                          | 10,470           | 1.1                          | 42.9                                | Tons...             | 30,397  | 1.2                          | 21,699           | 1.1                          | 40.1                                |  |
| 9     | Wild, salt, or prairie grasses.....   | 615             | 0.1                          | 541              | ( <sup>2</sup> )             | 13.7                                | Tons...             | 1,146   | 0.1                          | 527              | ( <sup>2</sup> )             | 117.5                               |  |
| 10    | Silage crops.....                     | 491             | 0.2                          | ( <sup>2</sup> ) |                              |                                     | Tons...             | 2,668   | 0.2                          | ( <sup>2</sup> ) |                              |                                     |  |
| 11    | Corn cut for forage.....              | 186             | ( <sup>2</sup> )             | ( <sup>2</sup> ) |                              |                                     | Tons...             | 500     | ( <sup>2</sup> )             | ( <sup>2</sup> ) |                              |                                     |  |
| 12    | Kafir, sorghum, etc., for forage..... | 1,238           | 0.1                          | ( <sup>2</sup> ) |                              |                                     | Tons...             | 3,033   | 0.2                          | ( <sup>2</sup> ) |                              |                                     |  |
| 1     | Seeds:                                |                 |                              |                  |                              |                                     |                     |         |                              |                  |                              |                                     |  |
| 2     | Kafir, millo, feterita, durra.....    | 3,050           | 0.6                          | ( <sup>2</sup> ) |                              |                                     | Bu.....             | 36,835  | 0.5                          | ( <sup>2</sup> ) |                              |                                     |  |
| 3     | Vegetables:                           |                 |                              |                  |                              |                                     |                     |         |                              |                  |                              |                                     |  |
| 4     | Sugar beets.....                      | 851             | 50.6                         | 5,638            | 97.1                         | -84.9                               | Tons...             | 4,036   | 50.8                         | 45,346           | 89.6                         | -91.1                               |  |

| CROP. |                                       | AVERAGE YIELD PER ACRE, 1919. |            |                        |                    |                                |   | VALUE.  |                              |                  |                              |                                     |
|-------|---------------------------------------|-------------------------------|------------|------------------------|--------------------|--------------------------------|---|---------|------------------------------|------------------|------------------------------|-------------------------------------|
|       |                                       | Unit.                         | For state. | On non-irrigated land. | On irrigated land. |                                |   | 1919    |                              | 1909             |                              | Per cent of in-crease. <sup>1</sup> |
|       |                                       |                               |            |                        | Average.           | Per cent of average for state. | Per cent of average for non-irrigated land. | Amount. | Per cent of total for state. | Amount.          | Per cent of total for state. |                                     |
| 1     | Cereals:                              |                               |            |                        |                    |                                |   |         |                              |                  |                              |                                     |
| 2     | Corn.....                             | Bu.....                       | 16.2       | 16.2                   | 17.2               | 106.2                          | 106.2                                       | \$5,930 | ( <sup>2</sup> )             | \$9,748          | ( <sup>2</sup> )             | -39.2                               |
| 3     | Oats.....                             | Bu.....                       | 25.6       | 26.0                   | 19.4               | 75.8                           | 75.8  | 19,218  | 0.1                          | 4,942            | 0.1                          | 288.9                               |
| 4     | Winter wheat.....                     | Bu.....                       | 13.2       | 13.2                   | 11.3               | 85.6                           | 85.6  | 97,934  | ( <sup>2</sup> )             | 17,708           | ( <sup>2</sup> )             | 484.7                               |
| 5     | Spring wheat.....                     | Bu.....                       | 8.5        | 8.5                    | 11.1               | 130.6                          | 130.6                                       | 5,599   | 1.3                          |                  |                              |                                     |
| 6     | Barley.....                           | Bu.....                       | 19.0       | 19.4                   | 13.5               | 68.9                           | 69.6  | 19,407  | 0.2                          | 3,281            | 0.3                          | 491.5                               |
| 7     | Hay and forage:                       |                               |            |                        |                    |                                |   |         |                              |                  |                              |                                     |
| 8     | Alfalfa.....                          | Tons...                       | 1.89       | 1.89                   | 2.03               | 107.4                          | 107.4                                       | 531,948 | 1.2                          | 153,250          | 1.1                          | 247.1                               |
| 9     | Wild, salt, or prairie grasses.....   | Tons...                       | 1.06       | 1.06                   | 1.89               | 175.5                          | 175.5                                       | 14,325  | 0.1                          | 3,099            |                              | 362.2                               |
| 10    | Silage crops.....                     | Tons...                       | 4.21       | 4.21                   | 5.43               | 129.0                          | 129.0                                       | 21,344  | 0.2                          | ( <sup>2</sup> ) |                              |                                     |
| 11    | Corn cut for forage.....              | Tons...                       | 1.50       | 1.50                   | 2.69               | 179.3                          | 179.3                                       | 4,000   | ( <sup>2</sup> )             | ( <sup>2</sup> ) |                              |                                     |
| 12    | Kafir, sorghum, etc., for forage..... | Tons...                       | 1.86       | 1.86                   | 2.45               | 131.7                          | 131.7                                       | 30,330  | 0.2                          | ( <sup>2</sup> ) |                              |                                     |
| 1     | Seeds:                                |                               |            |                        |                    |                                |   |         |                              |                  |                              |                                     |
| 2     | Kafir, millo, feterita, durra.....    | Bu.....                       | 13.9       | 13.9                   | 12.1               | 87.1                           | 87.1  | 49,727  | 0.5                          | ( <sup>2</sup> ) |                              |                                     |
| 3     | Vegetables:                           |                               |            |                        |                    |                                |   |         |                              |                  |                              |                                     |
| 4     | Sugar beets.....                      | Tons...                       | 4.72       | 4.70                   | 4.74               | 100.4                          | 100.9                                       | 42,399  | 50.8                         | 226,931          | 89.0                         | -81.3                               |

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Less than one-tenth of 1 per cent.

<sup>3</sup> Not reported separately in 1909.

## IRRIGATION—KANSAS.

COUNTY TABLE.—ACREAGE IRRIGATED AND INCLUDED IN ENTERPRISES; IRRIGATION WORKS; AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, BY COUNTIES: 1920 AND 1919.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                          |   | THE STATE. | Cheyenne. | Finney.   | Gray.     | Hamilton. | Kearny. | Pawnee. | Scott.  | Wallace. | Other counties. |
|--------------------------|---|------------|-----------|-----------|-----------|-----------|---------|---------|---------|----------|-----------------|
| 1                        | Number of all farms in 1920.....  | 165,286    | 974       | 717       | 733       | 326       | 359     | 1,144   | 428     | 341      | 160,264         |
| 2                        | Number of farms irrigated in 1919.....  | 504        | 7         | 206       | 16        | 23        | 81      | 18      | 100     | 8        | 45              |
| 3                        | Per cent of all farms.....  | 0.3        | 0.7       | 28.7      | 2.2       | 7.1       | 22.6    | 1.6     | 23.4    | 2.3      | 648             |
| 4                        | Number of farms irrigated in 1909.....  | 1,006      | 10        | 173       | 54        | 121       | 121     | 121     | 121     | 121      | 648             |
| 5                        | Per cent of increase, 1909-1919.....  | -49.9      | 19.1      | 19.1      | 19.1      | -33.1     | 19.1    | 19.1    | 19.1    | 19.1     | -93.1           |
| LAND AND FARM AREA.      |   |            |           |           |           |           |         |         |         |          |                 |
| 6                        | Approximate land area.....acres..   | 52,335,360 | 645,120   | 816,640   | 548,480   | 629,760   | 545,920 | 474,880 | 456,960 | 589,440  | 47,628,160      |
| 7                        | All land in farms.....acres..   | 45,425,179 | 570,222   | 629,119   | 423,068   | 262,213   | 213,685 | 456,771 | 335,360 | 336,271  | 42,198,470      |
| 8                        | Improved land in farms.....acres..  | 30,600,760 | 407,959   | 158,264   | 228,277   | 54,261    | 80,723  | 407,567 | 150,808 | 101,883  | 29,011,518      |
| 9                        | Area irrigated in 1919.....acres..  | 47,312     | 500       | 15,221    | 825       | 3,463     | 21,976  | 1,117   | 3,047   | 213      | 950             |
| 10                       | Per cent of improved land in farms.....   | 0.2        | 0.1       | 9.6       | 0.4       | 6.4       | 27.2    | 0.3     | 2.0     | 0.2      | (1)             |
| 11                       | Area irrigated in 1909.....acres..  | 37,479     | 1,515     | 17,285    | 60        | 2,366     | 15,168  | 15,168  | 15,168  | 251      | 834             |
| 12                       | Per cent of increase, 1909-1919.....  | 26.2       | -67.0     | -11.9     | 46.4      | 44.9      | 44.9    | 44.9    | 44.9    | -15.1    | 13.9            |
| 13                       | Area enterprises were capable of irrigating in 1920.....acres..                                       | 67,853     | 2,080     | 18,655    | 1,000     | 6,266     | 29,367  | 2,366   | 5,045   | 1,018    | 2,056           |
| 14                       | Area enterprises were capable of irrigating in 1910.....acres..                                       | 139,995    | 3,025     | 96,287    | 60        | 10,606    | 28,445  | 28,445  | 240     | 466      | 866             |
| 15                       | Per cent of increase, 1910-1920.....  | -51.5      | -31.2     | -80.6     | -40.9     | -40.9     | -40.9   | -40.9   | -40.9   | -40.9    | -40.9           |
| 16                       | Area included in enterprises in 1920.....acres..  | 102,562    | 2,080     | 19,209    | 1,000     | 6,266     | 37,897  | 2,630   | 30,163  | 1,018    | 2,299           |
| 17                       | Area included in enterprises in 1910.....acres..  | 161,300    | 4,500     | 109,376   | 110       | 16,754    | 28,581  | 28,581  | 480     | 621      | 878             |
| 18                       | Per cent of increase, 1910-1920.....  | -36.4      | -53.8     | -82.4     | 900.0     | -62.6     | -32.6   | -32.6   | -32.6   | -63.9    | -63.9           |
| IRRIGATION WORKS.        |   |            |           |           |           |           |         |         |         |          |                 |
| Independent enterprises: |   |            |           |           |           |           |         |         |         |          |                 |
| 19                       | Number, 1920.....   | 209        | 3         | 85        | 1         | 9         | 31      | 16      | 12      | 7        | 45              |
| 20                       | Number, 1910.....   | 716        | 6         | 39        | 11        | 10        | 10      | 10      | 10      | 10       | 850             |
| Main ditches:            |   |            |           |           |           |           |         |         |         |          |                 |
| 21                       | Number, 1920.....   | 139        | 3         | 72        | 1         | 4         | 6       | 15      | 2       | 7        | 29              |
| 22                       | Number, 1910.....   | 89         | 4         | 32        | 8         | 5         | 5       | 5       | 1       | 8        | 31              |
| 23                       | Length, 1920.....miles.   | 271        | 12        | 48        | 50        | 28        | 90      | 21      | 1       | 6        | 15              |
| 24                       | Length, 1910.....miles.   | 274        | 27        | 100       | 33        | 65        | 65      | 65      | 1       | 10       | 38              |
| 25                       | Capacity, 1920.....second-feet.   | 1,667      | 34        | 666       | 24        | 1         | 742     | 118     | 2       | 12       | 68              |
| 26                       | Capacity, 1910.....second-feet.   | 2,600      | 125       | 1,400     | 492       | 493       | 493     | 493     | 6       | 14       | 70              |
| Laterals:                |   |            |           |           |           |           |         |         |         |          |                 |
| 27                       | Number, 1920.....   | 374        | 1         | 179       | 30        | 16        | 2       | 101     | 17      | 14       | 15              |
| 28                       | Number, 1910.....   | 39         | 1         | 11        | 4         | 4         | 10      | 10      | 10      | 13       | 13              |
| 29                       | Length, 1920.....miles.   | 147        | 43        | 18        | 6         | 8         | 49      | 10      | 1       | 1        | 12              |
| 30                       | Length, 1910.....miles.   | 42         | 1         | 29        | 5         | 3         | 3       | 3       | 4       | 4        | 4               |
| Reservoirs:              |   |            |           |           |           |           |         |         |         |          |                 |
| 31                       | Number, 1920.....   | 36         | 13        | 13        | 2         | 1         | 3       | 7       | 1       | 1        | 10              |
| 32                       | Number, 1910.....   | 42         | 31        | 31        | 4         | 3         | 3       | 3       | 1       | 1        | 3               |
| 33                       | Capacity, 1920.....acre-feet.   | 391        | 237       | 237       | 41        | 101       | 101     | 9       | 9       | 9        | 3               |
| 34                       | Capacity, 1910.....acre-feet.   | 31,024     | 31,019    | 31,019    | 1         | 2         | 2       | 2       | 1       | 1        | 1               |
| Flowing wells:           |   |            |           |           |           |           |         |         |         |          |                 |
| 35                       | Number, 1920.....   | 6          | 3         | 3         | 3         | 3         | 3       | 3       | 3       | 3        | 6               |
| 36                       | Number, 1910.....   | 3          | 3         | 3         | 3         | 3         | 3       | 3       | 3       | 3        | 3               |
| 37                       | Capacity, 1920.....gallons per minute.  | 500        | 500       | 500       | 500       | 500       | 500     | 500     | 500     | 500      | 500             |
| 38                       | Capacity, 1910.....gallons per minute.  | 30         | 30        | 30        | 30        | 30        | 30      | 30      | 30      | 30       | 30              |
| Pumped wells:            |   |            |           |           |           |           |         |         |         |          |                 |
| 39                       | Number, 1920.....   | 710        | 368       | 368       | 11        | 165       | 7       | 54      | 24      | 81       | 81              |
| 40                       | Number, 1910.....   | 939        | 252       | 252       | 3         | 7         | 75      | 1       | 1       | 601      | 601             |
| 41                       | Capacity, 1920.....gallons per minute.  | 266,797    | 102,611   | 102,611   | 8,500     | 98,515    | 4,590   | 32,050  | 450     | 20,081   | 20,081          |
| 42                       | Capacity, 1910.....gallons per minute.  | 73,362     | 30,613    | 30,613    | 4,384     | 33,325    | 3,000   | 3,000   | 3,000   | 440      | 440             |
| Pumping plants:          |   |            |           |           |           |           |         |         |         |          |                 |
| 43                       | Number, 1920.....   | 198        | 81        | 81        | 6         | 30        | 17      | 13      | 3       | 48       | 48              |
| 44                       | Number, 1910.....   | 698        | 61        | 61        | 2         | 9         | 19      | 1       | 1       | 606      | 606             |
| 45                       | Engine capacity, 1920.....horsepower.   | 6,946      | 1,493     | 1,493     | 126       | 2,085     | 397     | 1,930   | 75      | 840      | 840             |
| 46                       | Engine capacity, 1910.....horsepower.   | 1,517      | 992       | 992       | 30        | 66        | 225     | 35      | 35      | 169      | 169             |
| 47                       | Pump capacity, 1920.....gallons per minute.   | 297,975    | 107,311   | 107,311   | 9,200     | 97,615    | 21,390  | 32,350  | 3,300   | 26,809   | 26,809          |
| 48                       | Pump capacity, 1910.....gallons per minute.   | 128,276    | 80,113    | 80,113    | 6,384     | 33,725    | 3,000   | 3,000   | 3,000   | 3,454    | 3,454           |
| 49                       | Average lift, 1920.....feet.  | 30         | 26        | 26        | 20        | 32        | 27      | 67      | 40      | 26       | 26              |
| CAPITAL INVESTED.        |   |            |           |           |           |           |         |         |         |          |                 |
| 50                       | Capital invested to Jan. 1, 1920.....dollars..  | 2,067,381  | 11,816    | 237,064   | 1,000,040 | 38,065    | 296,700 | 32,450  | 299,500 | 19,503   | 132,243         |
| 51                       | Capital invested to July 1, 1910.....dollars..  | 1,365,563  | 6,384     | 1,089,048 | 5,500     | 25,908    | 218,694 | 6,000   | 6,000   | 1,805    | 12,224          |
| 52                       | Per cent of increase, 1910-1920.....  | 51.4       | 85.1      | -78.2     | 46.9      | 46.9      | 35.7    | 35.7    | 35.7    | 980.5    | 981.8           |
| 53                       | Average per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 30.47      | 5.68      | 12.71     | 1,000.04  | 6.07      | 10.10   | 13.72   | 59.37   | 19.16    | 64.32           |
| 54                       | Average per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 9.75       | 2.11      | 11.31     | 91.67     | 2.44      | 7.69    | 25.00   | 3.87    | 14.12    | 14.12           |
| ESTIMATED FINAL COST.    |   |            |           |           |           |           |         |         |         |          |                 |
| 55                       | Estimated final cost of existing enterprises in 1920.....dollars..                                    | 2,195,981  | 11,816    | 237,064   | 1,005,040 | 38,065    | 296,700 | 35,750  | 416,000 | 19,503   | 136,043         |
| 56                       | Estimated final cost of existing enterprises in 1910.....dollars..                                    | 1,365,563  | 6,384     | 1,089,048 | 5,900     | 25,908    | 218,694 | 6,000   | 6,000   | 3,357    | 10,272          |
| 57                       | Per cent of increase, 1910-1920.....  | 60.8       | 85.1      | -78.2     | 46.9      | 46.9      | 35.7    | 35.7    | 35.7    | 481.0    | 481.0           |
| 58                       | Average per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 21.41      | 5.68      | 12.34     | 1,005.04  | 6.07      | 7.83    | 13.59   | 13.79   | 19.16    | 59.17           |
| 59                       | Average per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 8.47       | 1.42      | 9.96      | 53.64     | 1.55      | 7.65    | 12.50   | 5.41    | 11.70    | 11.70           |

<sup>1</sup> Less than one-tenth of 1 per cent.

## FOURTEENTH CENSUS OF THE UNITED STATES: 1920

DEPARTMENT  
OF COMMERCE

## BULLETIN

BUREAU OF  
THE CENSUS

## IRRIGATION : LOUISIANA

## STATISTICS FOR THE STATE AND ITS PARISHES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE .....   | 5     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 6     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 6     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 6     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | PARISH TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 8     |
| FARMS AND ACREAGE IRRIGATED.....                       | 4     |  |       |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by drainage basin.....                        | 5     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Louisiana collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

Rice is the only crop grown under irrigation in Louisiana, and small areas of rice are grown without irrigation, although in general the crop is irrigated. For the state the acreage of rice harvested in 1919 was 456,726 acres, the quantity produced was 16,005,936 bushels, and the value \$42,735,849.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

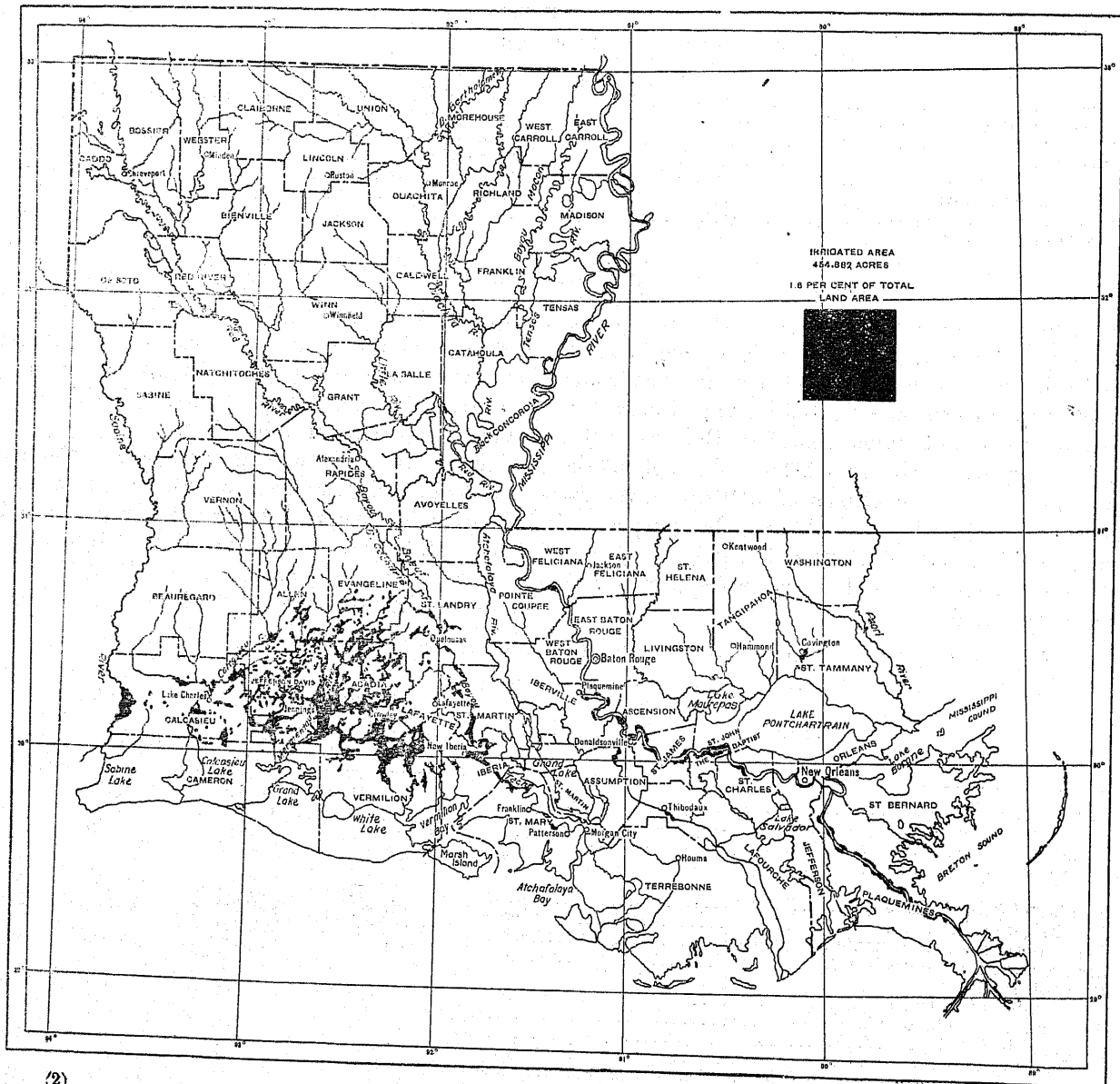
| ITEM.   | CENSUS OF—   |                  | INCREASE. <sup>1</sup> |           |
|---|--------------|------------------|------------------------|-----------|
|   | 1920         | 1910             | Amount.                | Per cent. |
| Number of all farms.....  | 135,463      | 120,546          | 14,917                 | 12.4      |
| Approximate land area of the state.....acres..  | 29,061,760   | 29,061,760       |                        |           |
| All land in farms.....acres..   | 10,019,822   | 10,439,481       | -419,659               | -4.0      |
| Improved land in farms.....acres..  | 5,626,226    | 5,276,016        | 350,210                | 6.6       |
| Number of farms irrigated.....  | 6,471        | 2,690            | 3,781                  | 140.6     |
| Area irrigated.....acres..  | 454,882      | 380,200          | 74,682                 | 19.6      |
| Area enterprises were capable of irrigating.....acres..                               | 728,742      | 553,220          | 175,522                | 31.7      |
| Area included in enterprises.....acres..  | 851,211      | 581,965          | 269,246                | 46.3      |
| Per cent irrigated:   |              |                  |                        |           |
| Number of all farms.....  | 4.8          | 2.2              | 2.6                    |           |
| Approximate land area of state.....   | 1.6          | 1.3              | 0.3                    |           |
| Land in farms.....  | 4.5          | 3.6              | 0.9                    |           |
| Improved land in farms.....   | 8.1          | 7.2              | 0.9                    |           |
| Excess of area enterprises were capable of irrigating over area irrigated.....acres.. | 273,860      | 173,020          | 100,840                | 58.3      |
| Excess of area included in enterprises over area irrigated.....acres..                | 396,329      | 201,765          | 194,564                | 96.4      |
| Capital invested.....   | \$14,063,181 | \$6,859,166      | \$7,204,015            | 105.0     |
| Average per acre enterprises were capable of irrigating.....                          | \$19.30      | \$12.40          | \$6.90                 | 55.6      |
| Estimated final cost of existing enterprises.....                                     | \$14,264,178 | \$6,914,166      | \$7,350,012            | 106.3     |
| Average per acre included in enterprises.....   | \$16.76      | \$11.88          | \$4.88                 | 41.1      |
| Average cost of operation and maintenance per acre.....                               | \$7.01       | ( <sup>2</sup> ) |                        |           |

<sup>1</sup> A minus sign (—) denotes decrease.<sup>2</sup> Not reported in 1910.



LOUISIANA

### APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consist of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

In Louisiana the normal rainfall is sufficient for the growing of general farm crops, the average annual rainfall for the state being about 54 inches. The rainfall in 1919 was far above the normal, the average for the state being about 69 inches.

As stated above, rice is the only crop irrigated, and some rice is grown without irrigation, although the area of rice grown in this way is small.

## WATER SUPPLY FOR IRRIGATION.

The larger part of the land irrigated for rice growing in Louisiana consists of level prairie land located in the southwestern part of the state, near the coast of the Gulf of Mexico. In this section the principal sources of water supply are the streams flowing to the Gulf and wells, from both of which the water is pumped. The streams are but little, if any, above the level of the Gulf, and water is pumped to the level lands lying between the streams. Usually the supply of fresh water is sufficient for the land irrigated, but at times the draft upon the streams is so heavy as to exhaust the supply of fresh water and salt water backs into the streams from the Gulf. At such times it is necessary to stop pumping until the fresh water coming from higher levels forces the salt water out of the streams, and occasionally crops suffer from shortage of water or from the use of salt water. Usually the pumping plants and canals are operated by commercial companies furnishing water to farmers for some form of crop rental.

About one-third of the area of irrigated land in the state is supplied with water pumped from wells. Usually these are owned by individual farmers, who supply water to their own farms only.

A small part of the rice is grown on lands along Mississippi River, which lie below the level of the water in the river at ordinary stages. Water for these lands is taken from the river by siphons passing over the levees. When the water is too low to siphon over the levees, it is pumped from the river to small basins made on the water side of the levees, high enough to permit of its being siphoned over.

The area of land available for rice growing and the water supply are ample to permit of a large extension of the area devoted to this crop. Other conditions limit the area.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED: 1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                                     |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|-------------------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. <sup>1</sup> | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 6,471            | 140.6                               | 4.8                    | 454,882         | 19.6                   | 1.6                          | 4.5                        | 8.1                                  |
| 1910.....    | 2,690            | —40.6                               | 2.2                    | 380,200         | 88.5                   | 1.3                          | 3.0                        | 7.2                                  |
| 1900.....    | 4,531            | .....                               | 3.9                    | 201,685         | 139.0                  | 0.7                          | 1.8                        | 4.3                                  |
| 1890.....    | (2)              | .....                               | .....                  | 84,377          | .....                  | 0.3                          | 0.9                        | 2.2                                  |

<sup>1</sup> A minus sign (—) denotes decrease.<sup>2</sup> Not reported.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area included in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                       | Area enter-prises were ca-pable of irrigating in 1920 (acres). |
|--------------------|--------------------------|--|-------------------------|---------------------------------------|--|
|                    |                          |  | Acres.                  | Per cent of acre-age in enter-prises. |  |
| Total.....         | 1,373                    | 851,211                                      | 454,882                 | 53.4                                  | 728,742  |
| 1870-1879.....     | 1                        | 160  | 40                      | 25.0                                  | 160  |
| 1880-1889.....     | 6                        | 4,018  | 2,050                   | 51.0                                  | 2,260  |
| 1890-1899.....     | 37                       | 320,400                                      | 151,983                 | 47.4                                  | 294,465  |
| 1900-1904.....     | 112                      | 92,361                                       | 50,263                  | 54.4                                  | 75,862   |
| 1905-1909.....     | 137                      | 68,605                                       | 34,631                  | 50.5                                  | 47,224   |
| 1910-1914.....     | 294                      | 108,290                                      | 59,919                  | 55.3                                  | 92,530   |
| 1915-1919.....     | 638                      | 212,410                                      | 126,831                 | 59.7                                  | 177,238  |
| Not reported.....  | 148                      | 44,967                                       | 29,165                  | 64.9                                  | 38,994   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY: 1919 AND 1909.

| CLASS.                                 | AREA IRRIGATED (ACRES). |                  |                        |           | Area enter-prises were capable of irrigating in 1920 (acres). | Area included in enter-prises, 1920 (acres). |
|--|-------------------------|------------------|------------------------|-----------|---|--|
|  | 1919                    | 1909             | Increase. <sup>1</sup> |           |   |  |
|  |                         |                  | Amount.                | Per cent. |   |  |
| Total.....                             | 454,882                 | 380,200          | 74,682                 | 19.6      | 728,742   | 851,211                                      |
| Stream, gravity.....                   | 10,226                  | 1,012            | 9,214                  | 910.5     | 12,393  | 15,225                                       |
| Stream, pumped.....                    | 248,306                 | 211,959          | 36,347                 | 17.1      | 437,475   | 488,611                                      |
| Stream, pumped and gravity.....        | 12,620                  |                  | 12,620                 |           | 27,675  | 30,800                                       |
| Wells, pumped.....                     | 154,304                 | 109,547          | 44,757                 | 40.9      | 209,698   | 258,680                                      |
| Wells, flowing.....                    | 196                     |                  | 196                    |           | 292   | 292  |
| Wells, flowing and pumped.....         | 1,075                   | ( <sup>2</sup> ) | 1,075                  |           | 1,325   | 2,175  |
| Lake, gravity.....                     | 3,225                   | 1,347            | 1,878                  | 139.4     | 4,616   | 5,095  |
| Lake, pumped.....                      | 6,966                   | 5,202            | 1,764                  | 33.9      | 10,140  | 11,100                                       |
| Stored storm water.....                | 84                      | 7,054            | —6,970                 | —98.8     | 229   | 229  |
| Stream, gravity, and pumped wells..... | 10,045                  | ( <sup>2</sup> ) | 10,045                 |           | 12,994  | 25,984                                       |
| Other mixed.....                       | 7,835                   | 44,079           | —36,244                | —82.2     | 11,905  | 13,020                                       |

<sup>1</sup> A minus sign (—) denotes decrease.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

Neither the Federal Carey Act (act of Aug. 18, 1894) nor the reclamation act (act of June 17, 1902) applies to the state of Louisiana, and the state has no laws relating to organization for supplying water for irrigation.

The commercial enterprises, reported in Table 5, are usually corporations that put in pumping plants and canals to supply water to farmers for crop rentals. Many of them own lands also and supply both land and water for a share of the crop.

The cooperative enterprises are unimportant, since they supply water to less than 3 per cent of the land.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920 AND 1910.

| ITEM AND CLASS.  | CENSUS OF— |         | INCREASE. |           |
|--|------------|---------|-----------|-----------|
|  | 1920       | 1910    | Amount.   | Per cent. |
| <b>ACREAGE IRRIGATED.</b>                              |            |         |           |           |
| Total.....   | 454,882    | 380,200 | 74,682    | 19.6      |
| Individual and partnership.....                        | 259,673    | 222,049 | 37,624    | 16.9      |
| Cooperative.....                                       | 10,635     | 10,635  | 0         | 0         |
| Commercial.....  | 184,574    | 158,161 | 26,423    | 16.7      |
| <b>ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING.</b> |            |         |           |           |
| Total.....   | 728,742    | 553,220 | 175,522   | 31.7      |
| Individual and partnership.....                        | 375,917    | 267,620 | 108,297   | 40.5      |
| Cooperative.....                                       | 20,325     | 20,325  | 0         | 0         |
| Commercial.....  | 332,500    | 285,600 | 46,900    | 16.4      |
| <b>ACREAGE INCLUDED IN ENTERPRISES.</b>                |            |         |           |           |
| Total.....   | 851,211    | 581,965 | 269,246   | 46.3      |
| Individual and partnership.....                        | 468,126    | 283,965 | 184,161   | 64.9      |
| Cooperative.....                                       | 20,685     | 20,685  | 0         | 0         |
| Commercial.....  | 362,400    | 298,000 | 64,400    | 21.6      |

## ACREAGE, BY DRAINAGE BASIN.

For no previous census have the results for Louisiana been tabulated by drainage basins; consequently no comparative figures can be included in Table 6.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919.

| DRAINAGE BASIN.                             | Area irrigated in 1919 (acres). | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|---|---------------------------------|---|--|
| Total.....                                  | 454,882                         | 851,211                                     | 728,742  |
| Sabine River and tributaries.....           | 13,035                          | 20,850                                      | 20,850   |
| Calcasieu Lake, River, and tributaries..... | 54,318                          | 169,193                                     | 137,178  |
| Mermentau River and tributaries.....        | 268,840                         | 458,463                                     | 382,755  |
| Vermilion River and tributaries.....        | 74,034                          | 138,066                                     | 126,649  |
| Atchafalaya River and tributaries.....      | 23,342                          | 31,920                                      | 30,885   |
| Mississippi River direct.....               | 17,416                          | 24,070                                      | 23,755   |
| Tributaries of Mississippi River.....       | 2,853                           | 5,358                                       | 3,473  |
| Other Gulfstreams.....                      | 1,044                           | 3,291                                       | 3,197  |

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 7.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1900 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                                    |
|--------------|--------------|-----------------------|-------------------|------------------------------------|
|              |              |                       | Amount.           | Per cent of increase. <sup>1</sup> |
| 1920.....    | \$14,063,181 | 105.0                 | \$19.30           | 55.6                               |
| 1910.....    | 6,859,166    | 171.2                 | 12.40             | -1.1                               |
| 1900.....    | 2,529,319    | .....                 | 12.54             | .....                              |

<sup>1</sup>A minus sign (—) denotes decrease.

TABLE 8.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$14,063,181 | 100.0              | \$19.30           |
| 1870-1879.....     | 1,000        | ( <sup>1</sup> )   | 6.25              |
| 1880-1889.....     | 24,800       | 0.2                | 10.97             |
| 1890-1899.....     | 5,487,222    | 39.0               | 18.63             |
| 1900-1904.....     | 1,347,322    | 9.6                | 17.76             |
| 1905-1909.....     | 1,171,166    | 8.3                | 24.80             |
| 1910-1914.....     | 1,502,682    | 10.7               | 16.24             |
| 1915-1919.....     | 3,848,822    | 27.4               | 21.72             |
| Not reported.....  | 680,167      | 4.8                | 17.44             |

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 9.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                 | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|--|-------------------------|--------------------|-------------------|--|-------------------------------------|
|  | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                             | \$14,063,181            | 100.0              | \$19.30           | 431,413                                  | \$7.01                              |
| Stream, gravity.....                   | 318,934                 | 2.3                | 25.74             | 9,937                                    | 3.69                                |
| Stream, pumped.....                    | 7,338,954               | 52.2               | 16.78             | 242,282                                  | 7.76                                |
| Stream, pumped and gravity.....        | 172,000                 | 1.2                | 6.21              | 12,550                                   | 6.06                                |
| Wells, pumped.....                     | 5,366,948               | 38.2               | 25.59             | 140,659                                  | 5.95                                |
| Wells, flowing.....                    | 5,000                   | .....              | 17.12             | 189                                      | 2.25                                |
| Wells, flowing and pumped.....         | 22,500                  | 0.2                | 16.98             | 1,075                                    | 4.19                                |
| Lake, pumped.....                      | 356,960                 | 2.5                | 35.20             | 6,716                                    | 9.17                                |
| Lake, gravity.....                     | 112,740                 | 0.8                | 24.42             | 2,480                                    | 3.21                                |
| Stored storm water.....                | 1,500                   | .....              | 6.55              | 10                                       | 5.00                                |
| Stream, gravity, and pumped wells..... | 247,595                 | 1.8                | 19.05             | 9,115                                    | 10.69                               |
| Other mixed.....                       | 120,050                 | 0.9                | 10.08             | 6,400                                    | 3.67                                |

<sup>1</sup> Based on area irrigated in 1919.

TABLE 10.—CAPITAL INVESTED, 1920, CLASSIFIED BY DRAINAGE BASIN.

| DRAINAGE BASIN.                             | 1920         |
|---|--------------|
| Total.....                                  | \$14,063,181 |
| Sabine River and tributaries.....           | 328,000      |
| Calcasieu Lake, River, and tributaries..... | 1,816,380    |
| Mermentau River and tributaries.....        | 7,713,797    |
| Vermilion River and tributaries.....        | 3,355,327    |
| Atchafalaya River and tributaries.....      | 407,956      |
| Mississippi River direct.....               | 302,385      |
| Tributaries of Mississippi River.....       | 28,686       |
| Other Gulfstreams.....                      | 110,650      |

TABLE 11.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$14,063,181            | 100.0              | 431,413                                  | \$7.01                              |
| Individual and partnership..... | 7,943,252               | 56.5               | 236,504                                  | 6.84                                |
| Cooperative.....                | 161,658                 | 1.1                | 10,635                                   | 4.81                                |
| Commercial.....                 | 5,958,271               | 42.4               | 184,274                                  | 7.35                                |

<sup>1</sup> Based on area irrigated in 1919.

## DRAINAGE OF IRRIGATED LAND.

TABLE 12.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|   |         |
|---|---------|
| Number of enterprises reporting land drained or needing drainage.....   | 406     |
| Acres included in enterprises reporting land drained or needing drainage..  | 283,476 |
| Acres for which drains have been installed.....   | 167,138 |
| Additional acreage needing drainage.....  | 21,202  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                              | 50.0    |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                         | 19.6    |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state.. | 22.1    |

The acreages reported in Table 12 relate to lands within the boundaries of irrigation projects, and do

not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 13. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 13.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.  | Measured. | Not measured. |
|---|---------|-----------|---------------|
| Average volume of water entering canals.....second-feet.. | 5,042   | 34        | 5,008         |
| Area irrigated in 1919.....acres..                        | 20,782  | 780       | 20,002        |
| Average number of acres per second-foot.....              | 4       | 23        | 4             |
| Total quantity of water entering canals.....acre-feet..   | 108,912 | 7,022     | 101,920       |
| Area irrigated in 1919.....acres..                        | 65,421  | 780       | 64,641        |
| Average quantity per acre.....acre-feet..                 | 3.0     | 0.0       | 3.0           |
| Total quantity of water delivered.....acre-feet..         | 10,497  | .....     | 10,497        |
| Area irrigated in 1919.....acres..                        | 7,094   | .....     | 7,094         |
| Average quantity per acre.....acre-feet..                 | 2.1     | .....     | 2.1           |

## IRRIGATION WORKS.

TABLE 14.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....         | 419                       | 63                      | 1,298         | 11,889                  | 1,584           | 3,008            | 1,659           | 74          | 7,632                 |
| 1870-1879.....     | .....                     | 1                       | .....         | .....                   | .....           | .....            | .....           | 1           | 400                   |
| 1880-1889.....     | .....                     | .....                   | .....         | .....                   | .....           | .....            | .....           | 1           | 60                    |
| 1890-1899.....     | .....                     | .....                   | .....         | .....                   | .....           | .....            | .....           | 1           | 6                     |
| 1900-1904.....     | 11                        | 3                       | 7             | 33                      | 9               | 1                | 1               | .....       | .....                 |
| 1905-1909.....     | 68                        | 2                       | 37            | 3,008                   | 411             | 1,493            | 1,011           | .....       | .....                 |
| 1910-1914.....     | 57                        | 2                       | 100           | 1,515                   | 166             | 336              | 113             | 3           | 85                    |
| 1915-1919.....     | 77                        | 14                      | 146           | 675                     | 131             | 363              | 92              | 4           | 30                    |
| Not reported.....  | 198                       | 38                      | 283           | 2,633                   | 248             | 495              | 124             | 17          | 2,275                 |
|                    | 8                         | 3                       | 648           | 3,797                   | 535             | 1,145            | 290             | 38          | 4,776                 |
|                    |                           |                         | 77            | 258                     | 84              | 76               | 28              | 9           | .....                 |

| DATE OF BEGINNING. | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |        |           |
|--------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|--------|-----------|
|                    |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps. |           |
| Total.....         | 50.1                        | 9              | 6,255                          | 812           | 1,607,637                      | 1,250           | 85,628                         | 1,941  | 4,068,686 |
| 1870-1879.....     | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....  | .....     |
| 1880-1889.....     | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....  | .....     |
| 1890-1899.....     | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....  | .....     |
| 1900-1904.....     | 0.2                         | .....          | .....                          | 1             | 7,000                          | .....           | .....                          | .....  | .....     |
| 1905-1909.....     | 2.9                         | .....          | .....                          | 9             | 96,200                         | 5               | 280                            | 5      | 21,000    |
| 1910-1914.....     | 1.0                         | .....          | .....                          | 64            | 132,850                        | 37              | 18,890                         | 85     | 2,124,715 |
| 1915-1919.....     | 0.9                         | .....          | .....                          | 117           | 199,100                        | 90              | 6,755                          | 146    | 477,200   |
| Not reported.....  | 44.9                        | 2              | 2,500                          | 179           | 338,550                        | 128             | 7,985                          | 193    | 352,250   |
|                    | 0.2                         | 5              | 3,330                          | 339           | 688,320                        | 268             | 17,052                         | 404    | 605,508   |
|                    |                             | 2              | 425                            | 108           | 145,617                        | 576             | 29,135                         | 790    | 1,178,993 |
|                    |                             |                |                                |               |                                | 146             | 6,031                          | 228    | 208,720   |

# IRRIGATION—LOUISIANA.

7

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|--------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                          |                         | Number.       | Capacity (second-foot). | Length (miles). | Number           | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 419                      | 63                      | 1,298         | 11,889                  | 1,584           | 3,908            | 1,659           | 74          | 7,632                 |
| Individual and partnership..... | 419                      | 62                      | 1,264         | 8,773                   | 1,110           | 2,383            | 522             | 74          | 7,632                 |
| Cooperative.....                |                          |                         | 6             | 35                      | 19              | 35               | 33              |             |                       |
| Commercial.....                 |                          | 1                       | 28            | 3,081                   | 455             | 1,490            | 1,104           |             |                       |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                                 |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total.....                      | 50.1                        | 9              | 6,255                          | 812           | 1,607,637                      | 1,250           | 85,628                         | 1,941   | 4,968,680                      |
| Individual and partnership..... | 50.1                        | 9              | 6,255                          | 805           | 1,588,837                      | 1,212           | 82,658                         | 1,855   | 2,611,880                      |
| Cooperative.....                |                             |                |                                | 2             | 7,500                          | 10              | 1,205                          | 12      | 100,500                        |
| Commercial.....                 |                             |                |                                | 5             | 11,300                         | 28              | 21,765                         | 74      | 2,250,300                      |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                             | Number<br>of<br>diverting<br>dams. | Number<br>of<br>storage<br>dams. | MAIN DITCHES. |                                |                    | LATERAL DITCHES. |                    | RESERVOIRS. |                          |
|---|------------------------------------|----------------------------------|---------------|--------------------------------|--------------------|------------------|--------------------|-------------|--------------------------|
|   |                                    |                                  | Number.       | Capacity<br>(second-<br>feet). | Length<br>(miles). | Number.          | Length<br>(miles). | Number.     | Capacity<br>(acre-feet). |
| Total.....                                  | 419                                | 63                               | 1,298         | 11,889                         | 1,584              | 3,908            | 1,659              | 74          | 7,632                    |
| Sabine River and tributaries.....           |                                    | 2                                | 1             | 111                            | 40                 | 25               | 25                 | 1           |                          |
| Calcasieu Lake, River, and tributaries..... | 4                                  | 4                                | 84            | 1,700                          | 159                | 92               | 168                | 3           | 400                      |
| Mormontau River and tributaries.....        | 14                                 | 47                               | 771           | 6,067                          | 863                | 1,632            | 568                | 61          | 5,058                    |
| Vermilion River and tributaries.....        |                                    |                                  | 68            | 1,099                          | 202                | 1,071            | 667                | 1           |                          |
| Atchafalaya River and tributaries.....      | 17                                 | 1                                | 91            | 728                            | 109                | 62               | 42                 | 1           | 2,041                    |
| Mississippi River direct.....               | 340                                |                                  | 241           | 869                            | 174                | 1,553            | 182                | 6           | 43                       |
| Tributaries of Mississippi River.....       | 39                                 |                                  | 37            | 707                            | 29                 | 58               | 2                  |             |                          |
| Other Gulf streams.....                     | 5                                  | 9                                | 5             | 8                              | 8                  | 15               | 5                  | 1           |                          |

| DRAINAGE BASIN.                             | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |                            |
|---|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|----------------------------|
|   |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average<br>lift<br>(feet). |
|   |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |                            |
| Total.....                                  | 50.1                              | 9              | 6,255                                | 812           | 1,607,637                            | 1,250           | 85,628                                   | 1,941   | 4,968,686                            | 32                         |
| Sabine River and tributaries.....           |                                   |                |                                      | 2             | 27,500                               | 3               | 1,050                                    | 6       | 54,500                               | 27                         |
| Calcasieu Lake, River, and tributaries..... | 0.4                               | 5              | 5,800                                | 92            | 243,400                              | 128             | 13,933                                   | 101     | 937,294                              | 30                         |
| Mormontau River and tributaries.....        | 0.1                               |                |                                      | 594           | 1,209,750                            | 800             | 56,300                                   | 1,293   | 2,927,213                            | 35                         |
| Vermilion River and tributaries.....        |                                   | 2              | 42½                                  | 82            | 67,007                               | 136             | 7,052                                    | 222     | 694,044                              | 29                         |
| Atchafalaya River and tributaries.....      | 42.2                              | 1              |                                      | 42            | 59,980                               | 105             | 4,070                                    | 171     | 230,675                              | 19                         |
| Mississippi River direct.....               | 6.2                               |                |                                      |               |                                      | 67              | 2,846                                    | 74      | 102,500                              | 11                         |
| Tributaries of Mississippi River.....       | 0.8                               |                |                                      |               |                                      | 5               | 285                                      | 5       | 22,300                               | 10                         |
| Other Gulf streams.....                     | 0.4                               | 1              | 30                                   |               |                                      | 6               | 92                                       | 9       | 160                                  | 8                          |

## IRRIGATION—LOUISIANA.

PARISH TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                          |  | THE STATE.       | Acadia.   | Allen. <sup>1</sup> | Ascension. | Assumption. | Calcasieu. <sup>2</sup> | Cameron. |
|--------------------------|--|------------------|-----------|---------------------|------------|-------------|-------------------------|----------|
| 1                        | Number of all farms in 1920.....   | 135,463          | 3,088     | 753                 | 1,630      | 438         | 922                     | 620      |
| 2                        | Number of farms reporting irrigation for rice growing in 1919.....   | 6,471            | 1,678     | 165                 | 74         | 13          | 377                     | 192      |
| 3                        | Per cent of all farms.....   | 4.8              | 54.3      | 21.9                | 4.5        | 3.0         | 40.9                    | 31.0     |
| 4                        | Number of farms reporting irrigation for rice growing in 1909.....   | 2,090            | 1,002     | 10                  | 10         | 815         | 21                      | 21       |
| 5                        | Per cent of increase, 1909-1919.....   | 140.6            | 67.5      |                     |            |             |                         |          |
| LAND AND FARM AREA.      |  |                  |           |                     |            |             |                         |          |
| 6                        | Approximate land area.....acres..  | 29,061,760       | 414,080   | 424,320             | 186,240    | 309,700     | 695,040                 | 960,040  |
| 7                        | All land in farms.....acres..  | 10,019,822       | 322,061   | 94,659              | 108,982    | 79,282      | 145,591                 | 132,513  |
| 8                        | Improved land in farms.....acres..   | 5,626,226        | 278,939   | 42,328              | 72,530     | 53,856      | 104,197                 | 33,261   |
| 9                        | Area irrigated for rice growing in 1919.....acres..  | 454,882          | 134,710   | 15,805              | 2,080      | 1,130       | 47,056                  | 725      |
| 10                       | Per cent of improved land in farms.....  | 8.1              | 48.3      | 37.3                | 2.9        | 2.1         | 45.2                    | 2.2      |
| 11                       | Area irrigated for rice growing in 1909.....acres..  | 380,200          | 107,466   | 10,466              | 4,233      | 2,131       | 131,208                 | 7,226    |
| 12                       | Per cent of increase, 1909-1919.....   | 19.6             | 25.4      |                     | -50.9      |             |                         | -90.0    |
| 13                       | Area enterprises were capable of irrigating in 1920.....acres..  | 728,742          | 186,218   | 28,590              | 2,635      | 1,530       | 121,612                 | 4,230    |
| 14                       | Area enterprises were capable of irrigating in 1910.....acres..  | 553,220          | 167,809   | 10,466              | 4,233      |             | 191,752                 | 11,180   |
| 15                       | Per cent of increase, 1910-1920.....   | 31.7             | 10.9      |                     | -37.8      |             |                         | -62.2    |
| 16                       | Area included in enterprises in 1920.....acres..   | 851,211          | 208,799   | 30,705              | 2,635      | 1,530       | 147,115                 | 4,310    |
| 17                       | Area included in enterprises in 1910.....acres..   | 581,965          | 171,917   | 10,466              | 4,233      |             | 208,404                 | 12,289   |
| 18                       | Per cent of increase, 1910-1920.....   | 46.3             | 21.5      |                     | -37.8      |             |                         | -64.9    |
| IRRIGATION WORKS.        |  |                  |           |                     |            |             |                         |          |
| Independent enterprises: |  |                  |           |                     |            |             |                         |          |
| 19                       | Number, 1920.....  | 1,373            | 328       | 32                  | 6          | 2           | 56                      | 5        |
| 20                       | Number, 1910.....  | 1,237            | 272       |                     | 7          |             | 358                     | 8        |
| Main ditches:            |  |                  |           |                     |            |             |                         |          |
| 21                       | Number, 1920.....  | 1,298            | 340       | 37                  | 8          | 1           | 38                      | 5        |
| 22                       | Number, 1910.....  | 515              | 110       |                     | 4          |             | 101                     | 4        |
| 23                       | Length, 1920.....miles..   | 1,584            | 428       | 36                  | 7          | 1           | 100                     | 5        |
| 24                       | Length, 1910.....miles..   | 729              | 220       |                     | 3          |             | 243                     | 14       |
| 25                       | Capacity, 1920.....second-feet..   | 11,889           | 1,934     | 36                  | 10         | 4           | 1,580                   | 8        |
| 26                       | Capacity, 1910.....second-feet..   | ( <sup>3</sup> ) |           |                     |            |             |                         |          |
| Laterals:                |  |                  |           |                     |            |             |                         |          |
| 27                       | Number, 1920.....  | 3,908            | 604       | 19                  | 1          |             | 77                      | 12       |
| 28                       | Number, 1910.....  | 180              | 82        |                     |            |             | 81                      | 3        |
| 29                       | Length, 1920.....miles..   | 1,659            | 390       | 41                  | 1          |             | 145                     | 6        |
| 30                       | Length, 1910.....miles..   | 439              | 187       |                     |            |             | 194                     | 4        |
| Reservoirs:              |  |                  |           |                     |            |             |                         |          |
| 31                       | Number, 1920.....  | 74               | 11        |                     |            |             | 3                       |          |
| 32                       | Number, 1910.....  | 104              |           |                     | 1          |             | 9                       | 1        |
| 33                       | Capacity, 1920.....acre-feet..   | 7,632            | 2,170     |                     |            |             | 460                     |          |
| 34                       | Capacity, 1910.....acre-feet..   | 19,482           |           |                     | 2          |             | 4,571                   | 1,800    |
| Flowing wells:           |  |                  |           |                     |            |             |                         |          |
| 35                       | Number, 1920.....  | 9                |           |                     |            |             | 5                       |          |
| 36                       | Number, 1910.....  | ( <sup>3</sup> ) |           |                     |            |             |                         |          |
| 37                       | Capacity, 1920.....gallons per minute..  | 6,255            |           |                     |            |             | 5,800                   |          |
| 38                       | Capacity, 1910.....gallons per minute..  | ( <sup>3</sup> ) |           |                     |            |             |                         |          |
| Pumped wells:            |  |                  |           |                     |            |             |                         |          |
| 39                       | Number, 1920.....  | 812              | 280       | 32                  |            |             | 28                      | 1        |
| 40                       | Number, 1910.....  | 606              | 180       |                     |            |             | 323                     | 5        |
| 41                       | Capacity, 1920.....gallons per minute..  | 1,607,637        | 426,300   | 89,700              |            |             | 106,800                 | 2,600    |
| 42                       | Capacity, 1910.....gallons per minute..  | 1,108,236        | 313,727   |                     |            |             | 585,470                 | 12,000   |
| Pumping plants:          |  |                  |           |                     |            |             |                         |          |
| 43                       | Number, 1920.....  | 1,250            | 347       | 45                  | 7          | 2           | 57                      | 5        |
| 44                       | Number, 1910.....  | 1,007            | 283       |                     | 7          |             | 362                     | 8        |
| 45                       | Engine capacity, 1920.....horsepower..   | 85,628           | 27,279    | 5,580               | 375        | 155         | 7,947                   | 187      |
| 46                       | Engine capacity, 1910.....horsepower..   | 57,426           | 16,907    |                     | 473        |             | 22,014                  | 643      |
| 47                       | Pump capacity, 1920.....gallons per minute..   | 4,968,686        | 1,509,335 | 161,100             | 9,500      | 11,000      | 745,200                 | 98,064   |
| 48                       | Pump capacity, 1910.....gallons per minute..   | 5,064,173        | 1,465,612 |                     | 31,213     |             | 2,040,052               | 144,190  |
| 49                       | Average lift, 1920.....feet..  | 32               | 37        | 36                  | 15         | 22          | 21                      | 17       |
| CAPITAL INVESTED.        |  |                  |           |                     |            |             |                         |          |
| 50                       | Capital invested to Jan. 1, 1920.....dollars..   | 14,063,181       | 3,732,648 | 309,450             | 44,100     | 12,500      | 1,667,236               | 59,570   |
| 51                       | Capital invested to July 1, 1910.....dollars..   | 6,859,166        | 2,098,121 |                     | 21,025     |             | 2,904,063               | 129,320  |
| 52                       | Per cent of increase, 1910-1920.....   | 105.0            | 77.9      |                     | 109.8      |             |                         | -53.9    |
| 53                       | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 19.30            | 20.04     | 10.82               | 10.74      | 8.17        | 13.71                   | 14.08    |
| 54                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 12.40            | 12.50     |                     | 4.97       |             | 15.14                   | 11.57    |
| ESTIMATED FINAL COST.    |  |                  |           |                     |            |             |                         |          |
| 55                       | Estimated final cost of existing enterprises in 1920.....dollars..   | 14,244,178       | 3,795,013 | 310,950             | 44,100     | 12,500      | 1,669,936               | 56,670   |
| 56                       | Estimated final cost of existing enterprises in 1910.....dollars..   | 6,914,166        | 2,098,121 |                     | 21,025     |             | 2,959,063               | 129,320  |
| 57                       | Per cent of increase, 1910-1920.....   | 106.3            | 80.9      |                     | 109.8      |             |                         | -53.9    |
| 58                       | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 16.76            | 18.18     | 10.13               | 16.74      | 8.17        | 11.35                   | 13.82    |
| 59                       | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 11.88            | 12.20     |                     | 4.97       |             | 14.20                   | 10.53    |

<sup>1</sup> Formed from part of Calcasieu Parish in 1913.

<sup>2</sup> Parts taken to form Allen, Beauregard, and Jefferson Davis Parishes in 1913.

<sup>3</sup> Not reported in 1910.



# IRRIGATION—LOUISIANA.

9

PARISH TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |  | Evange-<br>line. <sup>1</sup> | Iberia. | Iberville. | Jefferson<br>Davis. <sup>2</sup> | Lafayette. | Plaques-<br>mines. | Pointe<br>Coupee. | St. Charles. |
|------------------------------|--|-------------------------------|---------|------------|----------------------------------|------------|--------------------|-------------------|--------------|
| 1                            | Number of all farms in 1920.....   | 3,550                         | 1,481   | 669        | 1,163                            | 3,048      | 571                | 3,303             | 258          |
| 2                            | Number of farms reporting irrigation for rice growing in 1919.....   | 601                           | 197     | 35         | 776                              | 104        | 159                | 2                 | 34           |
| 3                            | Per cent of all farms.....   | 16.9                          | 13.3    | 5.2        | 66.7                             | 3.4        | 27.8               | 0.1               | 13.2         |
| 4                            | Number of farms reporting irrigation for rice growing in 1909.....   |                               | 29      | 13         |                                  | 23         | 150                | 10                | 39           |
| 5                            | Per cent of increase, 1909-1919.....   |                               |         |            |                                  |            | 6.0                |                   |              |
| <b>LAND AND FARM AREA.</b>   |  |                               |         |            |                                  |            |                    |                   |              |
| 6                            | Approximate land area.....acres..  | 616,960                       | 376,960 | 373,760    | 466,560                          | 178,560    | 644,480            | 368,640           | 188,800      |
| 7                            | All land in farms.....acres..  | 179,229                       | 110,646 | 113,802    | 264,063                          | 141,154    | 69,348             | 194,964           | 49,908       |
| 8                            | Improved land in farms.....acres..   | 140,959                       | 95,037  | 72,434     | 231,970                          | 128,526    | 22,419             | 120,536           | 24,740       |
| 9                            | Area irrigated for rice growing in 1919.....acres..  | 12,058                        | 11,801  | 2,275      | 99,534                           | 4,485      | 4,813              | 500               | 1,086        |
| 10                           | Per cent of improved land in farms.....  | 8.6                           | 12.4    | 3.1        | 42.9                             | 3.5        | 21.5               | 0.4               | 4.4          |
| 11                           | Area irrigated for rice growing in 1909.....acres..  |                               | 3,865   | 7,922      |                                  | 2,212      | 6,375              | 3,205             | 4,878        |
| 12                           | Per cent of increase, 1909-1919.....   |                               | 205.3   | -71.3      |                                  | 102.8      | -24.5              | -84.4             | -77.7        |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 17,502                        | 11,505  | 2,475      | 139,730                          | 5,625      | 7,338              | 1,200             | 1,500        |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  |                               | 4,090   | 7,845      |                                  | 2,562      | 10,481             | 3,830             | 5,586        |
| 15                           | Per cent of increase, 1910-1920.....   |                               | 181.3   | -68.5      |                                  | 119.6      | -30.0              | -68.7             | -73.1        |
| 16                           | Area included in enterprises in 1920.....acres..   | 18,812                        | 12,035  | 2,540      | 191,889                          | 5,725      | 9,473              | 1,200             | 1,500        |
| 17                           | Area included in enterprises in 1910.....acres..   |                               | 4,090   | 7,845      |                                  | 3,402      | 12,516             | 3,830             | 5,706        |
| 18                           | Per cent of increase, 1910-1920.....   |                               | 194.3   | -67.6      |                                  | 68.3       | -24.3              | -68.7             | -73.7        |
| <b>IRRIGATION WORKS.</b>     |  |                               |         |            |                                  |            |                    |                   |              |
| Independent enterprises:     |  |                               |         |            |                                  |            |                    |                   |              |
| 19                           | Number, 1920.....  | 83                            | 43      | 7          | 269                              | 14         | 157                | 1                 | 6            |
| 20                           | Number, 1910.....  |                               | 16      | 20         |                                  | 15         | 109                | 7                 | 25           |
| Main ditches:                |  |                               |         |            |                                  |            |                    |                   |              |
| 21                           | Number, 1920.....  | 59                            | 37      | 1          | 231                              | 19         | 231                |                   | 1            |
| 22                           | Number, 1910.....  |                               | 13      | 14         |                                  | 3          | 84                 | 4                 | 19           |
| 23                           | Length, 1920.....miles..   | 35                            | 42      |            | 303                              | 12         | 150                |                   |              |
| 24                           | Length, 1910.....miles..   |                               | 5       | 5          |                                  | 4          | 23                 | 3                 | 9            |
| 25                           | Capacity, 1920.....second-feet..   | 127                           | 381     | 9          | 1,850                            | 53         | 726                |                   | 12           |
| 26                           | Capacity, 1910.....second-feet..   |                               |         |            |                                  |            |                    |                   |              |
| Laterals:                    |  |                               |         |            |                                  |            |                    |                   |              |
| 27                           | Number, 1920.....  | 70                            | 35      |            | 184                              | 32         | 1,551              |                   |              |
| 28                           | Number, 1910.....  |                               |         |            |                                  |            |                    |                   |              |
| 29                           | Length, 1920.....miles..   | 21                            | 25      |            | 110                              | 12         | 159                |                   |              |
| 30                           | Length, 1910.....miles..   |                               |         |            |                                  |            |                    |                   |              |
| Reservoirs:                  |  |                               |         |            |                                  |            |                    |                   |              |
| 31                           | Number, 1920.....  | 10                            | 1       | 2          | 4                                |            |                    |                   |              |
| 32                           | Number, 1910.....  |                               |         | 2          |                                  |            |                    | 5                 |              |
| 33                           | Capacity, 1920.....acre-feet..   | 255                           | 2,041   | 43         | 55                               |            |                    |                   |              |
| 34                           | Capacity, 1910.....acre-feet..   |                               |         | 2          |                                  |            |                    | 30                |              |
| Flowing wells:               |  |                               |         |            |                                  |            |                    |                   |              |
| 35                           | Number, 1920.....  |                               | 1       |            |                                  |            |                    |                   |              |
| 36                           | Number, 1910.....  |                               |         |            |                                  |            |                    |                   |              |
| 37                           | Capacity, 1920.....gallons per minute..  |                               |         |            |                                  |            |                    |                   |              |
| 38                           | Capacity, 1910.....gallons per minute..  |                               |         |            |                                  |            |                    |                   |              |
| Pumped wells:                |  |                               |         |            |                                  |            |                    |                   |              |
| 39                           | Number, 1920.....  | 26                            | 35      |            | 259                              | 15         |                    |                   |              |
| 40                           | Number, 1910.....  |                               |         |            |                                  | 15         |                    |                   |              |
| 41                           | Capacity, 1920.....gallons per minute..  | 59,150                        | 40,580  |            | 631,700                          | 28,900     |                    |                   |              |
| 42                           | Capacity, 1910.....gallons per minute..  |                               |         |            |                                  | 29,074     |                    |                   |              |
| Pumping plants:              |  |                               |         |            |                                  |            |                    |                   |              |
| 43                           | Number, 1920.....  | 57                            | 46      | 9          | 282                              | 14         | 14                 | 2                 | 6            |
| 44                           | Number, 1910.....  |                               | 16      | 22         |                                  | 15         | 5                  | 8                 | 20           |
| 45                           | Engine capacity, 1920.....horsepower..   | 2,451                         | 1,826   | 435        | 21,565                           | 880        | 169                | 225               | 230          |
| 46                           | Engine capacity, 1910.....horsepower..   |                               | 775     | 1,190      |                                  | 547        | 102                | 394               | 714          |
| 47                           | Pump capacity, 1920.....gallons per minute..   | 71,070                        | 99,275  | 25,900     | 1,093,050                        | 28,900     | 3,300              | 21,000            | 5,500        |
| 48                           | Pump capacity, 1910.....gallons per minute..   |                               | 41,982  | 71,585     |                                  | 29,074     | 6,135              | 34,450            | 56,582       |
| 49                           | Average lift, 1920.....feet..  | 34                            | 19      | 13         | 38                               | 36         | 5                  | 25                | 10           |
| <b>CAPITAL INVESTED.</b>     |  |                               |         |            |                                  |            |                    |                   |              |
| 50                           | Capital invested to Jan. 1, 1920.....dollars..   | 487,977                       | 201,626 | 25,200     | 2,868,348                        | 144,000    | 66,628             | 12,960            | 16,400       |
| 51                           | Capital invested to July 1, 1910.....dollars..   |                               | 29,971  | 53,638     |                                  | 39,112     | 26,891             | 15,483            | 23,872       |
| 52                           | Per cent of increase, 1910-1920.....   |                               | 572.7   | -53.0      |                                  | 268.2      | 147.8              | -16.3             | -31.3        |
| 53                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 27.88                         | 17.53   | 10.18      | 20.53                            | 25.60      | 9.08               | 10.80             | 10.93        |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. |                               | 7.33    | 6.84       |                                  | 15.27      | 2.57               | 4.04              | 4.27         |
| <b>ESTIMATED FINAL COST.</b> |  |                               |         |            |                                  |            |                    |                   |              |
| 55                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 521,652                       | 201,626 | 25,200     | 2,902,520                        | 144,000    | 66,763             | 12,960            | 16,400       |
| 56                           | Estimated final cost of existing enterprises in 1910.....dollars..   |                               | 29,971  | 53,638     |                                  | 39,112     | 26,891             | 15,483            | 23,872       |
| 57                           | Per cent of increase, 1910-1920.....   |                               | 572.7   | -53.0      |                                  | 268.2      | 148.3              | -16.3             | -31.3        |
| 58                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 27.73                         | 16.75   | 9.92       | 15.13                            | 25.15      | 7.05               | 10.80             | 10.93        |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. |                               | 7.33    | 6.84       |                                  | 11.50      | 2.15               | 4.04              | 4.18         |

<sup>1</sup> Formed from part of St. Landry Parish in 1911.

<sup>2</sup> Formed from part of Calcasieu Parish in 1913.

PARISH TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100, or when per cent is more than 1,000.]

|  | St. James. | St. John the Baptist. | St. Landry. <sup>1</sup> | St. Martin. | St. Mary. | Vermilion. | All other parishes. |
|--|------------|-----------------------|--------------------------|-------------|-----------|------------|---------------------|
| 1 Number of all farms in 1920.....   | 289        | 227                   | 6,575                    | 2,006       | 410       | 2,958      | 101,504             |
| 2 Number of farms reporting irrigation for rice growing in 1919.....   | 86         | 52                    | 198                      | 203         | 28        | 1,461      | 36                  |
| 3 Per cent of all farms.....   | 29.8       | 22.9                  | 3.0                      | 10.1        | 6.8       | 49.4       | ( <sup>2</sup> )    |
| 4 Number of farms reporting irrigation for rice growing in 1909.....   | 59         | 42                    | 119                      |             |           | 272        | 80                  |
| 5 Per cent of increase, 1909-1919.....   |            |                       |                          |             |           | 437.1      |                     |
| <b>LAND AND FARM AREA.</b>   |            |                       |                          |             |           |            |                     |
| 6 Approximate land area..... acres..   | 162,560    | 147,840               | 435,840                  | 336,000     | 404,480   | 776,320    | 20,593,920          |
| 7 All land in farms..... acres..   | 54,324     | 31,610                | 302,175                  | 103,673     | 122,944   | 258,103    | 7,140,791           |
| 8 Improved land in farms..... acres..  | 39,747     | 21,813                | 228,315                  | 81,370      | 70,774    | 201,001    | 3,561,471           |
| 9 Area irrigated for rice growing in 1919..... acres..   | 5,221      | 3,214                 | 10,258                   | 6,267       | 3,040     | 87,830     | 994                 |
| 10 Per cent of improved land in farms.....   | 13.1       | 14.7                  | 4.5                      | 7.7         | 4.3       | 43.7       | ( <sup>2</sup> )    |
| 11 Area irrigated for rice growing in 1909..... acres..  | 8,140      | 6,124                 | 9,387                    | 520         | 525       | 52,196     | 24,718              |
| 12 Per cent of increase, 1909-1919.....  | -35.9      | -47.5                 |                          |             | 479.0     | 68.3       | -96.0               |
| 13 Area enterprises were capable of irrigating in 1920..... acres..  | 6,103      | 4,497                 | 21,022                   | 10,475      | 4,340     | 147,468    | 3,147               |
| 14 Area enterprises were capable of irrigating in 1910..... acres..  | 8,215      | 6,292                 | 12,756                   | 520         | 725       | 79,866     | 35,418              |
| 15 Per cent of increase, 1910-1920.....  | -25.7      | -28.5                 |                          |             | 498.6     | 84.6       | -91.1               |
| 16 Area included in enterprises in 1920..... acres..   | 6,103      | 4,497                 | 23,611                   | 10,575      | 4,340     | 160,576    | 3,241               |
| 17 Area included in enterprises in 1910..... acres..   | 8,215      | 6,292                 | 12,916                   | 520         | 725       | 81,581     | 37,493              |
| 18 Per cent of increase, 1910-1920.....  | -25.7      | -28.5                 |                          |             | 498.6     | 96.8       | -91.4               |
| <b>IRRIGATION WORKS.</b>   |            |                       |                          |             |           |            |                     |
| <b>Independent enterprises:</b>  |            |                       |                          |             |           |            |                     |
| 19 Number, 1920.....   | 21         | 11                    | 116                      | 32          | 13        | 165        | 6                   |
| 20 Number, 1910.....   | 36         | 24                    | 157                      |             |           | 93         | 90                  |
| <b>Main ditches:</b>   |            |                       |                          |             |           |            |                     |
| 21 Number, 1920.....   | 28         | 9                     | 122                      | 29          | 13        | 85         | 4                   |
| 22 Number, 1910.....   | 28         | 21                    | 28                       |             | 2         | 38         | 42                  |
| 23 Length, 1920..... miles..   | 35         | 9                     | 70                       | 46          | 11        | 225        | 9                   |
| 24 Length, 1910..... miles..   | 24         | 16                    | 11                       |             | 1         | 95         | 53                  |
| 25 Capacity, 1920..... second-feet..   | 101        | 701                   | 2,309                    | 232         | 28        | 1,767      | 15                  |
| 26 Capacity, 1910..... second-feet..   |            |                       |                          |             |           |            |                     |
| <b>Laterals:</b>   |            |                       |                          |             |           |            |                     |
| 27 Number, 1920.....   | 71         | 3                     | 123                      | 12          | 5         | 1,109      |                     |
| 28 Number, 1910.....   |            |                       |                          |             |           | 14         |                     |
| 29 Length, 1920..... miles..   | 25         | 4                     | 22                       | 2           | 5         | 692        |                     |
| 30 Length, 1910..... miles..   |            |                       |                          |             |           | 54         |                     |
| <b>Reservoirs:</b>   |            |                       |                          |             |           |            |                     |
| 31 Number, 1920.....   |            | 4                     | 38                       |             |           |            | 1                   |
| 32 Number, 1910.....   | 4          | 3                     | 69                       |             |           |            | 10                  |
| 33 Capacity, 1920..... acre-feet..   |            |                       | 2,608                    |             |           |            |                     |
| 34 Capacity, 1910..... acre-feet..   | 3          | 12                    | 12,736                   |             |           |            | 326                 |
| <b>Flowing wells:</b>  |            |                       |                          |             |           |            |                     |
| 35 Number, 1920.....   |            |                       |                          |             |           | 2          | 1                   |
| 36 Number, 1910.....   |            |                       |                          |             |           |            |                     |
| 37 Capacity, 1920..... gallons per minute..  |            |                       |                          |             |           | 425        | 30                  |
| 38 Capacity, 1910..... gallons per minute..  |            |                       |                          |             |           |            |                     |
| <b>Pumped wells:</b>   |            |                       |                          |             |           |            |                     |
| 39 Number, 1920.....   |            |                       | 28                       | 4           |           | 104        |                     |
| 40 Number, 1910.....   |            |                       | 10                       |             |           | 65         | 7                   |
| 41 Capacity, 1920..... gallons per minute..  |            |                       | 51,600                   | 15,000      |           | 155,307    |                     |
| 42 Capacity, 1910..... gallons per minute..  |            |                       | 17,900                   | 330         |           | 130,910    | 18,825              |
| <b>Pumping plants:</b>   |            |                       |                          |             |           |            |                     |
| 43 Number, 1920.....   | 21         | 11                    | 87                       | 32          | 15        | 185        | 6                   |
| 44 Number, 1910.....   | 28         | 20                    | 40                       | 3           | 2         | 92         | 76                  |
| 45 Engine capacity, 1920..... horsepower..   | 990        | 572                   | 4,320                    | 1,236       | 470       | 8,064      | 72                  |
| 46 Engine capacity, 1910..... horsepower..   | 958        | 742                   | 1,003                    | 74          | 95        | 5,506      | 5,289               |
| 47 Pump capacity, 1920..... gallons per minute..   | 44,800     | 800                   | 124,200                  | 96,100      | 12,900    | 809,502    | 3,160               |
| 48 Pump capacity, 1910..... gallons per minute..   | 57,301     | 66,135                | 76,230                   | 5,720       | 5,250     | 528,719    | 403,963             |
| 49 Average lift, 1920..... feet..  | 13         | 14                    | 56                       | 20          | 15        | 19         | 9                   |
| <b>CAPITAL INVESTED.</b>   |            |                       |                          |             |           |            |                     |
| 50 Capital invested to Jan. 1, 1920..... dollars..   | 52,132     | 68,850                | 530,222                  | 119,310     | 55,650    | 3,477,876  | 110,498             |
| 51 Capital invested to July 1, 1910..... dollars..   | 40,895     | 37,686                | 73,065                   | 6,198       | 2,250     | 1,075,561  | 282,015             |
| 52 Per cent of increase, 1910-1920.....  | 27.5       | 82.7                  |                          |             |           | 223.4      | -60.8               |
| 53 Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 8.54       | 15.31                 | 25.22                    | 11.39       | 12.82     | 23.58      | 35.11               |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 4.98       | 5.99                  | 5.73                     | 11.92       | 3.10      | 13.47      | 7.96                |
| <b>ESTIMATED FINAL COST.</b>   |            |                       |                          |             |           |            |                     |
| 55 Estimated final cost of existing enterprises in 1920..... dollars..   | 52,132     | 68,850                | 548,022                  | 120,810     | 55,650    | 3,479,026  | 156,498             |
| 56 Estimated final cost of existing enterprises in 1910..... dollars..   | 40,895     | 37,686                | 73,065                   | 6,198       | 2,250     | 1,075,561  | 282,015             |
| 57 Per cent of increase, 1910-1920.....  | 27.5       | 82.7                  |                          |             |           | 223.5      | -44.5               |
| 58 Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 8.54       | 15.31                 | 23.21                    | 11.42       | 12.82     | 21.67      | 48.20               |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 4.98       | 5.99                  | 5.66                     | 11.92       | 3.10      | 13.18      | 7.52                |

<sup>1</sup> Part taken to form Evangeline Parish in 1911.

<sup>2</sup> Less than one-tenth of 1 per cent.

## IRRIGATION : MONTANA

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |   | Page. |
|--|-------|---|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....               | 6     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....   | 7     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....   | 8     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....   | 8     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....  | 11    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enter-     |       |
| Acreage, by character of enterprise.....               | 5     | prises, irrigation works, and capital invested in irrigation enterprises, |       |
| Acreage, by character of water rights.....             | 5     | 1920 and 1910.....  | 12    |
| Acreage, by drainage basin.....                        | 6     |   |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Montana collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of show-

ing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

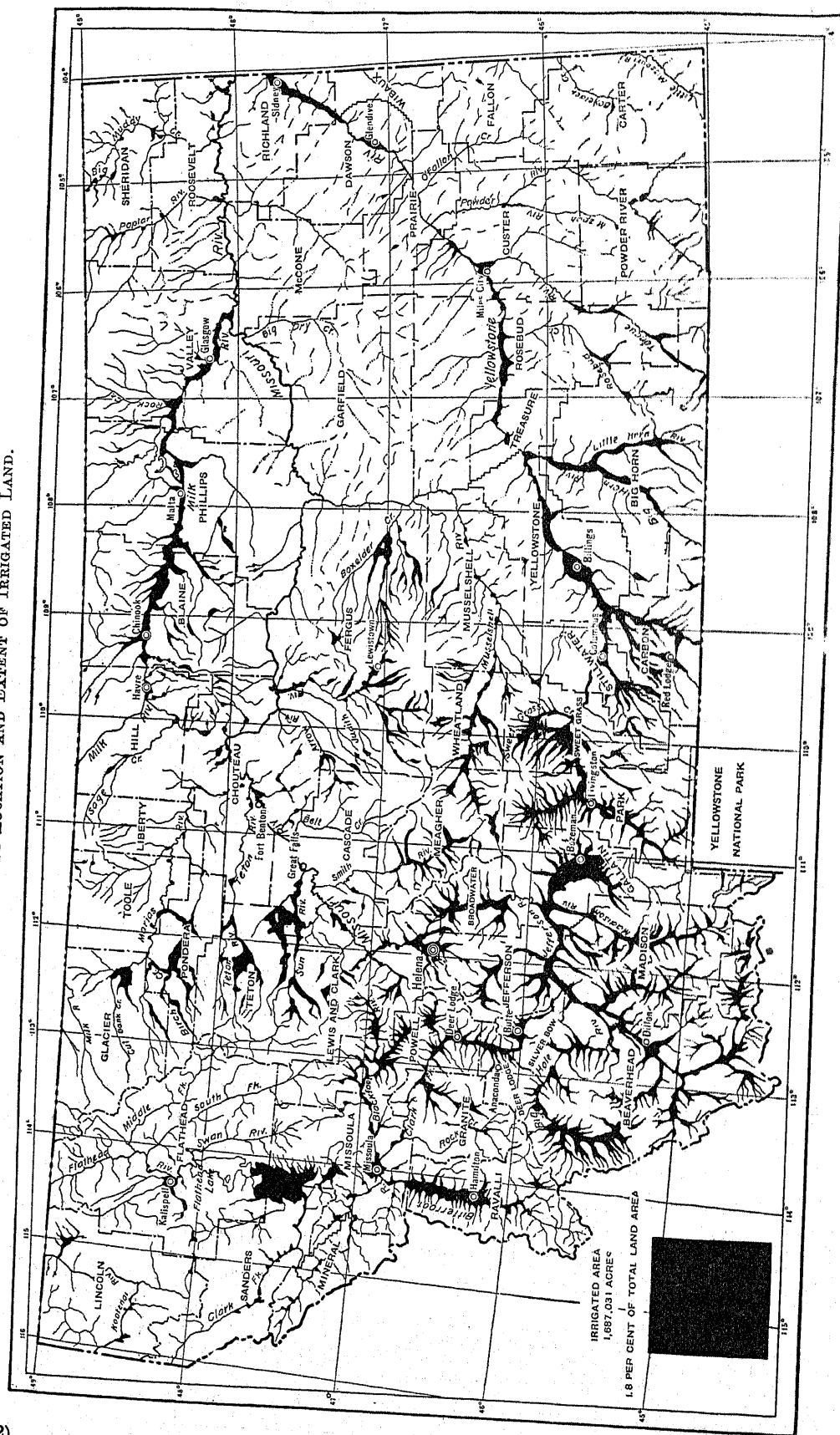
| ITEM.  | CENSUS OF—   |                  | INCREASE. <sup>1</sup> |                  |
|--|--------------|------------------|------------------------|------------------|
|  | 1920         | 1910             | Amount.                | Per cent.        |
| Number of all farms.....   | 57,677       | 26,214           | 31,463                 | 120.0            |
| Approximate land area of the state..... acres..  | 93,523,840   | 93,568,640       | <sup>2</sup> —44,800   | ( <sup>3</sup> ) |
| All land in farms..... acres..   | 35,070,656   | 13,545,603       | 21,525,053             | 158.9            |
| Improved land in farms..... acres..  | 11,007,278   | 3,640,309        | 7,366,969              | 202.4            |
| Number of farms irrigated.....   | 10,807       | 8,970            | 1,837                  | 20.5             |
| Area irrigated..... acres..  | 1,681,729    | 1,679,084        | 2,645                  | 0.2              |
| Area enterprises were capable of irrigating..... acres..                               | 2,753,498    | 2,205,155        | 548,343                | 24.9             |
| Area included in enterprises..... acres..  | 4,329,148    | 3,515,602        | 813,546                | 23.1             |
| Per cent irrigated:  |              |                  |                        |                  |
| Number of all farms.....   | 18.7         | 34.2             | —15.5                  | .....            |
| Approximate land area of state.....  | 1.8          | 1.8              | .....                  | .....            |
| Land in farms.....   | 4.8          | 12.4             | —7.6                   | .....            |
| Improved land in farms.....  | 15.3         | 46.1             | —30.8                  | .....            |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 1,071,769    | 526,071          | 545,698                | 103.7            |
| Excess of area included in enterprises over area irrigated..... acres..                | 2,647,419    | 1,836,518        | 810,901                | 44.2             |
| Area of irrigated land reported as available for settlement..... acres..               | 207,530      | ( <sup>4</sup> ) | .....                  | .....            |
| Capital invested.....  | \$52,143,363 | \$22,970,958     | \$29,172,405           | 127.0            |
| Average per acre enterprises were capable of irrigating.....                           | \$18.94      | \$10.42          | \$8.52                 | 81.8             |
| Estimated final cost of existing enterprises.....                                      | \$70,079,028 | \$32,382,077     | \$37,696,951           | 116.4            |
| Average per acre included in enterprises.....  | \$16.19      | \$9.21           | \$6.98                 | 75.8             |
| Average cost of operation and maintenance per acre.....                                | \$1.26       | \$0.89           | \$0.37                 | .....            |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown where base is less than 100.  
<sup>2</sup> Decrease due to the building of several reservoirs in connection with irrigation projects.

<sup>3</sup> Less than one-tenth of 1 per cent.  
<sup>4</sup> Not reported in 1910.

# MONTANA.

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the equipment for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes, with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

## CLIMATIC CONDITIONS.

The climatic conditions having the greatest influence in determining the necessity for irrigation are the amount and seasonal distribution of precipitation, especially rainfall. Temperature and wind movement also have an influence through their effect on evaporation from soil and plants.

The surface of Montana is divided approximately equally between the plains and the mountainous sections, the eastern part of the state consisting of high, rolling prairies and the western part of mountains and intervening valleys. The main range of the Rocky Mountains forms the boundary between Montana and Idaho for a considerable distance, then turns to the east and again to the north, leaving the northwestern part of the state on the Pacific slope, while all the rest of the state is in the drainage basin of the Missouri River and slopes to the east.

In the mountainous section the precipitation varies greatly with the altitude, the normal annual precipitation varying from about 10 inches in the lower portion of the Jefferson River drainage basin and along the Missouri, immediately below the point where this stream is formed by the confluence of the Madison, Jefferson, and Gallatin Rivers, to 20 inches in the vicinity of Yellowstone National Park and to 25 inches or more in the northwest corner of the state. In most of the valleys of this part of the state crops are grown without irrigation near the base of the mountains, while irrigation is practiced in the central portions. The mountain ranges prevent strong winds and tend to decrease the water requirements of plants. As a rule the precipitation is lightest in the autumn and winter, and the wettest season is from April to June, when water is most needed for grain crops.

On the plains the precipitation is lighter, the normal annual precipitation being from 12 to 15 inches, and the heat and wind velocity during the growing season are much greater than in the mountainous part of the state. In this section the demand for moisture is greater and the supply is smaller. However, dry farming is practiced throughout the state, but with varying success, depending on the season.

The year 1919 was the third in succession in which the precipitation was below normal, the summer season being drier than either of the two preceding. This condition not only brought about a general failure of "dry-farm" crops, but decreased greatly the supply of water available for irrigation, particularly from streams originating on the plains, which are not fed by melting snows in the mountains. As a result much land covered by irrigation ditches and ordinarily irrigated was not watered in 1919, and to that extent the figures for that year do not correctly represent the status of irrigation development in the state.

## WATER SUPPLY FOR IRRIGATION.

In the mountains of western Montana the precipitation is heavy, while the area of irrigable land is limited to the comparatively narrow valleys. Consequently there is an abundant supply of water for irrigation. The northwestern part of the state is drained by the Kootenai River and the Clark Fork of the Columbia and their tributaries. Both of these streams carry large volumes of water from the state.

The southwestern part of the state is drained by the headwaters of the Missouri. The Beaverhead and the Big Hole, which unite to form the Jefferson, drain the northern and eastern slopes of the main range of the Rocky Mountains, and the Madison and the Gallatin rise in Yellowstone National Park and flow north to their junction with the Jefferson to form the Missouri. From its head the Missouri flows northward through mountain valleys for slightly more than 100 miles and then turns to the east and flows to the eastern border of the state, roughly paralleling the northern line at distances varying between 60 and 100 miles.

Between the Missouri and the Canadian border are the Sun, Teton, Marias, and Milk Rivers, which rise in the main range of the Rocky Mountains and flow eastward to their junctions with the Missouri.

South of the Missouri is the Yellowstone, which rises in Yellowstone Lake in Yellowstone National Park. It flows northward for about 50 miles and from that point flows northeastward across the state to its confluence with the Missouri, just east of the Montana-North Dakota line. Between the Missouri and the Yellowstone there are many smaller streams, tributary to one or the other of these rivers. From the south the Yellowstone receives several large tributaries, which rise in Wyoming and flow northward into Montana, and many small tributaries rising on the plains. The principal tributaries of the Yellowstone are Clark Fork of the Yellowstone, Big Horn, Tongue, and Powder Rivers.

The streams rising in the mountains receive their water from melting snows and maintain a summer flow, while most of those rising on the plains become dry, or nearly so, in the summer. In the larger streams which rise in the mountains the water supply is generally sufficient for the land in their valleys. The supply would not be sufficient to water the great areas of arable land on the plains between the large rivers, but crops are grown on these lands without irrigation and there is no great demand for their irrigation.

As previously stated, the succession of dry years, of which 1919 was the third, decreased the supply of water to such an extent that much land ordinarily irrigated was not watered in 1919 because of a short supply.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                        |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 10,807           | 20.5                   | 18.7                   | 1,681,729       | 0.2                    | 1.8                          | 4.8                        | 15.3                                 |
| 1910.....    | 8,970            | 11.5                   | 34.2                   | 1,679,084       | 76.5                   | 1.8                          | 12.4                       | 46.1                                 |
| 1900.....    | 8,043            | 117.0                  | 60.2                   | 951,151         | 171.3                  | 1.0                          | 8.0                        | 54.8                                 |
| 1890.....    | 3,706            |                        | 66.1                   | 350,582         |                        | 0.4                          | 17.8                       | 38.3                                 |

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area in-cluded in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                       | Area enter-prises were ca-pable of irrigating in 1920 (acres). |
|--------------------|--------------------------|---|-------------------------|---------------------------------------|--|
|                    |                          |   | Acres.                  | Per cent of acre-age in enter-prises. |  |
| Total.....         | 6,035                    | 4,329,148                                     | 1,681,729               | 38.8                                  | 2,753,498  |
| Before 1860.....   | 10                       | 5,755   | 4,583                   | 79.7                                  | 5,585  |
| 1860-1869.....     | 503                      | 252,161                                       | 110,225                 | 43.7                                  | 179,832  |
| 1870-1879.....     | 516                      | 283,961                                       | 114,804                 | 40.4                                  | 185,018  |
| 1880-1889.....     | 1,343                    | 966,530                                       | 470,529                 | 48.7                                  | 697,811  |
| 1890-1899.....     | 1,195                    | 765,653                                       | 361,563                 | 47.2                                  | 580,515  |
| 1900-1904.....     | 667                      | 321,648                                       | 148,075                 | 46.0                                  | 228,249  |
| 1905-1909.....     | 487                      | 937,065                                       | 272,239                 | 29.1                                  | 505,833  |
| 1910-1914.....     | 416                      | 302,981                                       | 59,280                  | 19.6                                  | 123,847  |
| 1915-1919.....     | 367                      | 294,323                                       | 38,553                  | 13.1                                  | 105,278  |
| Not reported.....  | 531                      | 199,066                                       | 101,872                 | 51.2                                  | 140,510  |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                  | AREA IRRIGATED (ACRES). |           |                        |           | Area enter-prises were ca-pable of irrigating in 1920 (acres). | Area included in enter-prises, 1920 (acres). |
|---|-------------------------|-----------|------------------------|-----------|--|--|
|   | 1919                    | 1909      | Increase. <sup>1</sup> |           |  |  |
|   |                         |           | Amount.                | Per cent. |  |  |
| Total.....                              | 1,681,729               | 1,679,084 | 2,645                  | 0.2       | 2,753,498  | 4,329,148                                    |
| Stream, gravity.....                    | 1,515,212               | 1,624,656 | -109,444               | -6.7      | 2,451,190  | 3,901,211                                    |
| Stream, pumped.....                     | 15,743                  | 7,983     | 7,760                  | 97.7      | 36,766   | 47,178                                       |
| Stream, pumped and gravity.....         | 19,872                  | (?)       | 19,872                 |           | 33,599   | 34,149                                       |
| Wells, pumped.....                      | 139                     | 55        | 84                     |           | 153  | 193  |
| Wells, flowing.....                     | 212                     | 207       | 5                      | 2.4       | 403  | 724  |
| Lake, gravity.....                      | 16,653                  | 5,617     | 11,036                 | 196.5     | 22,512   | 24,840                                       |
| Lake, pumped.....                       | 79                      | 5         | 74                     |           | 180  | 351  |
| Springs.....                            | 14,945                  | 17,967    | -3,022                 | -16.8     | 22,695   | 37,337                                       |
| Stored storm water.....                 | 3,280                   | 22,614    | -19,334                | -85.5     | 12,152   | 32,261                                       |
| City water.....                         | 15                      | (?)       | 15                     |           | 15   | 20   |
| Sewage.....                             | 245                     | (?)       | 245                    |           | 820  | 983  |
| Stream, gravity, and pumped wells.....  | 155                     | (?)       | 155                    |           | 170  | 170  |
| Stream, gravity, and flowing wells..... | 6,068                   | (?)       | 6,068                  |           | 12,063   | 12,443                                       |
| Other mixed.....                        | 89,070                  | (?)       | 89,070                 |           | 160,603  | 237,120                                      |
| Other and not reported.....             | 41                      | (?)       | 41                     |           | 168  | 168  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when base is less than 100.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

Montana enacted an irrigation district law in 1907, and has amended this law from time to time since that date. Generally, in Montana irrigation districts

have not built irrigation works, but have been organized to take over works built by other agencies.

The state of Montana accepted the terms of the Federal Carey Act (act of Congress, Aug. 18, 1894) in 1895, and at first undertook construction of irrigation works by direct state action. The law has been amended from time to time, and state construction has been abandoned for the contract system common to the Western states.

The small area reported under "State" in Table 5 belongs to a State institution and does not represent a scheme of state construction.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                 | CENSUS OF— |           | INCREASE. <sup>1</sup> |           |
|---|------------|-----------|------------------------|-----------|
|   | 1920       | 1910      | Acres.                 | Per cent. |
| ACREAGE IRRIGATED.                              |            |           |                        |           |
| Total.....                                      | 1,681,729  | 1,679,084 | 2,645                  | 0.2       |
| Individual and partnership.....                 | 976,615    | 1,191,060 | -214,445               | -18.0     |
| Cooperative.....                                | 393,257    | 333,926   | 59,331                 | 17.8      |
| Irrigation district.....                        | 35,153     | 412       | 34,741                 |           |
| Carey Act.....                                  | 54,771     | 9,648     | 45,123                 | 467.7     |
| Commercial.....                                 | 34,115     | 62,544    | -28,429                | -45.5     |
| U. S. Reclamation Service.....                  | 88,291     | 14,077    | 74,214                 | 527.2     |
| U. S. Indian Service.....                       | 98,887     | 67,417    | 31,470                 | 46.7      |
| State.....                                      | 20         | (?)       | 20                     |           |
| City.....                                       | 320        | (?)       | 320                    |           |
| Other.....                                      | 300        | (?)       | 300                    |           |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |            |           |                        |           |
| Total.....                                      | 2,753,498  | 2,205,155 | 548,343                | 24.9      |
| Individual and partnership.....                 | 1,617,617  | 1,495,513 | 122,104                | 8.2       |
| Cooperative.....                                | 553,952    | 373,022   | 180,930                | 48.5      |
| Irrigation district.....                        | 70,650     | 6,630     | 64,010                 | 904.0     |
| Carey Act.....                                  | 83,913     | 49,500    | 34,413                 | 69.5      |
| Commercial.....                                 | 35,215     | 80,895    | -45,680                | -52.8     |
| U. S. Reclamation Service.....                  | 172,206    | 85,245    | 86,961                 | 102.0     |
| U. S. Indian Service.....                       | 215,940    | 114,340   | 101,600                | 88.9      |
| State.....                                      | 50         | (?)       | 50                     |           |
| City.....                                       | 390        | (?)       | 390                    |           |
| Other.....                                      | 365        | (?)       | 365                    |           |
| ACREAGE INCLUDED IN ENTERPRISES.                |            |           |                        |           |
| Total.....                                      | 4,329,148  | 3,515,602 | 813,546                | 23.1      |
| Individual and partnership.....                 | 2,372,086  | 1,982,220 | 389,866                | 19.7      |
| Cooperative.....                                | 699,310    | 518,209   | 181,101                | 34.9      |
| Irrigation district.....                        | 71,687     | 6,640     | 65,047                 | 979.6     |
| Carey Act.....                                  | 181,873    | 306,967   | -125,124               | -40.8     |
| Commercial.....                                 | 39,160     | 146,852   | -107,692               | -73.3     |
| U. S. Reclamation Service.....                  | 431,982    | 113,744   | 323,238                | 284.2     |
| U. S. Indian Service.....                       | 520,690    | 440,940   | 79,750                 | 19.4      |
| State.....                                      | 100        | (?)       | 100                    |           |
| City.....                                       | 530        | (?)       | 530                    |           |
| Other.....                                      | 730        | (?)       | 730                    |           |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Montana relating to water rights are summarized in the following paragraphs:

In 1865 the territory of Montana enacted a law recognizing the right of any person holding land bordering on or in the neighborhood of a stream to take water from the stream for irrigation, and providing for obtaining the right of way for ditches over the land of others.

This law was repealed in 1870 by one extending the right to take water for irrigation to the holder of land anywhere in the territory and recognizing priority among users.



In 1885 a more comprehensive law was enacted. This provided that rights might be acquired by "appropriation"; that the appropriation must be for a useful or beneficial purpose; that the place of use might be changed; and that "among appropriations the first in time is the first in right." This law provided also that persons desiring to appropriate water must post notices stating their claims, and must file copies of these claims with the county recorders; and, further, that persons who had acquired rights prior to the passage of the act should file with the proper county recorders declarations of their claims. The law provided also that controversies regarding water rights should be settled in the courts.

This law is still in effect, the state never having provided for applications for permits to appropriate water, as has been done in most of the Western states.

The constitution of the state, ratified in 1889, contains the following section relating to irrigation:

"The use of all water now appropriated, or that may hereafter be appropriated for sale, rental, distribution or other beneficial use and right of way over the lands of others for all ditches, drains, flumes, canals and aqueducts, necessarily used in connection therewith, as well as the sites for reservoirs necessary for collecting and storing the same shall be held to be a public use." (Art. 3, sec. 15.)

Under the rulings of the courts riparian rights are recognized in Montana to a limited extent.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                  | 1919      |                       | 1909,<br>per cent<br>of total. |
|-------------------------|-----------|-----------------------|--------------------------------|
|                         | Acres.    | Per cent<br>of total. |                                |
| Total.....              | 1,681,729 | 100.0                 | 100.0                          |
| Appropriation and use   | 229,887   | 13.7                  | 15.0                           |
| Notice filed and posted | 666,305   | 39.6                  | 44.4                           |
| Adjudicated by court    | 701,015   | 41.7                  | 38.0                           |
| Permit from state       | 595       | ( <sup>2</sup> )      | ( <sup>3</sup> )               |
| Riparian rights         | 5,500     | 0.3                   | ( <sup>3</sup> )               |
| Underground             | 482       | ( <sup>2</sup> )      | ( <sup>3</sup> )               |
| Other and mixed         | 8,561     | 0.5                   | ( <sup>3</sup> )               |
| Not reported            | 60,384    | 4.1                   | ( <sup>3</sup> )               |

<sup>1</sup> Small areas were incorrectly reported in some classes in 1910. These are not included here.

<sup>2</sup> Less than one-tenth of 1 per cent.

<sup>3</sup> This class was not included in the classification in 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

#### ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 and 1902.

| DRAINAGE BASIN.                             | AREA IRRIGATED (ACRES). |                  |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|---|-------------------------|------------------|------------------------------------|---|--|
|   | 1919                    | 1902             | Per cent of increase. <sup>1</sup> |   |  |
| Total.....                                  | 1,681,729               | 1,140,694        | 47.4                               | 4,329,148                                   | 2,753,498  |
| Missouri River and tributaries..            | 1,389,703               | 908,243          | 53.0                               | 3,713,068                                   | 2,299,910  |
| Missouri River direct.....                  | 15,635                  | 11,390           | 37.3                               | 34,194                                      | 28,174   |
| Jefferson River and tributaries.....        | 425,685                 | 291,788          | 83.7                               | 831,808                                     | 574,672  |
| Jefferson River direct.....                 | 21,276                  | 15,721           | 35.3                               | 40,347                                      | 34,594   |
| Beaverhead River.....                       | 145,673                 | 99,014           | 47.1                               | 296,079                                     | 199,797  |
| Big Hole River.....                         | 184,655                 | 67,422           | 173.9                              | 306,885                                     | 227,920  |
| Boulder River.....                          | 7,265                   | 9,333            | -22.2                              | 40,677                                      | 13,297   |
| Passamari River.....                        | 34,474                  | 21,101           | 63.4                               | 70,107                                      | 48,036   |
| Other tributaries of Jefferson River.....   | 32,342                  | 21,197           | 68.5                               | 71,803                                      | 50,728   |
| Madison River.....                          | 34,425                  | 20,338           | 69.3                               | 88,524                                      | 62,065   |
| Gallatin River.....                         | 95,063                  | 58,004           | 63.9                               | 228,056                                     | 152,515  |
| Smith River.....                            | 16,801                  | 18,677           | -9.7                               | 38,369                                      | 29,691   |
| Sun River.....                              | 31,785                  | 32,927           | -3.5                               | 244,071                                     | 95,522   |
| Teton River.....                            | 44,945                  | 34,961           | 28.6                               | 140,468                                     | 82,241   |
| Marias River.....                           | 63,758                  | 22,188           | 187.4                              | 308,158                                     | 122,431  |
| Judith River.....                           | 15,173                  | 44,672           | -66.0                              | 40,993                                      | 35,459   |
| Musselshell River.....                      | 45,559                  | 87,233           | -47.8                              | 141,363                                     | 113,904  |
| Milk River and tributaries.....             | 108,555                 | 56,597           | 91.8                               | 349,716                                     | 179,063  |
| Milk River direct.....                      | 19,766                  | 24,305           | -18.7                              | 26,358                                      | 23,443   |
| Sage Creek.....                             | 4,947                   | 2,135            | -57.4                              | 2,850                                       | 1,750  |
| Snake River.....                            | 910                     | 2,135            | -57.4                              | 3,130                                       | 2,275  |
| Other tributaries of Milk River.....        | 87,879                  | 25,210           | 248.6                              | 317,378                                     | 151,595  |
| Yellowstone River and tributaries.....      | 440,354                 | 209,137          | 110.6                              | 858,817                                     | 668,355  |
| Yellowstone River direct.....               | 189,453                 | 40,615           | 373.5                              | 279,211                                     | 262,801  |
| Shields River.....                          | 25,940                  | 19,836           | 30.8                               | 94,238                                      | 53,082   |
| Stillwater River.....                       | 23,801                  | 13,672           | 73.6                               | 34,278                                      | 20,664   |
| Clark Fork.....                             | 68,839                  | 64,628           | 6.5                                | 125,367                                     | 116,506  |
| Big Horn River.....                         | 51,103                  | 1,645            | .....                              | 92,030                                      | 60,206   |
| Rosebud River.....                          | 305                     | 13,618           | -97.3                              | 1,365                                       | 1,305  |
| Tongue River.....                           | 11,170                  | 12,622           | -11.5                              | 31,396                                      | 21,403   |
| Powder River.....                           | 728                     | 2,390            | -69.5                              | 5,871                                       | 4,841  |
| Other tributaries of Yellowstone River..... | 69,195                  | 40,811           | 69.5                               | 195,055                                     | 112,567  |
| Little Missouri River.....                  | 380                     | 2,385            | -86.7                              | 3,205                                       | 1,480  |
| Other tributaries of Missouri River.....    | 51,585                  | 77,486           | -33.4                              | 399,236                                     | 154,278  |
| Tributaries of Columbia River..             | 291,966                 | 232,451          | 25.6                               | 610,080                                     | 453,588  |
| Clark Fork and tributaries.....             | 285,984                 | 229,851          | 24.4                               | 601,657                                     | 443,864  |
| Clark Fork direct.....                      | 2,882                   | 8,808            | -67.3                              | 14,403                                      | 4,722  |
| Missoula River and tributaries.....         | 238,769                 | 221,043          | 8.0                                | 433,021                                     | 325,992  |
| Missoula River direct.....                  | 2,550                   | 1,181            | 115.9                              | 8,322                                       | 5,777  |
| Hellgate River.....                         | 77,381                  | 78,139           | -1.0                               | 165,391                                     | 108,161  |
| Big Blackfoot River.....                    | 40,604                  | 36,622           | 10.9                               | 83,716                                      | 61,476   |
| Bitter Root River.....                      | 112,622                 | 98,965           | 13.8                               | 158,241                                     | 139,481  |
| Other tributaries of Missoula River.....    | 5,012                   | 6,136            | -8.5                               | 17,351                                      | 11,097   |
| Flathead River.....                         | 44,333                  | ( <sup>4</sup> ) | .....                              | 154,233                                     | 113,150  |
| Kootenai River.....                         | 5,982                   | 2,600            | 130.1                              | 14,423                                      | 9,724  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.

<sup>2</sup> Includes springs and wells.

<sup>3</sup> Includes springs and wells and all sources in the Columbia River drainage basin, exclusive of the Missoula and Kootenai Rivers.

<sup>4</sup> Not reported separately in 1902.

#### CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                       |
|--------------|--------------|-----------------------|-------------------|-----------------------|
|              |              |                       | Amount.           | Per cent of increase. |
| 1920.....    | \$12,143,363 | 127.0                 | \$18.94           | 81.8                  |
| 1910.....    | 22,970,958   | 390.5                 | 10.42             | 111.8                 |
| 1900.....    | 4,683,073    | 188.5                 | 4.92              | 6.8                   |
| 1890.....    | 1,623,195    | .....                 | 4.63              | .....                 |

# IRRIGATION—MONTANA.

7

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$52,143,363 | 100.0              | \$18.94           |
| Before 1860.....   | 55,527       | 0.1                | 0.94              |
| 1860-1869.....     | 1,323,315    | 2.5                | 7.36              |
| 1870-1879.....     | 2,063,841    | 3.9                | 11.15             |
| 1880-1889.....     | 5,083,794    | 9.8                | 7.20              |
| 1890-1899.....     | 7,043,281    | 13.5               | 12.14             |
| 1900-1904.....     | 3,005,519    | 5.8                | 13.17             |
| 1905-1909.....     | 25,592,156   | 49.1               | 50.49             |
| 1910-1914.....     | 2,756,019    | 5.3                | 22.25             |
| 1915-1919.....     | 3,631,564    | 7.0                | 34.49             |
| Not reported.....  | 1,584,344    | 3.0                | 11.28             |

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$52,143,363            | 100.0              | \$18.94           | 1,369,651                                | \$1.26                              |
| Stream, gravity.....                    | 47,018,330              | 90.2               | 10.18             | 1,249,390                                | 1.18                                |
| Stream, pumped.....                     | 900,216                 | 1.7                | 24.40             | 11,414                                   | 5.63                                |
| Stream, pumped and gravity.....         | 1,012,316               | 3.1                | 47.99             | 19,872                                   | 1.77                                |
| Wells, pumped.....                      | 18,285                  | (2)                | 106.44            | 49                                       | 5.41                                |
| Wells, flowing.....                     | 10,007                  | (2)                | 24.83             | 154                                      | 7.24                                |
| Lake, pumped.....                       | 8,250                   | (2)                | 43.65             | 41                                       | 11.07                               |
| Lake, gravity.....                      | 271,760                 | 0.5                | 12.07             | 8,063                                    | 5.46                                |
| Springs.....                            | 247,094                 | 0.5                | 10.89             | 7,821                                    | 1.57                                |
| Stored storm water.....                 | 208,392                 | 0.4                | 24.55             | 1,057                                    | 5.74                                |
| Sewage.....                             | 6,724                   | (2)                | 8.20              | .....                                    | .....                               |
| Stream, gravity, and pumped wells.....  | 3,000                   | (2)                | 17.65             | 150                                      | 6.67                                |
| Stream, gravity, and flowing wells..... | 433,000                 | 0.9                | 35.89             | 6,066                                    | 1.41                                |
| Other mixed.....                        | 1,318,598               | 2.5                | 8.21              | 64,675                                   | 0.90                                |
| Other and not reported.....             | 1,382                   | (2)                | 8.23              | .....                                    | .....                               |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                           | 1920         | 1902                 | INCREASE. <sup>1</sup> |           |
|---|--------------|----------------------|------------------------|-----------|
|   |              |                      | Amount.                | Per cent. |
| Total.....                                | \$52,143,363 | \$5,576,975          | \$46,566,388           | 835.0     |
| Missouri River and tributaries.....       | 43,507,200   | 4,254,950            | 39,252,250             | 922.5     |
| Missouri River direct.....                | 440,345      | 81,162               | 359,183                | 442.6     |
| Jefferson River and tributaries.....      | 5,370,454    | 700,328              | 4,670,126              | 666.3     |
| Jefferson River direct.....               | 587,888      | 115,005              | 472,883                | 409.4     |
| Beaverhead River.....                     | 1,723,746    | 255,770              | 1,467,976              | 573.9     |
| Big Hole River.....                       | 1,009,707    | 135,000              | 874,707                | .....     |
| Boulder River.....                        | 149,655      | 43,510               | 106,145                | 244.0     |
| Passamauntee River.....                   | 559,000      | 122,658              | 436,342                | 355.7     |
| Other tributaries of Jefferson River..... | 680,898      | <sup>2</sup> 80,777  | 600,121                | 684.7     |
| Madison River.....                        | 400,823      | 92,080               | 308,743                | 395.6     |
| Gallatin River.....                       | 977,780      | 454,845              | 522,935                | 115.0     |
| Smith River.....                          | 100,836      | 64,777               | 36,059                 | 104.6     |
| San River.....                            | 4,700,303    | 173,399              | 4,526,904              | .....     |
| Teton River.....                          | 1,251,130    | 111,900              | 1,139,230              | .....     |
| Marias River.....                         | 5,602,770    | 142,443              | 5,460,327              | .....     |
| Judith River.....                         | 281,842      | 124,513              | 157,329                | 120.4     |
| Musselshell River.....                    | 980,755      | 285,808              | 694,947                | 245.2     |
| Milk River and tributaries.....           | 7,271,008    | 203,608              | 7,067,400              | .....     |
| Milk River direct.....                    | 154,208      | 110,200              | 44,008                 | 29.4      |
| Sage Creek.....                           | 2,400,248    | 16,127               | 2,384,121              | .....     |
| Snake River.....                          | 8,600        | 9,035                | -1,435                 | -13.4     |
| Other tributaries of Milk River.....      | 4,708,042    | <sup>2</sup> 118,436 | 4,589,606              | .....     |
| Yellowstone River and tributaries.....    | 13,702,337   | 1,306,838            | 12,395,499             | 953.1     |
| Yellowstone River direct.....             | 7,608,300    | 303,888              | 7,304,412              | .....     |
| Shields River.....                        | 424,103      | 100,074              | 324,029                | 288.8     |
| Stillwater River.....                     | 208,570      | 51,502               | 157,068                | 479.7     |
| Clark Fork.....                           | 1,108,191    | 205,302              | 902,889                | 275.3     |
| Big Horn River.....                       | 2,339,457    | 3,425                | 2,336,032              | .....     |
| Rosebud River.....                        | 9,803        | 61,708               | -52,905                | -84.9     |
| Tongue River.....                         | 608,504      | 211,870              | 396,634                | 157.2     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902—Continued.

| DRAINAGE BASIN.                                  | 1920      | 1902                 | INCREASE. <sup>1</sup> |           |
|--|-----------|----------------------|------------------------|-----------|
|  |           |                      | Amount.                | Per cent. |
| Missouri River and tributaries—Continued.....    | .....     | .....                | .....                  | .....     |
| Yellowstone River and tributaries—Continued..... | .....     | .....                | .....                  | .....     |
| Powder River.....                                | \$35,402  | \$12,500             | \$22,902               | 183.2     |
| Other tributaries of Yellowstone River.....      | 1,430,417 | <sup>2</sup> 257,569 | 1,172,848              | 455.4     |
| Little Missouri River.....                       | 15,064    | 33,747               | -18,683                | -55.4     |
| Other tributaries of Missouri River.....         | 2,286,753 | 358,356              | 1,928,397              | 538.1     |
| Tributaries of Columbia River.....               | 8,036,067 | 1,322,025            | 7,314,042              | 553.2     |
| Clark Fork and tributaries.....                  | 8,414,091 | 1,208,486            | 7,105,605              | 543.0     |
| Clark Fork direct.....                           | 202,256   | <sup>3</sup> 64,501  | 137,755                | 213.1     |
| Missoula River and tributaries.....              | 3,474,524 | 1,243,805            | 2,230,719              | 179.3     |
| Missoula River direct.....                       | 150,771   | 27,367               | 123,404                | 483.8     |
| Hellgate River.....                              | 1,340,403 | 392,085              | 948,318                | 244.2     |
| Big Blackfoot River.....                         | 624,201   | 114,450              | 509,751                | 445.5     |
| Bitter Root River.....                           | 1,138,320 | 674,130              | 464,190                | 68.9      |
| Other tributaries of Missoula River.....         | 202,730   | <sup>2</sup> 35,883  | 166,847                | 465.0     |
| Flathead River.....                              | 4,737,511 | ( <sup>4</sup> )     | .....                  | .....     |
| Kootenai River.....                              | 221,976   | 13,539               | 208,437                | .....     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Includes springs and wells.  
<sup>3</sup> Includes springs and wells and all sources in the Columbia River drainage basin exclusive of the Missoula and Kootenai Rivers.  
<sup>4</sup> Not reported separately in 1902.

In classifying capital invested by type of enterprise (Table 12) the average capital invested per acre is not presented, for the reason that it is not possible to compute this correctly. The United States Reclamation Service supplies stored water to enterprises controlled by agencies of most of the other classes shown in the table and a part of its expenditure is properly chargeable to those lands; but it is not possible to tell how much should be so charged or how it should be distributed among the various classes.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$52,143,363            | 100.0              | 1,369,651                                | \$1.26                              |
| Individual and partnership..... | 15,543,287              | 29.8               | 747,131                                  | 1.07                                |
| Cooperative.....                | 6,692,877               | 12.8               | 349,499                                  | 0.86                                |
| Irrigation district.....        | 1,708,851               | 3.3                | 34,983                                   | 0.98                                |
| Carey Act.....                  | 4,834,407               | 9.3                | 54,748                                   | 1.76                                |
| Commercial.....                 | 670,535                 | 1.3                | 34,115                                   | 2.14                                |
| U. S. Reclamation Service.....  | 14,381,318              | 27.6               | 45,786                                   | 2.00                                |
| U. S. Indian Service.....       | 8,193,390               | 15.7               | 103,309                                  | 3.01                                |
| State.....                      | 100                     | ( <sup>2</sup> )   | 20                                       | 0.75                                |
| City.....                       | 105,638                 | 0.2                | .....                                    | .....                               |
| Other.....                      | 7,060                   | ( <sup>2</sup> )   | 60                                       | 2.67                                |

<sup>1</sup> Based on acreage irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

## IRRIGATION—MONTANA.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |         |
|--|---------|
| Number of enterprises reporting land drained or needing drainage.....  | 276     |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 751,274 |
| Acreage for which drains have been installed.....  | 62,872  |
| Additional acreage needing drainage.....   | 50,901  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 8.4     |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 1.5     |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 2.6     |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing

estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.    | Measured. | Not measured. |
|---|-----------|-----------|---------------|
| Average volume of water entering canals, second-feet..... | 22,808    | 10,176    | 12,632        |
| Area irrigated in 1919.....acres..                        | 794,762   | 425,618   | 369,144       |
| Average number of acres per second-foot.....              | 35        | 42        | 29            |
| Total quantity of water entering canals, acre-feet.....   | 4,103,486 | 1,802,871 | 2,300,615     |
| Area irrigated in 1919.....acres..                        | 745,925   | 424,712   | 321,213       |
| Average quantity per acre.....acre-feet..                 | 5.5       | 4.2       | 7.2           |
| Total quantity of water delivered.....acre-feet..         | 968,991   | 409,939   | 559,052       |
| Area irrigated in 1919.....acres..                        | 290,884   | 181,430   | 109,454       |
| Average quantity per acre.....acre-feet..                 | 3.3       | 2.3       | 5.1           |

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....         | 3,545                     | 523                     | 8,819         | 94,429                  | 16,411          | 10,680           | 6,085           | 468         | 1,571,720             |
| Before 1860.....   | 5                         | 1                       | 15            | 89                      | 10              | 3                | 3               | —           | —                     |
| 1860-1869.....     | 238                       | 22                      | 798           | 4,614                   | 1,259           | 240              | 146             | 21          | 6,209                 |
| 1870-1879.....     | 373                       | 10                      | 876           | 6,284                   | 1,516           | 376              | 370             | 7           | 40                    |
| 1880-1889.....     | 1,064                     | 58                      | 2,222         | 19,259                  | 3,995           | 2,538            | 865             | 43          | 55,430                |
| 1890-1899.....     | 763                       | 91                      | 1,861         | 16,702                  | 3,429           | 3,070            | 1,554           | 79          | 52,572                |
| 1900-1904.....     | 339                       | 95                      | 870           | 12,275                  | 1,596           | 892              | 421             | 88          | 43,666                |
| 1905-1909.....     | 272                       | 97                      | 615           | 22,983                  | 1,968           | 1,581            | 1,887           | 81          | 555,349               |
| 1910-1914.....     | 197                       | 87                      | 484           | 4,672                   | 896             | 579              | 245             | 84          | 758,084               |
| 1915-1919.....     | 163                       | 38                      | 407           | 3,241                   | 808             | 395              | 402             | 43          | 95,791                |
| Not reported.....  | 131                       | 24                      | 671           | 4,310                   | 934             | 506              | 192             | 22          | 3,079                 |

| DATE OF BEGINNING. | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |        |
|--------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|--------|
|                    |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps. |
| Total.....         | 48.0                        | 41             | 4,608                          | 22            | 11,085                         | 253             | 10,341                         | 299    |
| Before 1860.....   | —                           | —              | —                              | 1             | —                              | 1               | 2                              | 1      |
| 1860-1869.....     | 0.2                         | 2              | —                              | —             | —                              | 1               | —                              | 1      |
| 1870-1879.....     | 2.9                         | 4              | 2,257                          | —             | —                              | 2               | 30                             | 2      |
| 1880-1889.....     | 2.0                         | 1              | —                              | 4             | —                              | 6               | 38                             | 7      |
| 1890-1899.....     | 6.9                         | 1              | 50                             | —             | 905                            | 15              | 479                            | 24     |
| 1900-1904.....     | 3.3                         | 5              | 51                             | 6             | 5,010                          | 36              | 932                            | 37     |
| 1905-1909.....     | 14.6                        | 7              | 1,032                          | 2             | 10                             | 37              | 2,368                          | 48     |
| 1910-1914.....     | 11.5                        | 5              | 109                            | 1             | —                              | 54              | 4,539                          | 73     |
| 1915-1919.....     | 4.7                         | 13             | 1,109                          | 5             | 2,090                          | 84              | 1,714                          | 89     |
| Not reported.....  | 1.9                         | 3              | —                              | 3             | 3,070                          | 17              | 239                            | 17     |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 3,545                     | 523                     | 8,819         | 94,429                  | 16,411          | 10,680           | 6,085           | 468         | 1,571,720             |
| Individual and partnership..... | 3,352                     | 454                     | 8,378         | 68,461                  | 13,513          | 8,949            | 2,813           | 397         | 300,131               |
| Cooperative.....                | 136                       | 32                      | 324           | 16,191                  | 1,723           | 747              | 770             | 38          | 334,555               |
| Irrigation district.....        | 10                        | 5                       | 24            | 1,680                   | 212             | 50               | 62              | 4           | 30,313                |
| Carey Act.....                  | 3                         | 6                       | 8             | 1,977                   | 82              | 250              | 588             | 4           | 18,000                |
| Commercial.....                 | 4                         | 4                       | 19            | 514                     | 134             | 136              | 27              | 4           | 656,720               |
| U. S. Reclamation Service.....  | 8                         | 6                       | 12            | 3,155                   | 337             | 192              | 367             | 6           | 102,878               |
| U. S. Indian Service.....       | 30                        | 15                      | 45            | 2,338                   | 396             | 349              | 1,453           | 14          | 128,995               |
| State.....                      | 2                         | —                       | 1             | 19                      | 2               | 3                | 2               | —           | —                     |
| City.....                       | —                         | —                       | 1             | 68                      | 5               | 1                | 1               | —           | —                     |
| Other.....                      | —                         | 1                       | 7             | 26                      | 7               | 3                | 2               | —           | 128                   |

# IRRIGATION—MONTANA.

9

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920—Continued.

| CLASS.                          | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |
|---------------------------------|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|
|                                 |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      |
|                                 |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |
| Total.....                      | 48.0                              | 41             | 4,608                                | 22            | 11,085                               | 253             | 10,341                                   | 299     | 453,231                              |
| Individual and partnership..... | 33.8                              | 37             | 3,608                                | 22            | 11,085                               | 243             | 5,630                                    | 272     | 315,031                              |
| Cooperative.....                | 2.0                               | 4              | 1,000                                |               |                                      | 1               | 36                                       | 1       | 50                                   |
| Irrigation district.....        | 1.9                               |                |                                      |               |                                      | 4               | 260                                      | 10      | 61,650                               |
| Carey Act.....                  | 1.3                               |                |                                      |               |                                      |                 |  |         |                                      |
| Commercial.....                 | 4.8                               |                |                                      |               |                                      | 2               | 3,680                                    | 11      | 73,500                               |
| U. S. Reclamation Service.....  | 1.5                               |                |                                      |               |                                      | 2               | 710                                      | 4       |                                      |
| U. S. Indian Service.....       | 0.2                               |                |                                      |               |                                      | 1               | 25                                       | 1       | 3,000                                |
| State.....                      |                                   |                |                                      |               |                                      |                 |  |         |                                      |
| City.....                       |                                   |                |                                      |               |                                      |                 |  |         |                                      |
| Other.....                      | 2.5                               |                |                                      |               |                                      |                 |  |         |                                      |

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                               | Number<br>of<br>diverting<br>dams. | Number<br>of<br>storage<br>dams. | MAIN DITCHES. |                                |                    | LATERAL DITCHES. |                    | RESERVOIRS. |                          |
|---|------------------------------------|----------------------------------|---------------|--------------------------------|--------------------|------------------|--------------------|-------------|--------------------------|
|   |                                    |                                  | Number.       | Capacity<br>(second-<br>feet). | Length<br>(miles). | Number.          | Length<br>(miles). | Number.     | Capacity<br>(acre feet). |
| Total.....                                    | 3,545                              | 523                              | 8,819         | 94,429                         | 16,411             | 10,680           | 6,085              | 468         | 1,571,720                |
| Missouri River and tributaries.....           | 2,805                              | 414                              | 6,672         | 78,815                         | 13,194             | 8,893            | 4,956              | 396         | 1,477,741                |
| Missouri River direct.....                    | 19                                 | 11                               | 73            | 778                            | 456                | 178              | 55                 | 13          | 870,709                  |
| Jefferson River and tributaries.....          | 1,174                              | 45                               | 2,106         | 25,319                         | 3,422              | 3,468            | 890                | 59          | 165,003                  |
| Jefferson River direct.....                   | 23                                 | 2                                | 52            | 1,331                          | 159                | 18               | 39                 |             |                          |
| Beaverhead River.....                         | 516                                | 15                               | 805           | 5,340                          | 1,120              | 954              | 253                | 16          | 130,275                  |
| Big Hole River.....                           | 442                                | 8                                | 726           | 7,171                          | 1,132              | 2,231            | 480                | 10          | 6,171                    |
| Boulder River.....                            | 48                                 | 3                                | 105           | 649                            | 185                | 83               | 2                  | 3           | 11                       |
| Passamari River.....                          | 54                                 | 7                                | 184           | 1,456                          | 298                | 101              | 61                 | 18          | 19,676                   |
| Other tributaries of Jefferson River.....     | 91                                 | 10                               | 234           | 9,372                          | 498                | 81               | 55                 | 12          | 8,870                    |
| Madison River.....                            | 100                                | 10                               | 251           | 2,709                          | 560                | 129              | 112                | 12          | 4,602                    |
| Gallatin River.....                           | 88                                 | 5                                | 410           | 4,243                          | 885                | 146              | 228                | 2           | 1,200                    |
| Smith River.....                              | 66                                 | 4                                | 285           | 983                            | 325                | 600              | 124                | 7           | 181                      |
| Sun River.....                                | 91                                 | 14                               | 109           | 2,467                          | 313                | 166              | 199                | 16          | 854                      |
| Teton River.....                              | 21                                 | 7                                | 76            | 2,566                          | 266                | 74               | 112                | 7           | 145,742                  |
| Marias River.....                             | 38                                 | 15                               | 76            | 2,634                          | 227                | 260              | 719                | 15          | 22,926                   |
| Judith River.....                             | 147                                | 5                                | 214           | 1,479                          | 311                | 252              | 84                 | 7           | 85                       |
| Musselshell River.....                        | 192                                | 35                               | 443           | 4,277                          | 866                | 806              | 286                | 16          | 34,479                   |
| Milk River and tributaries.....               | 201                                | 104                              | 301           | 7,416                          | 692                | 895              | 554                | 94          | 146,041                  |
| Milk River direct.....                        | 5                                  |                                  | 7             | 200                            | 31                 | 9                | 2                  | 1           | 16                       |
| Sage Creek.....                               | 5                                  | 6                                | 8             | 11                             | 12                 | 16               | 15                 | 5           | 2,089                    |
| Snake River.....                              | 13                                 | 6                                | 17            | 72                             | 23                 | 86               | 38                 | 4           | 158                      |
| Other tributaries of Milk River.....          | 178                                | 92                               | 269           | 7,133                          | 626                | 784              | 499                | 84          | 143,778                  |
| Yellowstone River and tributaries.....        | 449                                | 86                               | 1,463         | 19,605                         | 3,435              | 1,332            | 1,248              | 70          | 31,888                   |
| Yellowstone River direct.....                 | 14                                 | 11                               | 102           | 5,508                          | 720                | 279              | 447                | 11          | 2,519                    |
| Shields River.....                            | 88                                 | 1                                | 208           | 1,620                          | 457                | 210              | 75                 | 5           | 9,016                    |
| Stillwater River.....                         | 5                                  |                                  | 128           | 1,284                          | 279                | 40               | 46                 | 2           | 2                        |
| Clark Fork.....                               | 101                                | 5                                | 300           | 3,139                          | 707                | 397              | 217                | 1           | 91                       |
| Big Horn River.....                           | 45                                 | 1                                | 51            | 1,675                          | 198                | 24               | 218                |             |                          |
| Rosebud River.....                            | 11                                 | 2                                | 17            | 73                             | 21                 | 6                |                    | 2           | 18                       |
| Tongue River.....                             | 23                                 | 12                               | 59            | 974                            | 130                | 78               | 23                 | 9           | 150                      |
| Powder River.....                             | 17                                 | 13                               | 34            | 111                            | 23                 | 17               | 3                  | 10          | 50                       |
| Other tributaries of Yellowstone River.....   | 145                                | 41                               | 564           | 5,221                          | 900                | 281              | 214                | 30          | 19,542                   |
| Little Missouri River.....                    | 12                                 | 7                                | 19            | 70                             | 16                 | 35               | 13                 | 14          | 1,513                    |
| Other tributaries of Missouri River.....      | 207                                | 66                               | 846           | 4,269                          | 1,420              | 552              | 332                | 64          | 58,018                   |
| Tributaries of Columbia River.....            | 740                                | 109                              | 2,147         | 15,614                         | 3,217              | 1,787            | 1,129              | 72          | 93,979                   |
| Clark Fork (of Columbia) and tributaries..... | 710                                | 102                              | 2,083         | 14,519                         | 3,124              | 1,746            | 1,103              | 59          | 93,655                   |
| Clark Fork direct.....                        | 1                                  |                                  | 64            | 1,300                          | 73                 | 9                | 1                  |             |                          |
| Missoula River and tributaries.....           | 609                                | 79                               | 1,863         | 11,998                         | 2,655              | 1,217            | 367                | 46          | 8,640                    |
| Missoula River direct.....                    | 5                                  | 1                                | 15            | 200                            | 110                |                  |                    | 1           |                          |
| Helgate River.....                            | 246                                | 27                               | 777           | 4,628                          | 1,195              | 455              | 142                | 24          | 527                      |
| Big Blackfoot River.....                      | 137                                | 10                               | 310           | 2,378                          | 304                | 193              | 48                 | 3           | 200                      |
| Bitter Root River.....                        | 173                                | 37                               | 644           | 4,073                          | 870                | 424              | 158                | 10          | 7,634                    |
| Other tributaries of Missoula River.....      | 48                                 | 4                                | 117           | 724                            | 110                | 134              | 19                 | 8           | 279                      |
| Flathead River.....                           | 100                                | 23                               | 156           | 1,221                          | 396                | 520              | 735                | 13          | 85,015                   |
| Kootenai River.....                           | 30                                 | 7                                | 64            | 1,095                          | 93                 | 41               | 26                 | 13          | 324                      |

## IRRIGATION—MONTANA.

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920—Continued.

| DRAINAGE BASIN.                               | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |                            |
|---|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|----------------------------|
|   |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average<br>lift<br>(feet). |
|   |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |                            |
| Total.....                                    | 48.0                              | 41             | 4,608                                | 22            | 11,085                               | 253             | 10,341                                   | 299     | 453,231                              | 20                         |
| Missouri River and tributaries.....           | 17.6                              | 28             | 1,245                                | 19            | 11,005                               | 225             | 10,058                                   | 271     | 440,779                              | 19                         |
| Missouri River direct.....                    | 4.0                               |                |                                      |               |                                      | 26              | 4,494                                    | 34      | 115,975                              | 24                         |
| Jefferson River and tributaries.....          | 0.1                               | 2              | 2                                    |               |                                      | 3               | 135                                      | 4       | 4,968                                | 24                         |
| Jefferson River direct.....                   | 0.1                               |                |                                      |               |                                      | 2               | 25                                       | 2       | 1,968                                | 24                         |
| Beaverhead River.....                         |                                   | 1              |                                      |               |                                      |                 |  |         |                                      |                            |
| Boulder River.....                            |                                   |                |                                      |               |                                      | 1               | 110                                      | 2       | 3,000                                | 24                         |
| Other tributaries of Jefferson River.....     |                                   | 1              | 2                                    |               |                                      |                 |  |         |                                      |                            |
| Gallatin River.....                           | 0.5                               |                |                                      |               |                                      | 4               | 70                                       | 4       | 5,329                                | 16                         |
| Smith River.....                              |                                   |                |                                      |               |                                      | 1               | 18                                       | 1       | 6,000                                | 9                          |
| Sun River.....                                | 1.2                               |                |                                      |               |                                      | 15              | 326                                      | 20      | 20,210                               | 15                         |
| Teton River.....                              | 0.5                               | 3              | 1,000                                | 1             | 10                                   | 8               | 130                                      | 8       | 13,410                               | 17                         |
| Marias River.....                             | 1.6                               |                |                                      | 3             | 8,000                                | 22              | 623                                      | 22      | 37,165                               | 15                         |
| Judith River.....                             | 2.4                               |                |                                      | 1             | 1,500                                | 8               | 72                                       | 16      | 10,600                               | 11                         |
| Musselshell River.....                        |                                   |                |                                      |               |                                      | 10              | 178                                      | 12      | 16,250                               | 19                         |
| Milk River and tributaries.....               | 1.2                               | 1              | 50                                   |               |                                      | 22              | 377                                      | 23      | 24,345                               | 16                         |
| Milk River direct.....                        |                                   |                |                                      |               |                                      | 4               | 70                                       | 4       | 2,570                                | 18                         |
| Other tributaries of Milk River.....          | 1.2                               | 1              | 50                                   |               |                                      | 18              | 307                                      | 19      | 21,775                               | 16                         |
| Yellowstone River and tributaries.....        | 2.7                               | 18             | 188                                  | 2             | 50                                   | 75              | 3,173                                    | 90      | 106,553                              | 19                         |
| Yellowstone River direct.....                 | 2.0                               | 3              | 69                                   |               |                                      | 35              | 2,501                                    | 45      | 127,662                              | 24                         |
| Shields River.....                            |                                   |                |                                      | 1             | 40                                   |                 |  |         |                                      |                            |
| Clark Fork.....                               |                                   |                |                                      |               |                                      | 2               | 10                                       | 2       | 470                                  | 8                          |
| Big Horn River.....                           | 0.1                               |                |                                      |               |                                      | 2               | 38                                       | 3       | 1,850                                | 17                         |
| Tongue River.....                             | 0.1                               |                |                                      |               |                                      | 16              | 286                                      | 16      | 14,575                               | 15                         |
| Powder River.....                             |                                   | 15             | 119                                  | 1             | 10                                   | 9               | 221                                      | 13      | 13,365                               | 15                         |
| Other tributaries of Yellowstone River.....   | 0.5                               |                |                                      |               |                                      | 11              | 117                                      | 11      | 8,631                                | 12                         |
| Other tributaries of Missouri River.....      | 3.4                               | 4              | 5                                    | 12            | 1,445                                | 31              | 462                                      | 37      | 19,974                               | 18                         |
| Tributaries of Columbia River.....            | 30.4                              | 13             | 3,363                                | 3             | 80                                   | 28              | 283                                      | 28      | 12,452                               | 31                         |
| Clark Fork (of Columbia) and tributaries..... | 26.8                              | 11             | 3,333                                | 3             | 80                                   | 27              | 283                                      | 27      | 12,447                               | 8                          |
| Clark Fork direct.....                        | 1.5                               |                |                                      |               |                                      |                 |  |         |                                      | 8                          |
| Missoula River and tributaries.....           | 17.2                              | 1              | 2,250                                | 3             | 80                                   | 11              | 106                                      | 11      | 3,282                                | 24                         |
| Missoula River direct.....                    | 3.8                               |                |                                      | 2             |                                      | 6               | 52                                       | 6       | 1,096                                | 29                         |
| Hellgate River.....                           | 3.2                               | 1              | 2,250                                | 1             | 80                                   | 2               | 10                                       | 2       | 130                                  | 29                         |
| Big Blackfoot River.....                      | 0.4                               |                |                                      |               |                                      | 1               | 16                                       | 1       | 650                                  | 12                         |
| Bitter Root River.....                        | 3.4                               |                |                                      |               |                                      | 1               | 12                                       | 1       | 1,406                                | 7                          |
| Other tributaries of Missoula River.....      | 5.4                               |                |                                      |               |                                      | 1               | 16                                       |         |                                      |                            |
| Flathead River.....                           | 8.1                               | 10             | 1,083                                |               |                                      | 16              | 177                                      | 16      | 9,165                                | 37                         |
| Kootenai River.....                           | 3.6                               | 2              | 30                                   |               |                                      | 1               |  | 1       | 5                                    | 10                         |

# IRRIGATION—MONTANA.

11

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP.                                  | AREA HARVESTED.      |                              |                  |                              |                                    | QUANTITY HARVESTED. |           |                              |                  |                                    |
|--|----------------------|------------------------------|------------------|------------------------------|------------------------------------|---------------------|-----------|------------------------------|------------------|------------------------------------|
|  | 1919                 |                              | 1909             |                              | Per cent of increase. <sup>1</sup> | Unit.               | 1919      |                              | 1909             | Per cent of increase. <sup>1</sup> |
|  | Acres.               | Per cent of total for state. | Acres.           | Per cent of total for state. |                                    |                     | Amount.   | Per cent of total for state. | Amount.          | Per cent of total for state.       |
| <b>Cereals:</b>                        |                      |                              |                  |                              |                                    |                     |           |                              |                  |                                    |
| 1 Corn.....                            | 2,436                | 13.0                         | 1,640            | 17.2                         | 48.5                               | Bu.....             | 34,132    | 21.4                         | 51,488           | 18.8                               |
| 2 Oats.....                            | 45,153               | 23.6                         | 159,658          | 47.9                         | -71.7                              | Bu.....             | 1,183,068 | 45.8                         | 6,965,254        | 50.5                               |
| 3 Winter wheat.....                    | 39,396               | 7.3                          | 45,568           | 17.6                         | 253.8                              | Bu.....             | 331,668   | 11.9                         | 1,236,137        | 19.8                               |
| 4 Spring wheat.....                    | 121,804              | 10.5                         | 9,271            | 34.0                         | 10.9                               | Bu.....             | 1,551,685 | 31.0                         | 185,866          | 38.4                               |
| 5 Barley.....                          | 10,286               | 35.1                         | 867              | 14.4                         | 58.0                               | Bu.....             | 6,826     | 3.0                          | 273,827          | 13.9                               |
| 6 Rye.....                             | 1,370                | 1.8                          |                  |                              |                                    |                     |           |                              |                  |                                    |
| <b>Hay and forage:</b>                 |                      |                              |                  |                              |                                    |                     |           |                              |                  |                                    |
| 7 Timothy alone.....                   | 35,781               | 44.3                         | 48,868           | 41.5                         | -26.8                              | Tons.....           | 35,613    | 56.8                         | 76,230           | 44.6                               |
| 8 Timothy and clover mixed.....        | 91,912               | 65.3                         | 60,437           | 66.8                         | 52.1                               | Tons.....           | 105,845   | 70.4                         | 102,660          | 65.8                               |
| 9 Clover alone.....                    | 5,576                | 42.4                         | 8,433            | 72.9                         | -33.9                              | Tons.....           | 6,987     | 51.0                         | 17,350           | 72.0                               |
| 10 Alfalfa.....                        | 220,281              | 58.9                         | 183,264          | 81.7                         | 20.2                               | Tons.....           | 408,983   | 69.7                         | 514,803          | 85.8                               |
| 11 Other tame grasses.....             | 39,254               | 52.0                         | 22,195           | 37.5                         | 76.9                               | Tons.....           | 39,823    | 61.6                         | 37,424           | 47.6                               |
| 12 Annual legumes cut for hay.....     | 770                  | 12.1                         | 5,988            | 13.0                         | 336.2                              | Tons.....           | 1,184     | 25.4                         | 10,418           | 14.8                               |
| 13 Small grains cut for hay.....       | 25,349               | 5.4                          | 329,579          | 56.4                         | -64.4                              | Tons.....           | 18,194    | 10.6                         | 339,821          | 57.6                               |
| 14 Wild, salt, or prairie grasses..... | 117,385              | 26.0                         | ( <sup>2</sup> ) |                              |                                    | Tons.....           | 131,652   | 46.8                         | ( <sup>2</sup> ) |                                    |
| 15 Silage crops.....                   | 620                  | 32.3                         |                  |                              |                                    | Tons.....           | 3,357     | 43.2                         |                  |                                    |
| <b>Vegetables:</b>                     |                      |                              |                  |                              |                                    |                     |           |                              |                  |                                    |
| 16 Potatoes.....                       | 4,903                | 22.1                         | 11,137           | 53.8                         | -56.0                              | Bu.....             | 568,008   | 34.2                         | 1,938,677        | 59.8                               |
| <b>Fruits:</b>                         |                      |                              |                  |                              |                                    |                     |           |                              |                  |                                    |
| 17 Apples.....                         | <sup>3</sup> 761,904 | 71.9                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 477,796   | 70.9                         | ( <sup>2</sup> ) |                                    |
| 18 Cherries.....                       | <sup>3</sup> 47,600  | 72.5                         | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 9,595     | 65.0                         | ( <sup>2</sup> ) |                                    |
| <b>Miscellaneous:</b>                  |                      |                              |                  |                              |                                    |                     |           |                              |                  |                                    |
| 19 Sugar beets grown for sugar.....    | 7,686                | 89.4                         | 7,551            | 86.7                         | 1.8                                | Tons.....           | 67,297    | 91.2                         | 91,509           | 84.1                               |
| 20 Clover and alfalfa seed.....        | 3,330                | 34.6                         | 1,527            | 41.3                         | 118.1                              | Bu.....             | 8,824     | 37.8                         | 4,817            | 46.4                               |
| 21 Dry beans.....                      | 1,022                | 44.5                         |                  |                              |                                    | Bu.....             | 14,576    | 55.8                         | ( <sup>2</sup> ) |                                    |
| 22 Dry peas.....                       | 12,070               | 81.2                         | 951              | 80.3                         |                                    | Bu.....             | 143,042   | 85.9                         | 19,966           | 92.1                               |
| 23 Flaxseed.....                       | 3,740                | 2.9                          | ( <sup>2</sup> ) |                              |                                    | Bu.....             | 22,534    | 6.9                          | ( <sup>2</sup> ) |                                    |
| 24 Sugar-beet seed.....                | 965                  | 56.3                         | ( <sup>2</sup> ) |                              |                                    | Lbs.....            | 508,385   | 52.0                         | ( <sup>2</sup> ) |                                    |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.

<sup>2</sup> Not reported separately in 1910.

<sup>3</sup> Number of trees of bearing age.

<sup>4</sup> Not including red clover seed.

<sup>5</sup> Yield per tree.

## IRRIGATION—MONTANA.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease.]

|   | THE STATE.    | Beaver-head. <sup>1</sup> | Big Horn. <sup>2</sup> | Blaine. <sup>3</sup> | Broad-water. | Carbon. <sup>4</sup> | Carter. <sup>5</sup> | Cascade.  | Chouteau. <sup>6</sup> | Custer. <sup>7</sup> |
|---|---------------|---------------------------|------------------------|----------------------|--------------|----------------------|----------------------|-----------|------------------------|----------------------|
| 1 Number of all farms in 1920.....  | \$ 57,677     | 642                       | 791                    | 1,761                | 466          | 1,353                | 855                  | 1,703     | 2,573                  | 941                  |
| 2 Number of farms irrigated in 1919.....  | 10,807        | 479                       | 341                    | 162                  | 196          | 768                  | 13                   | 218       | 32                     | 112                  |
| 3 Per cent of all farms.....  | 18.7          | 74.6                      | 43.1                   | 9.2                  | 42.1         | 56.8                 | 1.5                  | 12.8      | 1.2                    | 11.9                 |
| 4 Number of farms irrigated in 1909.....  | 8,970         | 480                       |                        |                      | 231          | 912                  |                      | 194       | 354                    | 129                  |
| 5 Per cent of increase, 1909-1919.....  | 20.5          |                           |                        |                      | -15.2        |                      |                      | 12.4      |                        |                      |
| <b>LAND AND FARM AREA.</b>  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 6 Approximate land area.....acres..   | \$ 93,523,810 | 3,620,480                 | 3,178,240              | 2,706,560            | 771,840      | 1,318,400            | 2,160,000            | 2,183,040 | 2,696,320              | 2,394,240            |
| 7 All land in farms.....acres..   | \$ 35,070,656 | 637,009                   | 748,749                | 1,159,056            | 304,483      | 446,386              | 557,495              | 1,252,282 | 1,508,898              | 997,169              |
| 8 Improved land in farms.....acres..  | \$ 11,007,278 | 270,603                   | 153,363                | 291,431              | 110,566      | 178,503              | 83,763               | 378,035   | 599,542                | 121,688              |
| 9 Area irrigated in 1919.....acres..  | 1,681,720     | 302,375                   | 48,306                 | 59,119               | 25,733       | 99,336               | 380                  | 14,864    | 6,020                  | 8,469                |
| 10 Per cent of improved land in farms.....  | 15.3          | 111.7                     | 30.5                   | 20.3                 | 23.3         | 55.6                 | 0.5                  | 3.9       | 1.0                    | 7.9                  |
| 11 Area irrigated in 1909.....acres..   | 1,679,084     | 221,716                   |                        |                      | 39,612       | 121,174              |                      | 25,063    | 110,291                | 19,399               |
| 12 Per cent of increase, 1909-1919.....   | 0.2           |                           |                        |                      | -35.0        |                      |                      | -40.7     |                        |                      |
| 13 Area enterprises were capable of irrigating in 1920.....acres..  | 2,753,498     | 385,619                   | 60,591                 | 99,704               | 61,175       | 147,195              | 1,320                | 53,163    | 18,790                 | 21,080               |
| 14 Area enterprises were capable of irrigating in 1910.....acres..  | 2,205,155     | 238,267                   |                        |                      | 50,870       | 129,922              |                      | 50,334    | 138,063                | 32,872               |
| 15 Per cent of increase, 1910-1920.....   | 24.9          |                           |                        |                      | 20.3         |                      |                      | 5.6       |                        |                      |
| 16 Area included in enterprises in 1920.....acres..   | 4,329,148     | 525,181                   | 87,765                 | 190,347              | 109,435      | 156,675              | 3,045                | 144,376   | 40,244                 | 25,872               |
| 17 Area included in enterprises in 1910.....acres..   | 3,515,602     | 347,877                   |                        |                      | 72,436       | 165,509              |                      | 81,279    | 193,849                | 57,191               |
| 18 Per cent of increase, 1910-1920.....   | 23.1          |                           |                        |                      | 51.1         |                      |                      | 77.6      |                        |                      |
| 19 Area of irrigated land reported as available for settlement.....acres..                                    | 297,531       | 1,800                     |                        | 47,597               | 450          |                      |                      | 168       | 150                    |                      |
| <b>IRRIGATION WORKS.</b>  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| Independent enterprises:  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 20 Number, 1920.....  | 6,035         | 521                       | 38                     | 87                   | 211          | 258                  |                      | 100       | 98                     | 44                   |
| 21 Number, 1910.....  | 5,534         | 446                       |                        |                      | 180          | 288                  | 10                   | 93        | 247                    | 89                   |
| Main ditches:   |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 22 Number, 1920.....  | 8,819         | 1,318                     | 67                     | 165                  | 299          | 343                  | 18                   | 127       | 134                    | 41                   |
| 23 Number, 1910.....  | 6,673         | 901                       |                        |                      | 221          | 284                  |                      | 100       | 306                    | 78                   |
| 24 Length, 1920.....miles..   | 16,411        | 2,004                     | 209                    | 358                  | 591          | 831                  | 15                   | 213       | 491                    | 88                   |
| 25 Length, 1910.....miles..   | 12,990        | 1,415                     |                        |                      | 417          | 805                  |                      | 217       | 747                    | 169                  |
| 26 Capacity, 1920.....second-feet..   | 94,429        | 10,119                    | 1,540                  | 2,110                | 1,883        | 3,772                | 70                   | 1,264     | 972                    | 882                  |
| 27 Capacity, 1910.....second-feet..   | 83,849        | 8,596                     |                        |                      | 1,938        | 4,112                |                      | 1,019     | 5,392                  | 1,143                |
| Laterals:   |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 28 Number, 1920.....  | 10,680        | 2,931                     | 18                     | 271                  | 96           | 406                  |                      | 122       | 318                    | 13                   |
| 29 Number, 1910.....  | 8,307         | 1,163                     |                        |                      | 93           | 401                  | 33                   | 192       | 630                    | 110                  |
| 30 Length, 1920.....miles..   | 6,785         | 669                       | 204                    | 299                  | 49           | 230                  | 11                   | 47        | 201                    | 4                    |
| 31 Length, 1910.....miles..   | 5,944         | 555                       |                        |                      | 61           | 335                  |                      | 156       | 344                    | 76                   |
| Reservoirs:   |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 32 Number, 1920.....  | 468           | 25                        | 8                      | 45                   | 4            | 1                    | 13                   | 15        | 27                     | 18                   |
| 33 Number, 1910.....  | 827           | 27                        |                        |                      | 14           | 8                    |                      | 62        | 137                    | 70                   |
| 34 Capacity, 1920.....acre-feet..   | 1,571,720     | 136,446                   | 128                    | 15,671               | 211          | 91                   | 1,513                | 218,086   | 3,124                  | 844                  |
| 35 Capacity, 1910.....acre-feet..   | 580,261       | 158,772                   |                        |                      | 490          | 467                  |                      | 30,772    | 44,140                 | 7,728                |
| Flowing wells:  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 36 Number, 1920.....  | 41            | 1                         |                        |                      |              |                      |                      |           |                        | 1                    |
| 37 Number, 1910.....  | 15            |                           |                        |                      |              |                      |                      |           |                        | 4                    |
| 38 Capacity, 1920.....gallons per minute..  | 4,608         |                           |                        |                      |              | 1                    |                      |           |                        | 1                    |
| 39 Capacity, 1910.....gallons per minute..  | 22,185        |                           |                        |                      |              |                      |                      |           |                        | 42                   |
| Pumped wells:   |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 40 Number, 1920.....  | 22            |                           |                        |                      | 5            | 2,138                |                      |           |                        |                      |
| 41 Number, 1910.....  | 10            |                           |                        |                      | 3            |                      |                      |           |                        |                      |
| 42 Capacity, 1920.....gallons per minute..  | 11,085        |                           |                        |                      |              |                      |                      |           | 1                      |                      |
| 43 Capacity, 1910.....gallons per minute..  | 5,263         |                           |                        |                      |              |                      |                      |           |                        |                      |
| Pumping plants:   |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 44 Number, 1920.....  | 253           |                           | 9                      | 7                    | 195          |                      |                      |           | 10                     |                      |
| 45 Number, 1910.....  | 125           |                           |                        |                      | 8            |                      |                      |           |                        |                      |
| 46 Engine capacity, 1920.....horsepower..   | 10,341        |                           | 172                    | 136                  | 94           | 4                    |                      | 22        | 26                     | 12                   |
| 47 Engine capacity, 1910.....horsepower..   | 3,511         |                           |                        |                      | 26           | 4                    |                      | 11        | 21                     | 8                    |
| 48 Pump capacity, 1920.....gallons per minute..   | 453,231       |                           | 10,225                 | 8,785                | 16           | 59                   |                      | 565       | 577                    | 375                  |
| 49 Pump capacity, 1910.....gallons per minute..   | 281,199       |                           |                        |                      | 2,688        | 1,741                |                      | 377       | 709                    | 588                  |
| 50 Average lift, 1920.....feet..  | 20            |                           | 14                     | 20                   | 1,438        | 1,182                |                      | 32,310    | 42,260                 | 28,250               |
|   |               |                           |                        |                      | 16           | 10                   |                      | 29,225    | 51,244                 | 42,025               |
|   |               |                           |                        |                      |              |                      |                      | 18        | 18                     | 14                   |
| <b>CAPITAL INVESTED.</b>  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 51 Capital invested to Jan. 1, 1920.....dollars..   | 52,143,363    | 2,385,045                 | 2,311,418              | 2,549,735            | 476,675      | 1,456,985            | 14,095               | 2,555,563 | 640,656                | 209,355              |
| 52 Capital invested to July 1, 1910.....dollars..   | 22,970,958    | 4,003,286                 |                        |                      | 379,681      | 546,864              |                      | 832,204   | 849,450                | 375,414              |
| 53 Per cent of increase, 1910-1920.....   | 127.0         |                           |                        |                      | 25.5         |                      |                      | 207.1     |                        |                      |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 18.94         | 6.18                      | 38.15                  | 25.56                | 7.79         | 9.90                 | 10.68                | 48.07     | 34.10                  | 13.63                |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 10.42         | 16.80                     |                        |                      | 7.46         | 4.21                 |                      | 16.53     | 6.15                   | 11.42                |
| <b>ESTIMATED FINAL COST.</b>  |               |                           |                        |                      |              |                      |                      |           |                        |                      |
| 56 Estimated final cost of existing enterprises in 1920.....dollars..   | 70,079,028    | 2,433,395                 | 2,686,470              | 2,737,185            | 482,625      | 1,463,610            | 18,095               | 5,120,595 | 1,051,398              | 376,180              |
| 57 Estimated final cost of existing enterprises in 1910.....dollars..   | 32,382,077    | 4,003,286                 |                        |                      | 379,681      | 546,864              |                      | 912,194   | 890,801                | 379,409              |
| 58 Per cent of increase, 1910-1920.....   | 116.4         |                           |                        |                      | 27.1         |                      |                      | 461.3     |                        |                      |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 16.19         | 4.63                      | 30.61                  | 14.38                | 4.41         | 9.34                 | 5.94                 | 35.47     | 26.13                  | 14.54                |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 9.21          | 11.51                     |                        |                      | 5.24         | 3.30                 |                      | 11.22     | 4.60                   | 6.63                 |

<sup>1</sup> Part of Madison annexed in 1911.

<sup>2</sup> Organized from parts of Rosebud and Yellowstone in 1913.

<sup>3</sup> Organized from part of Chouteau in 1912; part taken to form part of Phillips in 1915.

<sup>4</sup> Part taken to form part of Stillwater in 1913; part annexed to Yellowstone and part of Yellowstone annexed in 1919.

<sup>5</sup> Organized from part of Fallon in 1917.

<sup>6</sup> Parts taken to form Blaine and Hill in 1912, and parts of Pondera and Liberty in 1919.

<sup>7</sup> Part including Northern Cheyenne Indian Reservation and part of Crow Indian Reservation, taken to form Rosebud in 1901; parts taken to form Fallon in 1913, part of Prairie in 1915, and Powder River in 1919.

<sup>8</sup> Includes Liberty and McCone Counties and that part of Yellowstone National Park which is in Montana, for which no irrigation is reported in 1919.



# IRRIGATION—MONTANA.

13

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease.]

|                              |  | Dawson. <sup>1</sup> | Deer Lodge. <sup>2</sup> | Fallon. <sup>3</sup> | Fergus. <sup>4</sup> | Flathead. <sup>5</sup> | Gallatin. | Garfield. <sup>6</sup> | Glacier. <sup>7</sup> | Granite.  | Hill. <sup>8</sup> |
|------------------------------|--|----------------------|--------------------------|----------------------|----------------------|------------------------|-----------|------------------------|-----------------------|-----------|--------------------|
| 1                            | Number of all farms in 1920.....   | 1,195                | 202                      | 758                  | 4,226                | 1,923                  | 1,349     | 1,530                  | 372                   | 354       | 2,257              |
| 2                            | Number of farms irrigated in 1919.....   | 14                   | 120                      | 2                    | 154                  | 247                    | 782       | 3                      | 19                    | 189       | 34                 |
| 3                            | Per cent of all farms.....   | 1.2                  | 59.4                     | 0.3                  | 3.6                  | 12.8                   | 58.0      | 0.2                    | 5.1                   | 53.4      | 1.6                |
| 4                            | Number of farms irrigated in 1909.....   | 100                  | 170                      |                      | 191                  | 63                     | 802       |                        |                       | 175       |                    |
| 5                            | Per cent of increase, 1909-1919.....   |                      |                          |                      |                      |                        | —2.5      |                        |                       | 8.0       |                    |
| <b>LAND AND FARM AREA.</b>   |  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 6                            | Approximate land area.....acres..  | 1,509,760            | 476,800                  | 1,029,120            | 4,573,440            | 3,909,760              | 1,604,480 | 3,095,680              | 1,907,840             | 1,098,880 | 1,850,880          |
| 7                            | All land in farms.....acres..  | 747,993              | 53,484                   | 576,754              | 2,573,981            | 470,283                | 783,189   | 874,129                | 545,256               | 254,148   | 1,107,399          |
| 8                            | Improved land in farms.....acres..   | 298,620              | 24,210                   | 171,815              | 1,037,819            | 179,201                | 350,776   | 136,554                | 168,338               | 72,336    | 491,358            |
| 9                            | Area irrigated in 1919.....acres..   | 1,674                | 13,474                   |                      | 33,499               | 11,244                 | 103,975   | 370                    | 9,767                 | 31,177    | 2,528              |
| 10                           | Per cent of improved land in farms.....  | 0.6                  | 55.7                     |                      | 3.2                  | 6.3                    | 29.6      | 0.3                    | 5.8                   | 43.1      | 0.5                |
| 11                           | Area irrigated in 1909.....acres..   | 11,158               | 29,881                   |                      | 48,232               | 14,527                 | 127,449   |                        |                       | 24,107    |                    |
| 12                           | Per cent of increase, 1909-1919.....   |                      |                          |                      |                      |                        | —18.4     |                        |                       | 29.3      |                    |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 6,880                | 24,271                   | 260                  | 82,521               | 24,642                 | 174,906   | 390                    | 25,600                | 38,500    | 12,033             |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 46,741               | 39,949                   |                      | 84,558               | 19,908                 | 139,050   |                        |                       | 28,550    |                    |
| 15                           | Per cent of increase, 1910-1920.....   |                      |                          |                      |                      |                        | 25.8      |                        |                       | 35.8      |                    |
| 16                           | Area included in enterprises in 1920.....acres..   | 7,663                | 40,125                   | 260                  | 96,690               | 33,787                 | 287,590   | 4,090                  | 118,500               | 58,394    | 14,824             |
| 17                           | Area included in enterprises in 1910.....acres..   | 73,061               | 45,858                   |                      | 100,364              | 86,287                 | 169,926   |                        |                       | 33,916    |                    |
| 18                           | Per cent of increase, 1910-1920.....   |                      |                          |                      |                      |                        | 69.2      |                        |                       | 72.2      |                    |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | 793                  | 560                      |                      | 2,480                |                        | 3,270     |                        |                       |           |                    |
| <b>IRRIGATION WORKS.</b>     |  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 20                           | Independent enterprises:   |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 21                           | Number, 1920.....  | 14                   | 90                       | 2                    | 232                  | 129                    | 463       | 2                      | 2                     | 170       | 42                 |
| 22                           | Number, 1910.....  | 30                   | 161                      |                      | 206                  | 42                     | 389       |                        |                       | 151       |                    |
| 23                           | Main ditches:  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 24                           | Number, 1920.....  | 11                   | 142                      | 2                    | 360                  | 109                    | 531       | 5                      | 6                     | 277       | 67                 |
| 25                           | Number, 1910.....  | 27                   | 200                      |                      | 253                  | 40                     | 384       |                        |                       | 172       |                    |
| 26                           | Length, 1920.....miles..   | 10                   | 285                      | 2                    | 580                  | 283                    | 1,127     | 15                     | 114                   | 272       | 95                 |
| 27                           | Length, 1910.....miles..   | 108                  | 341                      |                      | 536                  | 82                     | 770       |                        |                       | 231       |                    |
| 28                           | Capacity, 1920.....second-feet..   | 83                   | 1,304                    | 2                    | 3,283                | 1,292                  | 5,315     | 3                      | 341                   | 1,822     | 235                |
| 29                           | Capacity, 1910.....second-feet..   | 1,275                | 1,677                    |                      | 2,847                | 454                    | 5,552     |                        |                       | 1,177     |                    |
| 30                           | Laterals:  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 31                           | Number, 1920.....  | 37                   | 399                      | 6                    | 472                  | 162                    | 204       |                        |                       | 143       | 282                |
| 32                           | Number, 1910.....  | 56                   | 1,555                    |                      | 309                  | 48                     | 479       |                        |                       | 94        |                    |
| 33                           | Length, 1920.....miles..   | 10                   | 65                       | 2                    | 195                  | 139                    | 269       |                        |                       | 44        | 91                 |
| 34                           | Length, 1910.....miles..   | 143                  | 79                       |                      | 191                  | 46                     | 362       |                        |                       | 41        |                    |
| 35                           | Reservoirs:  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 36                           | Number, 1920.....  | 2                    | 9                        | 2                    | 16                   | 11                     | 4         |                        | 3                     | 2         | 31                 |
| 37                           | Number, 1910.....  | 16                   | 20                       |                      | 31                   | 7                      | 12        |                        |                       | 16        |                    |
| 38                           | Capacity, 1920.....acre-feet..   | 2                    | 109                      | 80                   | 31,638               | 38,101                 | 2,199     |                        | 95,000                | 330       | 7,205              |
| 39                           | Capacity, 1910.....acre-feet..   | 1,119                | 143                      |                      | 655                  | 12,281                 | 1,420     |                        |                       | 68        |                    |
| 40                           | Flowing wells:   |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 41                           | Number, 1920.....  |                      | 1                        |                      |                      | 9                      |           |                        |                       |           | 1                  |
| 42                           | Number, 1910.....  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 43                           | Capacity, 1920.....gallons per minute..  |                      | 2,250                    |                      |                      | 1,083                  |           |                        |                       |           | 50                 |
| 44                           | Capacity, 1910.....gallons per minute..  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 45                           | Pumped wells:  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 46                           | Number, 1920.....  |                      |                          |                      | 1                    |                        |           |                        |                       |           | 1                  |
| 47                           | Number, 1910.....  | 2                    |                          |                      |                      |                        | 1         |                        |                       |           |                    |
| 48                           | Capacity, 1920.....gallons per minute..  |                      |                          |                      | 1,500                |                        |           |                        |                       |           | 3,000              |
| 49                           | Capacity, 1910.....gallons per minute..  | 4,550                |                          |                      |                      |                        | 135       |                        |                       |           |                    |
| 50                           | Pumping plants:  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 51                           | Number, 1920.....  | 4                    |                          |                      | 14                   | 15                     | 6         |                        |                       |           | 12                 |
| 52                           | Number, 1910.....  | 12                   |                          |                      | 2                    |                        | 3         |                        |                       |           |                    |
| 53                           | Engine capacity, 1920.....horsepower..   | 487                  |                          |                      | 204                  | 170                    | 115       |                        |                       |           | 352                |
| 54                           | Engine capacity, 1910.....horsepower..   | 205                  |                          |                      | 35                   |                        | 24        |                        |                       |           |                    |
| 55                           | Pump capacity, 1920.....gallons per minute..   | 7,750                |                          |                      | 16,180               | 9,165                  | 6,729     |                        |                       |           | 21,335             |
| 56                           | Pump capacity, 1910.....gallons per minute..   | 23,942               |                          |                      | 3,350                |                        | 785       |                        |                       |           |                    |
| 57                           | Average lift, 1920.....feet..  | 41                   |                          |                      | 14                   | 38                     | 14        |                        |                       |           | 16                 |
| <b>CAPITAL INVESTED.</b>     |  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 58                           | Capital invested to Jan. 1, 1920.....dollars..   | 154,334              | 354,148                  | 2,900                | 729,436              | 836,723                | 1,176,492 | 50,385                 | 3,545,069             | 344,544   | 188,822            |
| 59                           | Capital invested to July 1, 1910.....dollars..   | 2,819,774            | 139,766                  |                      | 375,025              | 239,589                | 1,017,474 |                        |                       | 76,500    |                    |
| 60                           | Per cent of increase, 1910-1920.....   |                      |                          |                      |                      |                        | 15.6      |                        |                       | 350.4     |                    |
| 61                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 22.50                | 14.59                    | 11.15                | 8.84                 | 33.96                  | 6.73      | 129.19                 | 138.48                | 8.95      | 15.69              |
| 62                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 60.33                | 3.50                     |                      | 4.44                 | 12.03                  | 7.32      |                        |                       | 2.70      |                    |
| <b>ESTIMATED FINAL COST.</b> |  |                      |                          |                      |                      |                        |           |                        |                       |           |                    |
| 63                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 189,070              | 356,338                  | 2,900                | 743,186              | 1,234,620              | 1,211,747 | 50,885                 | 7,219,059             | 355,744   | 208,222            |
| 64                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 3,158,950            | 139,766                  |                      | 375,025              | 2,371,947              | 1,017,474 |                        |                       | 76,500    |                    |
| 65                           | Per cent of increase, 1910-1920.....   |                      |                          |                      |                      |                        | 19.1      |                        |                       | 355.0     |                    |
| 66                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 24.67                | 8.88                     | 11.15                | 7.69                 | 36.54                  | 4.21      | 12.44                  | 60.92                 | 6.09      | 14.05              |
| 67                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 43.24                | 3.05                     |                      | 3.74                 | 27.49                  | 5.99      |                        |                       | 2.26      |                    |

<sup>1</sup> Parts taken to form Richland and part of Wibaux in 1914, part of Prairie in 1915, and Garfield and part of McCone in 1919; part annexed to Wibaux in 1917.

<sup>2</sup> Parts taken to form Powell in 1901; part of Silver Bow annexed in 1913; and part annexed to Silver Bow in 1917.

<sup>3</sup> Organized from part of Custer in 1913; parts taken to form part of Wibaux in 1914, part of Prairie in 1915, and Carter in 1917.

<sup>4</sup> Part annexed to Meagher and part taken to form part of Musselshell in 1911.

<sup>5</sup> Part taken to form Lincoln in 1909; part annexed to Missoula in 1917.

<sup>6</sup> Organized from part of Dawson in 1919.

<sup>7</sup> Organized from part of Teton in 1919.

<sup>8</sup> Organized from part of Chouteau in 1912; parts taken to form part of Toole in 1914 and part of Liberty in 1919.

## COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|   | Jefferson. | Lewis and Clark. | Lincoln. <sup>1</sup> | Madison. <sup>2</sup> | Meagher. <sup>3</sup> | Mineral. <sup>4</sup> | Missoula. <sup>5</sup> | Musselshell. <sup>6</sup> | Park.     | Phillips. <sup>7</sup> |
|---|------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|---------------------------|-----------|------------------------|
| 1 Number of all farms in 1920.....  | 555        | 855              | 341                   | 901                   | 447                   | 95                    | 1,323                  | 1,604                     | 756       | 1,914                  |
| 2 Number of farms irrigated in 1919.....  | 227        | 109              | 81                    | 614                   | 122                   | 28                    | 854                    | 49                        | 402       | 137                    |
| 3 Per cent of all farms.....  | 40.9       | 12.7             | 23.8                  | 68.1                  | 27.3                  | 29.5                  | 64.6                   | 3.1                       | 53.2      | 7.2                    |
| 4 Number of farms irrigated in 1909.....  | 188        | 295              | 54                    | 592                   | 176                   |                       | 333                    |                           | 463       |                        |
| 5 Per cent of increase, 1909-1919.....  | 20.7       | -63.1            |                       |                       |                       |                       |                        |                           | -13.2     |                        |
| <b>LAND AND FARM AREA.</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 6 Approximate land area.....acres..   | 1,044,480  | 2,206,080        | 2,319,360             | 2,318,080             | 1,516,160             | 787,200               | 2,030,720              | 1,857,920                 | 1,703,040 | 3,313,920              |
| 7 All land in farms.....acres..   | 281,494    | 754,135          | 65,050                | 564,616               | 801,801               | 20,209                | 388,408                | 999,389                   | 613,597   | 1,084,725              |
| 8 Improved land in farms.....acres..  | 80,933     | 132,576          | 16,894                | 168,035               | 136,839               | 5,160                 | 173,031                | 382,159                   | 168,679   | 227,811                |
| 9 Area irrigated in 1919.....acres..  | 24,946     | 33,226           | 5,923                 | 115,598               | 25,075                | 967                   | 50,237                 | 4,138                     | 52,854    | 28,047                 |
| 10 Per cent of improved land in farms.....  | 30.8       | 25.1             | 35.1                  | 68.5                  | 18.3                  | 18.7                  | 29.0                   | 1.1                       | 31.3      | 12.3                   |
| 11 Area irrigated in 1909.....acres..   | 23,314     | 38,391           | 2,105                 | 102,179               | 102,090               |                       | 42,689                 |                           | 78,722    |                        |
| 12 Per cent of increase, 1909-1919.....   | 7.0        | -13.5            | 181.4                 |                       |                       |                       |                        |                           | -32.9     |                        |
| 13 Area enterprises were capable of irrigating in 1920.....acres..  | 45,553     | 69,907           | 9,353                 | 172,083               | 48,175                | 2,105                 | 120,456                | 11,059                    | 88,940    | 43,748                 |
| 14 Area enterprises were capable of irrigating in 1910.....acres..  | 26,373     | 55,317           | 3,081                 | 118,115               | 128,209               |                       | 47,917                 |                           | 99,862    |                        |
| 15 Per cent of increase, 1910-1920.....   | 72.7       | 26.4             |                       |                       |                       |                       |                        |                           | -10.9     |                        |
| 16 Area included in enterprises in 1920.....acres..   | 86,086     | 94,133           | 13,737                | 265,103               | 60,348                | 6,690                 | 150,883                | 19,255                    | 125,767   | 85,132                 |
| 17 Area included in enterprises in 1910.....acres..   | 37,494     | 107,789          | 4,281                 | 191,230               | 146,373               |                       | 127,779                |                           | 149,533   |                        |
| 18 Per cent of increase, 1910-1920.....   | 129.6      | -12.7            | 220.9                 |                       |                       |                       |                        |                           | -15.9     |                        |
| 19 Area of irrigated land reported as available for settlement.....acres..                                    | 800        |                  |                       | 3,489                 |                       | 110                   |                        | 610                       |           | 34,555                 |
| <b>IRRIGATION WORKS.</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| <b>Independent enterprises:</b>   |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 20 Number, 1920.....  | 175        | 311              | 64                    | 517                   | 137                   | 57                    | 253                    | 47                        | 314       | 36                     |
| 21 Number, 1910.....  | 149        | 251              | 32                    | 446                   | 200                   |                       | 252                    |                           | 363       |                        |
| <b>Main ditches:</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 22 Number, 1920.....  | 226        | 423              | 56                    | 627                   | 376                   | 55                    | 257                    | 73                        | 382       | 47                     |
| 23 Number, 1910.....  | 159        | 313              | 30                    | 493                   | 481                   |                       | 208                    |                           | 361       |                        |
| 24 Length, 1920.....miles..   | 440        | 635              | 83                    | 1,304                 | 490                   | 36                    | 507                    | 126                       | 756       | 124                    |
| 25 Length, 1910.....miles..   | 259        | 518              | 30                    | 938                   | 792                   |                       | 351                    |                           | 729       |                        |
| 26 Capacity, 1920.....second-feet..   | 9,547      | 2,356            | 577                   | 6,290                 | 1,546                 | 239                   | 2,404                  | 671                       | 3,180     | 852                    |
| 27 Capacity, 1910.....second-feet..   | 1,267      | 2,334            | 187                   | 7,855                 | 4,464                 |                       | 2,316                  |                           | 3,065     |                        |
| <b>Laterals:</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 28 Number, 1920.....  | 123        | 268              | 35                    | 349                   | 577                   | 69                    | 437                    | 227                       | 315       | 176                    |
| 29 Number, 1910.....  | 137        | 273              | 38                    | 752                   | 378                   |                       | 78                     |                           | 635       |                        |
| 30 Length, 1920.....miles..   | 52         | 107              | 22                    | 267                   | 127                   | 7                     | 682                    | 78                        | 122       | 120                    |
| 31 Length, 1910.....miles..   | 67         | 180              | 20                    | 487                   | 170                   |                       | 45                     |                           | 435       |                        |
| <b>Reservoirs:</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 32 Number, 1920.....  | 11         | 31               | 10                    | 37                    | 7                     | 6                     | 8                      | 2                         | 7         | 8                      |
| 33 Number, 1910.....  | 15         | 38               | 3                     | 39                    | 14                    |                       | 12                     |                           | 41        |                        |
| 34 Capacity, 1920.....acre-feet..   | 8,288      | 651,071          | 313                   | 24,879                | 181                   | 129                   | 43,297                 | 120                       | 8,029     | 48,221                 |
| 35 Capacity, 1910.....acre-feet..   | 587        | 1,482            | 1                     | 5,927                 | 3,807                 |                       | 1,732                  |                           | 5,747     |                        |
| <b>Flowing wells:</b>   |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 36 Number, 1920.....  |            | 4                | 2                     |                       |                       |                       |                        |                           |           |                        |
| 37 Number, 1910.....  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 38 Capacity, 1920.....gallons per minute..  |            | 5                | 30                    |                       |                       |                       | 1                      |                           |           |                        |
| 39 Capacity, 1910.....gallons per minute..  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| <b>Pumped wells:</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 40 Number, 1920.....  |            | 7                |                       |                       |                       |                       | 5                      |                           |           |                        |
| 41 Number, 1910.....  |            |                  | 1                     |                       |                       |                       | 2                      |                           | 1         |                        |
| 42 Capacity, 1920.....gallons per minute..  |            | 1,445            |                       |                       |                       |                       |                        |                           |           |                        |
| 43 Capacity, 1910.....gallons per minute..  |            |                  | 30                    |                       |                       |                       |                        |                           | 40        |                        |
| <b>Pumping plants:</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 44 Number, 1920.....  | 1          | 14               | 1                     |                       |                       | 3                     | 5                      | 5                         | 1         | 6                      |
| 45 Number, 1910.....  | 1          |                  | 2                     |                       |                       |                       | 3                      |                           | 1         |                        |
| 46 Engine capacity, 1920.....horsepower..   | 10         | 3,884            |                       |                       |                       | 48                    | 32                     | 86                        | 15        | 154                    |
| 47 Engine capacity, 1910.....horsepower..   | 5          |                  |                       |                       |                       |                       | 45                     |                           | 1         |                        |
| 48 Pump capacity, 1920.....gallons per minute..   | 280        | 77,949           | 4                     |                       |                       | 361                   | 2,141                  | 11,970                    |           | 10,420                 |
| 49 Pump capacity, 1910.....gallons per minute..   | 550        |                  | 90                    |                       |                       |                       | 2,932                  |                           | 64        |                        |
| 50 Average lift, 1920.....feet..  | 33         | 45               | 10                    |                       |                       | 28                    | 22                     | 20                        | 18        | 18                     |
| <b>CAPITAL INVESTED.</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 51 Capital invested to Jan. 1, 1920.....dollars..   | 685,014    | 784,413          | 195,752               | 2,566,017             | 346,257               | 41,481                | 3,975,483              | 155,259                   | 672,677   | 1,417,550              |
| 52 Capital invested to July 1, 1910.....dollars..   | 148,684    | 711,000          | 21,526                | 1,101,329             | 490,092               |                       | 332,442                |                           | 470,173   |                        |
| 53 Per cent of increase, 1910-1920.....   | 360.7      | 10.3             | 809.4                 |                       |                       |                       |                        |                           | 43.1      |                        |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 15.04      | 11.22            | 20.93                 | 14.91                 | 7.19                  | 19.71                 | 33.00                  | 13.32                     | 7.56      | 32.40                  |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 5.64       | 12.85            | 6.99                  | 9.32                  | 3.82                  |                       | 6.94                   |                           | 4.71      |                        |
| <b>ESTIMATED FINAL COST.</b>  |            |                  |                       |                       |                       |                       |                        |                           |           |                        |
| 56 Estimated final cost of existing enterprises in 1920.....dollars..   | 699,764    | 819,113          | 197,902               | 2,587,647             | 363,507               | 47,646                | 5,909,973              | 160,209                   | 691,027   | 1,430,709              |
| 57 Estimated final cost of existing enterprises in 1910.....dollars..   | 148,684    | 896,000          | 21,526                | 1,101,329             | 490,092               |                       | 2,498,292              |                           | 470,173   |                        |
| 58 Per cent of increase, 1910-1920.....   | 370.6      | -8.6             | 819.4                 |                       |                       |                       |                        |                           | 47.0      |                        |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 8.13       | 8.70             | 14.41                 | 9.76                  | 6.02                  | 7.12                  | 37.67                  | 8.32                      | 5.49      | 16.81                  |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 3.97       | 8.31             | 5.03                  | 5.76                  | 3.35                  |                       | 19.55                  |                           | 3.14      |                        |

<sup>1</sup> Organized from part of Flathead in 1909.<sup>2</sup> Part annexed to Beaverhead in 1911.<sup>3</sup> Part of Fergus annexed in 1911; parts taken to form part of Musselshell in 1911 and part of Wheatland in 1917.<sup>4</sup> Organized from part of Missoula in 1914.<sup>5</sup> Parts taken to form Sanders in 1906, and Mineral in 1914; part of Powell annexed in 1915. Parts of Flathead and Powell annexed in 1917.<sup>6</sup> Organized from parts of Fergus, Meagher, and Yellowstone in 1911.<sup>7</sup> Organized from parts of Blaine and Valley in 1915.

# IRRIGATION—MONTANA.

15

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100, or when per cent is more than 1,000.]

|                              |  | Pondera. <sup>1</sup> | Powder River. <sup>2</sup> | Powell. <sup>3</sup> | Prairie. <sup>4</sup> | Ravalli. <sup>5</sup> | Richland. <sup>6</sup> | Roosevelt. <sup>7</sup> | Rosebud. <sup>7</sup> | Sanders. <sup>8</sup> | Sheridan. <sup>9</sup> |
|------------------------------|--|-----------------------|----------------------------|----------------------|-----------------------|-----------------------|------------------------|-------------------------|-----------------------|-----------------------|------------------------|
| 1                            | Number of all farms in 1920.....   | 1,000                 | 833                        | 470                  | 673                   | 1,231                 | 1,577                  | 1,215                   | 1,136                 | 607                   | 2,408                  |
| 2                            | Number of farms irrigated in 1919.....   | 427                   | 11                         | 219                  | 8                     | 1,096                 | 200                    | 7                       | 61                    | 123                   | 16                     |
| 3                            | Per cent of all farms.....   | 40.3                  | 1.3                        | 46.0                 | 1.2                   | 89.0                  | 12.7                   | 0.6                     | 5.4                   | 18.4                  | 0.7                    |
| 4                            | Number of farms irrigated in 1909.....   |                       |                            | 278                  |                       | 975                   |                        |                         | 179                   | 62                    |                        |
| 5                            | Per cent of increase, 1909-1919.....   |                       |                            |                      |                       | 12.4                  |                        |                         |                       |                       |                        |
| <b>LAND AND FARM AREA.</b>   |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 6                            | Approximate land area.....acres..  | 1,061,120             | 2,135,680                  | 1,490,560            | 1,114,880             | 1,530,240             | 1,345,920              | 1,505,920               | 3,195,520             | 1,831,040             | 1,719,040              |
| 7                            | All land in farms.....acres..  | 629,935               | 597,056                    | 520,085              | 548,989               | 245,965               | 812,194                | 673,936                 | 1,608,235             | 175,088               | 1,155,850              |
| 8                            | Improved land in farms.....acres..   | 203,150               | 75,240                     | 125,924              | 126,134               | 114,473               | 311,006                | 302,519                 | 226,113               | 42,425                | 570,955                |
| 9                            | Area irrigated in 1919.....acres..   | 55,754                | 800                        | 64,045               | 480                   | 107,028               | 15,450                 | 1,190                   | 20,814                | 6,373                 | 3,879                  |
| 10                           | Per cent of improved land in farms.....  | 20.9                  | 1.1                        | 59.9                 | 0.4                   | 63.5                  | 5.0                    | 0.4                     | 9.2                   | 15.0                  | 0.7                    |
| 11                           | Area irrigated in 1909.....acres..   |                       |                            | 51,373               |                       | 93,441                |                        |                         | 33,271                | 3,101                 |                        |
| 12                           | Per cent of increase, 1909-1919.....   |                       |                            |                      |                       | 14.5                  |                        |                         |                       | 165.5                 |                        |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 103,411               | 3,785                      | 93,120               | 834                   | 120,401               | 35,835                 | 7,537                   | 29,670                | 13,291                | 10,355                 |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  |                       |                            | 60,643               |                       | 118,984               |                        |                         | 64,452                | 4,101                 |                        |
| 15                           | Per cent of increase, 1910-1920.....   |                       |                            |                      |                       | 6.2                   |                        |                         |                       | 224.1                 |                        |
| 16                           | Area included in enterprises in 1920.....acres..   | 212,743               | 3,785                      | 134,742              | 834                   | 143,892               | 41,385                 | 115,955                 | 36,733                | 26,537                | 16,499                 |
| 17                           | Area included in enterprises in 1910.....acres..   |                       |                            | 81,360               |                       | 202,206               |                        |                         | 92,217                | 9,812                 |                        |
| 18                           | Per cent of increase, 1910-1920.....   |                       |                            |                      |                       | —28.9                 |                        |                         |                       |                       |                        |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | 27,198                |                            | 600                  |                       |                       | 23,535                 |                         | 200                   |                       |                        |
| <b>IRRIGATION WORKS.</b>     |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| Independent enterprises:     |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 20                           | Number, 1920.....  | 30                    | 23                         | 272                  | 10                    | 449                   | 9                      | 8                       | 36                    | 83                    | 28                     |
| 21                           | Number, 1910.....  |                       |                            | 302                  |                       | 350                   |                        |                         | 90                    | 61                    |                        |
| Main ditches:                |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 22                           | Number, 1920.....  | 44                    | 31                         | 526                  | 7                     | 578                   | 13                     | 6                       | 44                    | 73                    | 28                     |
| 23                           | Number, 1910.....  |                       |                            | 308                  |                       | 364                   |                        |                         | 102                   | 62                    |                        |
| 24                           | Length, 1920.....miles..   | 143                   | 17                         | 809                  | 9                     | 702                   | 60                     | 48                      | 110                   | 87                    | 48                     |
| 25                           | Length, 1910.....miles..   |                       |                            | 663                  |                       | 682                   |                        |                         | 234                   | 66                    |                        |
| 26                           | Capacity, 1920.....second-feet..   | 3,184                 | 80                         | 3,233                | 55                    | 3,430                 | 672                    | 287                     | 1,540                 | 1,343                 | 419                    |
| 27                           | Capacity, 1910.....second-feet..   |                       |                            | 2,563                |                       | 4,235                 |                        |                         | 1,921                 | 184                   |                        |
| Laterals:                    |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 28                           | Number, 1920.....  | 232                   | 17                         | 200                  | 3                     | 428                   | 57                     | 63                      | 95                    | 91                    | 21                     |
| 29                           | Number, 1910.....  |                       |                            | 290                  |                       | 205                   |                        |                         | 89                    | 79                    |                        |
| 30                           | Length, 1920.....miles..   | 499                   | 3                          | 62                   |                       | 130                   | 78                     | 63                      | 28                    | 71                    | 12                     |
| 31                           | Length, 1910.....miles..   |                       |                            | 137                  |                       | 204                   |                        |                         | 71                    | 24                    |                        |
| Reservoirs:                  |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 32                           | Number, 1920.....  | 6                     | 8                          | 8                    | 3                     | 10                    | 4                      | 0                       | 1                     | 1                     | 5                      |
| 33                           | Number, 1910.....  |                       |                            | 40                   |                       | 46                    |                        |                         | 17                    |                       |                        |
| 34                           | Capacity, 1920.....acre-feet..   | 62,800                | 50                         | 276                  | 8                     | 7,634                 | 395                    | 50,005                  | 40                    | 3,778                 | 408                    |
| 35                           | Capacity, 1910.....acre-feet..   |                       |                            | 5,502                |                       | 57,450                |                        |                         | 778                   |                       |                        |
| Flowing wells:               |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 36                           | Number, 1920.....  | 3                     | 12                         |                      | 5                     |                       |                        |                         |                       | 1                     |                        |
| 37                           | Number, 1910.....  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 38                           | Capacity, 1920.....gallons per minute..  | 1,000                 | 83                         |                      | 104                   |                       |                        |                         |                       |                       |                        |
| 39                           | Capacity, 1910.....gallons per minute..  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| Pumped wells:                |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 40                           | Number, 1920.....  |                       | 1                          |                      |                       |                       |                        |                         | 1                     | 2                     |                        |
| 41                           | Number, 1910.....  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 42                           | Capacity, 1920.....gallons per minute..  |                       | 10                         |                      |                       |                       |                        |                         | 176                   | 177                   |                        |
| 43                           | Capacity, 1910.....gallons per minute..  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| Pumping plants:              |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 44                           | Number, 1920.....  |                       | 4                          | 1                    | 3                     |                       | 3                      | 1                       | 10                    | 1                     | 14                     |
| 45                           | Number, 1910.....  |                       |                            |                      |                       |                       |                        |                         | 18                    | 3                     |                        |
| 46                           | Engine capacity, 1920.....horsepower..   |                       | 56                         | 16                   | 462                   |                       | 125                    | 50                      | 269                   | 7                     | 183                    |
| 47                           | Engine capacity, 1910.....horsepower..   |                       |                            |                      |                       |                       |                        |                         | 568                   | 6                     |                        |
| 48                           | Pump capacity, 1920.....gallons per minute..   |                       | 4,750                      | 650                  | 19,015                |                       | 9,750                  | 4,500                   | 13,100                |                       | 11,700                 |
| 49                           | Pump capacity, 1910.....gallons per minute..   |                       |                            |                      |                       |                       |                        |                         | 38,507                | 197                   |                        |
| 50                           | Average lift, 1920.....feet..  |                       | 12                         | 12                   | 24                    |                       | 20                     | 22                      | 16                    | 10                    | 12                     |
| <b>CAPITAL INVESTED.</b>     |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 4,919,860             | 20,435                     | 877,108              | 60,866                | 994,246               | 2,442,876              | 713,197                 | 1,024,981             | 595,212               | 91,808                 |
| 52                           | Capital invested to July 1, 1910.....dollars..   |                       |                            | 306,173              |                       | 960,144               |                        |                         | 1,007,778             | 27,869                |                        |
| 53                           | Per cent of increase, 1910-1920.....   |                       |                            |                      |                       | 3.0                   |                        |                         |                       |                       |                        |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 47.58                 | 5.40                       | 9.42                 | 80.18                 | 7.87                  | 68.16                  | 94.63                   | 34.55                 | 44.78                 | 8.87                   |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. |                       |                            | 5.05                 |                       | 8.07                  |                        |                         | 15.64                 | 6.80                  |                        |
| <b>ESTIMATED FINAL COST.</b> |  |                       |                            |                      |                       |                       |                        |                         |                       |                       |                        |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 5,264,860             | 37,835                     | 929,033              | 60,866                | 998,697               | 2,664,392              | 4,327,335               | 1,040,341             | 854,850               | 227,102                |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   |                       |                            | 306,173              |                       | 1,185,094             |                        |                         | 1,286,565             | 27,869                |                        |
| 58                           | Per cent of increase, 1910-1920.....   |                       |                            |                      |                       | —15.7                 |                        |                         |                       |                       |                        |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 24.75                 | 10.00                      | 6.90                 | 80.18                 | 6.94                  | 64.38                  | 37.32                   | 28.32                 | 32.21                 | 13.76                  |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. |                       |                            | 3.70                 |                       | 5.86                  |                        |                         | 13.95                 | 2.84                  |                        |

<sup>1</sup> Organized from parts of Chouteau and Teton in 1919.

<sup>2</sup> Organized from part of Custer in 1919.

<sup>3</sup> Organized from part of Deer Lodge in 1901; part annexed to Missoula in 1917.

<sup>4</sup> Organized from parts of Custer, Dawson, and Fallon in 1915.

<sup>5</sup> Organized from parts of Custer in 1914; parts taken to form part of Wibaux in 1914 and part of McCone in 1919.

<sup>6</sup> Organized from part of Sheridan in 1919.

<sup>7</sup> Organized from part of Custer County, including Northern Cheyenne Indian Reservation and part of Crow Indian Reservation in 1901; parts taken to form part of Big Horn in 1913 and Treasure in 1919.

<sup>8</sup> Organized from part of Missoula in 1906.

<sup>9</sup> Organized from part of Valley in 1913; part taken to form Roosevelt in 1919.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

|                              |  | Silver<br>Bow. <sup>1</sup> | Still-<br>water. <sup>2</sup> | Sweet<br>Grass. <sup>3</sup> | Teton. <sup>4</sup> | Toole. <sup>5</sup> | Treasure. <sup>6</sup> | Valley. <sup>7</sup> | Wheat-<br>land. <sup>8</sup> | Wibaux. <sup>9</sup> | Yellow-<br>stone. <sup>10</sup> |
|------------------------------|--|-----------------------------|-------------------------------|------------------------------|---------------------|---------------------|------------------------|----------------------|------------------------------|----------------------|---------------------------------|
| 1                            | Number of all farms in 1920.....   | 331                         | 1,370                         | 863                          | 1,135               | 933                 | 330                    | 2,169                | 688                          | 530                  | 2,211                           |
| 2                            | Number of farms irrigated in 1919.....   | 107                         | 291                           | 261                          | 178                 | 3                   | 98                     | 43                   | 54                           | 1                    | 1,095                           |
| 3                            | Per cent of all farms.....   | 32.3                        | 21.2                          | 30.2                         | 15.7                | 0.3                 | 29.7                   | 2.0                  | 7.8                          | 0.2                  | 49.5                            |
| 4                            | Number of farms irrigated in 1909.....   | 84                          |                               | 332                          | 179                 |                     |                        | 179                  |                              |                      | 800                             |
| 5                            | Per cent of increase, 1909-1919.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| <b>LAND AND FARM AREA.</b>   |  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 6                            | Approximate land area..... acres..   | 464,640                     | 1,137,280                     | 1,260,160                    | 1,308,160           | 1,253,120           | 614,400                | 3,486,080            | 903,040                      | 565,120              | 1,671,040                       |
| 7                            | All land in farms..... acres..   | 100,170                     | 660,996                       | 645,120                      | 613,506             | 570,163             | 237,133                | 1,126,872            | 589,827                      | 336,167              | 1,067,425                       |
| 8                            | Improved land in farms..... acres..  | 28,238                      | 278,040                       | 138,530                      | 234,833             | 153,852             | 44,933                 | 344,335              | 205,076                      | 140,299              | 333,174                         |
| 9                            | Area irrigated in 1919..... acres..  | 11,519                      | 33,039                        | 47,306                       | 55,433              | 839                 | 7,788                  | 20,800               | 14,478                       |                      | 101,378                         |
| 10                           | Per cent of improved land in farms.....  | 40.8                        | 11.9                          | 34.1                         | 23.6                | 0.5                 | 17.3                   | 6.0                  | 7.1                          |                      | 30.4                            |
| 11                           | Area irrigated in 1909..... acres..  | 7,385                       |                               | 58,963                       | 99,711              |                     |                        | 52,320               |                              |                      | 97,420                          |
| 12                           | Per cent of increase, 1909-1919.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 13                           | Area enterprises were capable of irrigating in 1920..... acres..   | 15,521                      | 44,926                        | 79,069                       | 119,323             | 976                 | 21,017                 | 36,336               | 36,946                       | 100                  | 123,506                         |
| 14                           | Area enterprises were capable of irrigating in 1910..... acres..   | 8,646                       |                               | 82,978                       | 140,444             |                     |                        | 64,261               |                              |                      | 182,888                         |
| 15                           | Per cent of increase, 1910-1920.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 16                           | Area included in enterprises in 1920..... acres..  | 20,386                      | 49,432                        | 146,265                      | 222,521             | 1,291               | 21,462                 | 93,308               | 48,091                       | 100                  | 135,190                         |
| 17                           | Area included in enterprises in 1910..... acres..  | 10,059                      |                               | 142,178                      | 362,186             |                     |                        | 203,256              |                              |                      | 220,206                         |
| 18                           | Per cent of increase, 1910-1920.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 19                           | Area of irrigated land reported as available for set-<br>tlement..... acres..                                  |                             |                               | 10,000                       | 27,000              |                     |                        | 18,848               |                              |                      | 3,317                           |
| <b>IRRIGATION WORKS.</b>     |  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 20                           | Independent enterprises:   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 21                           | Number, 1920.....  | 144                         | 128                           | 164                          | 62                  | 10                  | 15                     | 30                   | 61                           | 1                    | 48                              |
| 22                           | Number, 1910.....  | 79                          |                               | 232                          | 118                 |                     |                        | 126                  |                              |                      | 71                              |
| 23                           | Main ditches:  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 24                           | Number, 1920.....  | 211                         | 134                           | 283                          | 78                  | 8                   | 9                      | 32                   | 115                          | 1                    | 54                              |
| 25                           | Number, 1910.....  | 97                          |                               | 249                          | 135                 |                     |                        | 123                  |                              |                      | 102                             |
| 26                           | Length, 1920..... miles..  | 220                         | 300                           | 547                          | 328                 | 11                  | 30                     | 96                   | 283                          | 2                    | 417                             |
| 27                           | Length, 1910..... miles..  | 109                         |                               | 644                          | 468                 |                     |                        | 203                  |                              |                      | 516                             |
| 28                           | Capacity, 1920..... second-feet..  | 720                         | 1,600                         | 3,173                        | 2,239               | 46                  | 397                    | 4,324                | 1,179                        |                      | 2,545                           |
| 29                           | Capacity, 1910..... second-feet..  | 436                         |                               | 3,795                        | 3,633               |                     |                        | 5,081                |                              |                      | 4,671                           |
| 30                           | Laterals:  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 31                           | Number, 1920.....  | 26                          | 65                            | 148                          | 93                  | 14                  | 74                     | 116                  | 362                          |                      | 86                              |
| 32                           | Number, 1910.....  | 73                          |                               | 766                          | 406                 |                     |                        | 83                   |                              |                      | 205                             |
| 33                           | Length, 1920..... miles..  | 36                          | 64                            | 159                          | 199                 | 6                   | 44                     | 79                   | 108                          |                      | 341                             |
| 34                           | Length, 1910..... miles..  | 37                          |                               | 384                          | 848                 |                     |                        | 53                   |                              |                      | 333                             |
| 35                           | Reservoir:   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 36                           | Number, 1920.....  | 6                           | 3                             | 9                            | 6                   | 7                   |                        | 13                   | 5                            | 1                    | 3                               |
| 37                           | Number, 1910.....  | 19                          |                               | 12                           | 25                  |                     |                        | 63                   |                              |                      | 17                              |
| 38                           | Capacity, 1920..... acre-feet..  | 12                          | 2                             | 18,153                       | 85,718              | 60                  |                        | 1,540                | 2,893                        | 58                   | 2,599                           |
| 39                           | Capacity, 1910..... acre-feet..  | 102                         |                               | 17,767                       | 174,261             |                     |                        | 40,823               |                              |                      | 174                             |
| 40                           | Flowing wells:   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 41                           | Number, 1920.....  | 1                           |                               |                              | 9                   |                     |                        |                      |                              |                      |                                 |
| 42                           | Number, 1910.....  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 43                           | Capacity, 1920..... gallons per minute..   | 2                           |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 44                           | Capacity, 1910..... gallons per minute..   |                             |                               |                              | 20,000              |                     |                        |                      |                              |                      |                                 |
| 45                           | Pumped wells:  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 46                           | Number, 1920.....  | 1                           |                               |                              |                     | 2                   |                        |                      |                              |                      |                                 |
| 47                           | Number, 1910.....  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 48                           | Capacity, 1920..... gallons per minute..   | 80                          |                               |                              |                     | 5,000               |                        |                      |                              |                      |                                 |
| 49                           | Capacity, 1910..... gallons per minute..   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 50                           | Pumping plants:  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 51                           | Number, 1920.....  | 2                           | 1                             |                              |                     | 5                   | 14                     | 7                    | 1                            |                      | 11                              |
| 52                           | Number, 1910.....  | 1                           |                               | 1                            |                     |                     |                        | 24                   |                              |                      | 6                               |
| 53                           | Engine capacity, 1920..... horsepower..  | 10                          | 45                            |                              |                     | 258                 | 434                    | 137                  | 20                           |                      | 767                             |
| 54                           | Engine capacity, 1910..... horsepower..  | 6                           |                               | 10                           |                     |                     |                        | 514                  |                              |                      | 342                             |
| 55                           | Pump capacity, 1920..... gallons per minute..  | 130                         |                               |                              |                     | 12,100              | 71,870                 | 9,020                | 1,000                        |                      | 5,102                           |
| 56                           | Pump capacity, 1910..... gallons per minute..  | 200                         |                               | 1,350                        |                     |                     |                        | 52,320               |                              |                      | 30,898                          |
| 57                           | Average lift, 1920..... feet..   | 58                          | 63                            |                              |                     | 16                  | 18                     | 14                   | 30                           |                      | 26                              |
| <b>CAPITAL INVESTED.</b>     |  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 58                           | Capital invested to Jan. 1, 1920..... dollars..  | 292,302                     | 402,941                       | 1,032,451                    | 2,698,814           | 26,231              | 453,790                | 1,006,823            | 234,750                      | 3,000                | 3,303,850                       |
| 59                           | Capital invested to July 1, 1910..... dollars..  | 80,435                      |                               | 834,057                      | 1,221,220           |                     |                        | 508,449              |                              |                      | 3,064,560                       |
| 60                           | Per cent of increase, 1910-1920.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 61                           | Average cost per acre based on area enterprises were<br>capable of supplying with water in 1920..... dollars.. | 18.83                       | 8.97                          | 13.06                        | 22.62               | 26.88               | 23.02                  | 27.71                | 6.35                         | 30.00                | 26.75                           |
| 62                           | Average cost per acre based on area enterprises were<br>capable of supplying with water in 1910..... dollars.. | 9.30                        |                               | 10.05                        | 8.70                |                     |                        | 7.91                 |                              |                      | 16.92                           |
| <b>ESTIMATED FINAL COST.</b> |  |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 63                           | Estimated final cost of existing enterprises in<br>1920..... dollars..   | 296,827                     | 407,541                       | 1,032,951                    | 4,731,005           | 26,731              | 485,340                | 2,097,253            | 246,350                      | 3,000                | 3,491,298                       |
| 64                           | Estimated final cost of existing enterprises in<br>1910..... dollars..   | 80,435                      |                               | 834,057                      | 2,984,220           |                     |                        | 2,621,041            |                              |                      | 3,178,630                       |
| 65                           | Per cent of increase, 1910-1920.....   |                             |                               |                              |                     |                     |                        |                      |                              |                      |                                 |
| 66                           | Average cost per acre based on estimated final cost<br>and area included in enterprises in 1920..... dollars.. | 14.56                       | 8.24                          | 7.06                         | 21.26               | 20.71               | 22.61                  | 22.48                | 5.12                         | 30.00                | 25.83                           |
| 67                           | Average cost per acre based on estimated final cost<br>and area included in enterprises in 1910..... dollars.. | 8.00                        |                               | 5.87                         | 8.24                |                     |                        | 12.90                |                              |                      | 14.43                           |

<sup>1</sup> Part annexed to Deer Lodge in 1903; part of Deer Lodge annexed in 1917.<sup>2</sup> Organized from parts of Carbon, Sweet Grass, and Yellowstone in 1913. Part annexed to Sweet Grass in 1915.<sup>3</sup> Parts taken to form part of Stillwater in 1913 and part of Wheatland in 1917. Part of Stillwater annexed in 1915.<sup>4</sup> Part taken to form part of Toole in 1914; parts taken to form Glacier and part of Pondera in 1919.<sup>5</sup> Organized from parts of Hill and Teton in 1914.<sup>6</sup> Organized from part of Rosebud in 1919.<sup>7</sup> Parts taken to form Sheridan in 1913 and part of Phillips in 1915.<sup>8</sup> Organized from parts of Meagher and Sweet Grass in 1917.<sup>9</sup> Organized from parts of Dawson, Fallon, and Richland in 1914; part of Dawson annexed in 1917.<sup>10</sup> Parts taken to form part of Musselshell in 1911 and parts of Big Horn and Stillwater in 1913; part annexed to Carbon and part of Carbon annexed in 1919.

## FOURTEENTH CENSUS OF THE UNITED STATES: 1920

DEPARTMENT  
OF COMMERCE

## BULLETIN

BUREAU OF  
THE CENSUS

## IRRIGATION : NEBRASKA

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 6     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 7     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 7     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 8     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 9     |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910..... | 10    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 5     |  |       |
| Acreage, by drainage basin.....                        | 6     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Nebraska collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of

showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

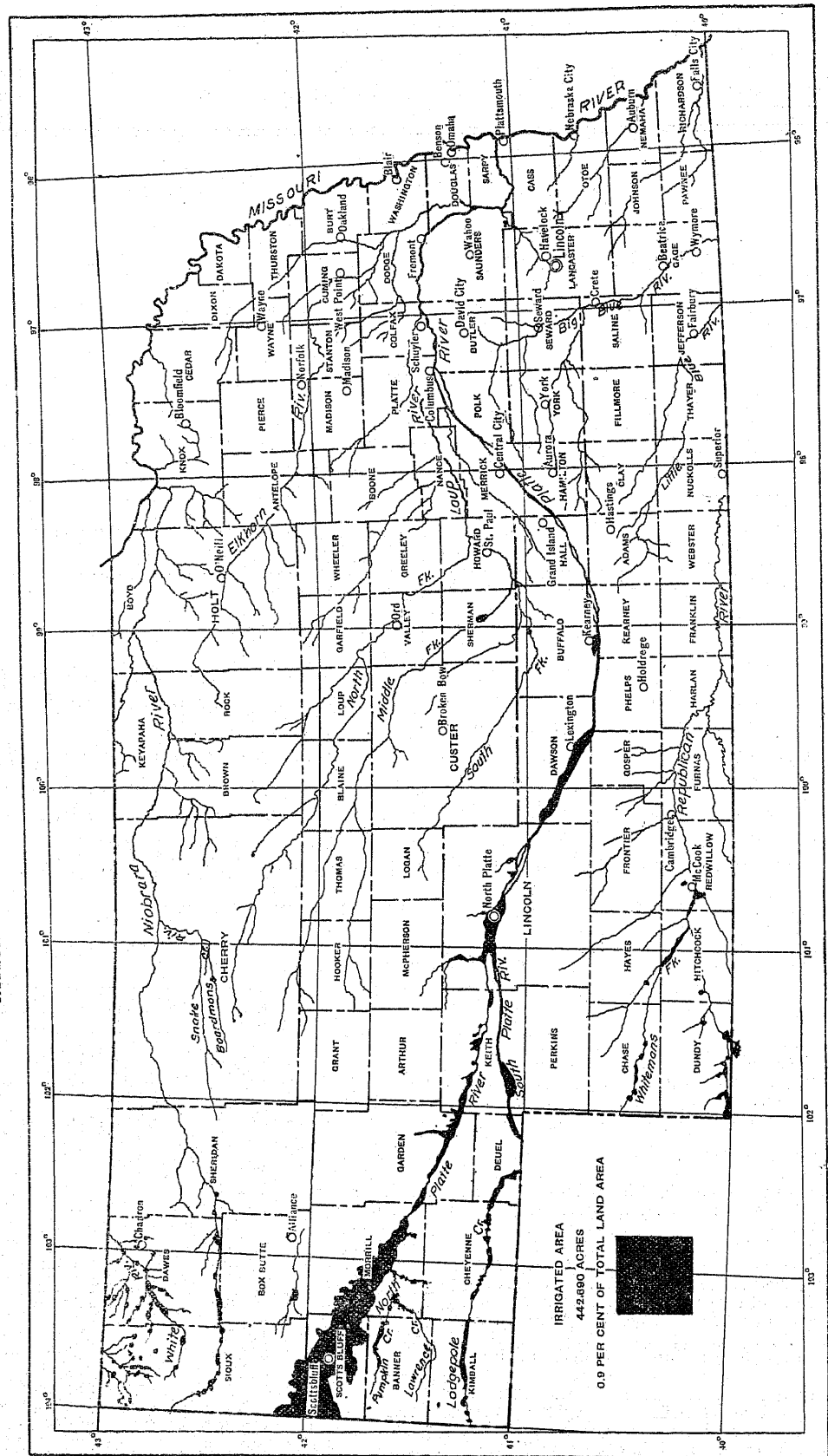
TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—   |             | INCREASE. <sup>1</sup> |           |
|--|--------------|-------------|------------------------|-----------|
|  | 1920         | 1910        | Amount.                | Per cent. |
| Number of all farms.....   | 124,417      | 129,678     | -5,261                 | -4.1      |
| Approximate land area of the state..... acres..  | 49,157,120   | 49,157,120  |                        |           |
| All land in farms..... acres..   | 42,225,475   | 38,622,021  | 3,603,454              | 9.3       |
| Improved land in farms..... acres..  | 23,109,624   | 24,382,577  | -1,272,953             | -5.2      |
| Number of farms irrigated.....   | 3,021        | 1,852       | 1,169                  | 63.1      |
| Area irrigated..... acres..  | 442,690      | 255,950     | 186,740                | 73.0      |
| Area enterprises were capable of irrigating..... acres..                               | 562,468      | 429,225     | 133,243                | 31.0      |
| Area included in enterprises..... acres..  | 766,768      | 680,133     | 86,635                 | 12.7      |
| Per cent irrigated:  |              |             |                        |           |
| Number of all farms.....   | 2.4          | 1.4         | 1.0                    |           |
| Approximate land area of state.....  | 0.9          | 0.5         | 0.4                    |           |
| Land in farms.....   | 1.0          | 0.7         | 0.3                    |           |
| Improved land in farms.....  | 1.9          | 1.0         | 0.9                    |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 119,778      | 173,275     | -53,497                | -30.9     |
| Excess of area included in enterprises over area irrigated..... acres..                | 324,078      | 424,183     | -100,105               | -23.6     |
| Capital invested.....  | \$13,909,185 | \$7,798,310 | \$6,110,875            | 78.4      |
| Average per acre enterprises were capable of irrigating.....                           | \$24.73      | \$18.17     | \$6.56                 | 36.1      |
| Estimated final cost of existing enterprises.....                                      | \$18,030,154 | \$9,485,231 | \$8,544,923            | 90.1      |
| Average per acre included in enterprises.....  | \$23.51      | \$13.95     | \$9.56                 | 68.5      |
| Average cost of operation and maintenance per acre.....                                | \$1.48       | \$1.09      | \$0.39                 | 35.8      |

<sup>1</sup> A minus sign (—) denotes decrease.

(2)

IRRIGATED AREA  
442,890 ACRES  
0.9 PER CENT OF TOTAL LAND AREA



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.



**CLIMATIC CONDITIONS.**

Nebraska lies in the semiarid region. The eastern part of the state receives sufficient rainfall for the growth of crops in most seasons; while the extreme western part receives so little rainfall that irrigation is generally practiced where water is available, although crops are grown without irrigation.

The normal annual precipitation is about 30 inches at the eastern line of the state, and decreases very regularly to the westward to about 15 inches at the Nebraska-Wyoming line. About three-fourths of the annual precipitation occurs within the growing season, the spring and early summer rains being general while the late summer precipitation occurs in local and irregular showers.

In the western part of the state in summer the relative humidity is low, and temperatures and wind velocities are high, and these conditions result in heavy demands for moisture to maintain plant growth.

The line of 20-inch normal annual precipitation follows approximately the one-hundredth meridian of longitude, and this marks approximately the eastern extension of the general practice of irrigation.

For the state as a whole the precipitation in 1919 was slightly above the normal but the excess occurred in the winter, and in the western part of the state there was a marked deficiency in May and August, with no excess in June and July.

**WATER SUPPLY FOR IRRIGATION.**

Western Nebraska consists of high, rolling prairies cut by the valleys of the North Platte, the South Platte, the Niobrara, and the Republican Rivers. The streams named, and their tributaries, and the main Platte River, below the junction of the north and south branches, supply water to almost all of the land irrigated.

The North Platte and its tributaries supplied water to nearly 85 per cent of the land irrigated in 1919. This river rises in the mountains of northern Colorado, flows through Wyoming and then into Nebraska, and is used for irrigation in all three states. The flow of the river in eastern Wyoming and in Nebraska is regulated by the Pathfinder Reservoir of the United States Reclamation Service and stored water is furnished to lands along the North Platte as well as to those along the North Platte. The supply is usually ample for the lands under existing canals, and a large extension of the North Platte project of the United States Reclamation Service, covering land in both Wyoming and Nebraska, is under construction. Stored water from Pathfinder Reservoir also serves a large area under numerous private canals, mainly

in Nebraska. Before the construction of the Pathfinder Reservoir the North Platte in Nebraska carried very heavy flood discharges in the spring and very little water in the late summer.

The South Platte also rises in the mountains in Colorado, and is used extensively for irrigation in that state, the area irrigated from the stream and its tributaries in Colorado in 1919 being more than 1,000,000 acres. The South Platte is a typical plains stream, having its source in the mountains, being subject to heavy floods in the early summer with the melting of the snows, and having a greatly reduced flow in the late summer, and the summer flow is largely lost in its sandy bed and by evaporation. This natural condition has been much changed by the storage of flood waters and the use of water in Colorado. The storage of flood waters has greatly reduced the flood flow in Nebraska, while return seepage from the irrigated lands in Colorado has tended to increase the regular flow of the stream in both summer and winter. No storage has been provided on this stream in Nebraska, although there is a large quantity of water available for storage.

The Platte River is formed by the uniting of the north and south forks, and is of the same character as its branches—it has a large flood flow in spring and early summer, and is very low in late summer, sometimes having no visible flow. The regulation of the North Platte and return seepage to that stream are increasing the summer flow, and stored water from the Pathfinder Reservoir is available for canals taking water from the main stream.

The Niobrara, which rises in Wyoming and flows along the northern border of Nebraska, is a plains stream but a considerable part of its drainage area is composed of sand hills which absorb the rains and snows. As a consequence the water drains into the stream gradually, and it has a remarkably uniform flow, giving rise to its original name, "The river which flows."

The Republican River rises on the plains in Colorado, enters Nebraska near the southwest corner of the state, flows eastward near the southern line of the state for about 275 miles, and crosses the line into Kansas. During the spring the river is subject to heavy floods and it is very low in summer. It is used to some extent for irrigation in both Colorado and Nebraska, although in both states crops are grown in its drainage basin without irrigation. Very little provision for storing flood water has been made.

In the stream valleys water for irrigation can be obtained from wells with low lifts but on the high plains the ground water is at such great depths that the cost of pumping is prohibitive.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |   |                                 | AREA IRRIGATED. |                                  |   |  |   |
|--------------|------------------|---|---------------------------------|-----------------|----------------------------------|---|--|---|
|              | Num-<br>ber.     | Per<br>cent<br>of in-<br>crease. <sup>1</sup> | Per<br>cent<br>of all<br>farms. | Acres.          | Per<br>cent<br>of in-<br>crease. | Per<br>cent<br>of<br>total<br>land<br>area. | Per<br>cent<br>of land<br>in<br>farms. | Per<br>cent<br>of im-<br>proved<br>land<br>in<br>farms. |
| 1920.....    | 3,021            | 63.1  | 2.4                             | 442,690         | 73.0                             | 0.9   | 1.0                                    | 1.9   |
| 1910.....    | 1,852            | —4.1  | 1.4                             | 255,950         | 72.3                             | 0.5   | 0.7                                    | 1.0   |
| 1900.....    | 1,932            | 802.8   | 1.6                             | 148,538         | .....                            | 0.3   | 0.5                                    | 0.8   |
| 1890.....    | 214              | .....   | 0.2                             | 11,744          | .....                            | .....                                       | 0.1                                    | 0.1   |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF  
ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-<br>ber of<br>enter-<br>prises. | Area<br>included<br>in enter-<br>prises,<br>1920<br>(acres). | AREA IRRIGATED<br>IN 1919. |   | Area<br>enter-<br>prises<br>were<br>capable<br>of<br>irrigating<br>in<br>1920<br>(acres). |
|--------------------|-------------------------------------|--|----------------------------|---|---|
|                    |                                     |  | Acres.                     | Per<br>cent of<br>acreage<br>in enter-<br>prises. |   |
| Total.....         | 470                                 | 766,768  | 442,690                    | 57.7  | 562,468   |
| Before 1890.....   | 1                                   | 30   | 30                         | 100.0   | 30  |
| 1870-1879.....     | 4                                   | 1,515  | 1,090                      | 71.9  | 1,115   |
| 1880-1889.....     | 61                                  | 117,177  | 104,100                    | 88.8  | 105,817   |
| 1890-1899.....     | 191                                 | 375,191  | 191,229                    | 51.0  | 258,341   |
| 1900-1904.....     | 58                                  | 33,808   | 21,580                     | 63.8  | 40,979  |
| 1905-1909.....     | 26                                  | 192,888  | 98,704                     | 51.2  | 124,540   |
| 1910-1914.....     | 62                                  | 27,184   | 19,788                     | 72.8  | 23,241  |
| 1915-1919.....     | 36                                  | 6,103  | 2,746                      | 45.0  | 3,784   |
| Not reported.....  | 31                                  | 12,872   | 3,423                      | 26.6  | 4,621   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                       | AREA IRRIGATED (ACRES), |                  |           |                        | Area enter-<br>prises<br>were<br>capable<br>of irri-<br>gating in<br>1920<br>(acres). | Area in-<br>cluded<br>in<br>enter-<br>prises,<br>1920<br>(acres). |
|--|-------------------------|------------------|-----------|------------------------|---|---|
|  | 1919                    | 1909             | Increase. |                        |   |   |
|  |                         |                  | Amount.   | Per cent. <sup>1</sup> |   |   |
| Total.....                                   | 442,690                 | 255,950          | 186,740   | 73.0                   | 562,468   | 766,768   |
| Stream, gravity.....                         | 435,567                 | 254,105          | 181,462   | 71.4                   | 550,491   | 750,931   |
| Stream, pumped.....                          | 1,115                   | 18               | 1,097     |                        | 2,468   | 2,755   |
| Stream, pumped and grav-<br>ity.....         | 850                     | ( <sup>2</sup> ) | 850       |                        | 1,140   | 1,140   |
| Wells, pumped.....                           | 546                     | 139              | 407       | 292.8                  | 1,148   | 1,228   |
| Lake, gravity.....                           |                         |                  |           |                        | 30  | 30  |
| Springs.....                                 | 2,050                   | 688              | 1,364     | 198.8                  | 3,141   | 4,546   |
| Stored storm water.....                      | 1,200                   | 1,002            | 198       | 19.8                   | 1,870   | 1,900   |
| City water.....                              | 7                       | ( <sup>2</sup> ) | 7         |                        | 7   | 7   |
| Seepage.....                                 | 120                     | ( <sup>2</sup> ) | 120       |                        | 120   | 120   |
| Stream, gravity, and<br>pumped wells.....    | 115                     | ( <sup>2</sup> ) | 115       |                        | 230   | 320   |
| Stream, gravity, and flow-<br>ing wells..... |                         | ( <sup>2</sup> ) |           |                        | 160   | 160   |
| Other mixed.....                             | 1,120                   | ( <sup>2</sup> ) | 1,120     |                        | 1,663   | 3,631   |

<sup>1</sup> Per cent not shown when base is less than 100.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

The provisions of law relating to internal improvements were extended to irrigation canals by a law of 1877. This empowered canal companies to issue bonds and to condemn rights of way for canals.

Nebraska enacted an irrigation district law in 1895. This law has been amended from time to time, and is

still in force. Very few districts have been organized to develop new enterprises, but many have been organized to take over works already built, many cooperative enterprises having been organized into districts. The land watered by such enterprises is reported under districts in Table 5.

Nebraska has not accepted the conditions of the Federal Carey Act (act of Aug. 18, 1894).

In addition to the area credited to the United States Reclamation Service in Table 5, that service supplies water to a large but varying area under the Warren Act and special contracts providing for supplying water to lands that receive their principal supply from other sources.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                    | CENSUS OF—           |                  | INCREASE. <sup>1</sup> |              |
|--|----------------------|------------------|------------------------|--------------|
|  | 1920                 | 1910             | Acres.                 | Per<br>cent. |
| ACREAGE IRRIGATED.                                 |                      |                  |                        |              |
| Total.....   | 442,690              | 255,950          | 186,740                | 73.0         |
| Individual and partnership.....                    | 68,140               | 45,227           | 22,913                 | 50.7         |
| Cooperative.....                                   | 55,408               | 78,605           | —23,197                | —29.5        |
| Irrigation district.....                           | 206,206              | 76,448           | 129,758                | 169.7        |
| Commercial.....                                    | 25,335               | 24,834           | 501                    | 2.0          |
| U. S. Reclamation Service.....                     | <sup>2</sup> 87,558  | 80,536           | 57,022                 | 186.7        |
| U. S. Indian Service.....                          | .....                | 300              | —300                   | .....        |
| Other.....   | 43                   | ( <sup>3</sup> ) | 43                     | .....        |
| ACREAGE ENTERPRISES WERE CAPABLE OF<br>IRRIGATING. |                      |                  |                        |              |
| Total.....   | 562,468              | 420,225          | 133,243                | 31.0         |
| Individual and partnership.....                    | 96,465               | 64,472           | 31,993                 | 49.6         |
| Cooperative.....                                   | 102,242              | 168,260          | —66,018                | —39.2        |
| Irrigation district.....                           | 220,859              | 77,228           | 143,631                | 186.0        |
| Commercial.....                                    | 27,332               | 52,724           | —25,392                | —48.2        |
| U. S. Reclamation Service.....                     | <sup>2</sup> 115,487 | 66,241           | 49,246                 | 74.3         |
| U. S. Indian Service.....                          | .....                | 300              | —300                   | .....        |
| Other.....   | 83                   | ( <sup>3</sup> ) | 83                     | .....        |
| ACREAGE INCLUDED IN ENTERPRISES.                   |                      |                  |                        |              |
| Total.....   | 766,768              | 680,133          | 86,635                 | 12.7         |
| Individual and partnership.....                    | 124,098              | 86,305           | 37,793                 | 43.8         |
| Cooperative.....                                   | 145,444              | 240,009          | —94,565                | —39.4        |
| Irrigation district.....                           | 244,383              | 91,076           | 153,307                | 168.3        |
| Commercial.....                                    | 76,925               | 154,623          | —77,698                | —50.2        |
| U. S. Reclamation Service.....                     | <sup>2</sup> 175,820 | 107,520          | 68,300                 | 63.5         |
| U. S. Indian Service.....                          | .....                | 600              | —600                   | .....        |
| Other.....   | 98                   | ( <sup>3</sup> ) | 98                     | .....        |

<sup>1</sup> A minus sign (—) denotes decrease.<sup>2</sup> Does not include land supplied with stored water under the Warren Act.<sup>3</sup> Not included in 1910 classification.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Nebraska relating to water rights are summarized in the following paragraphs:

Upon its organization the territory of Nebraska adopted the common law of England, so far as it was applicable and not inconsistent with the Constitution of the United States, with the organic law of the territory, or with any law passed by the legislature. The supreme court of the state held that this included the common law rule as to riparian rights, and that this rule held until abrogated by statute.

In 1889 a law was enacted providing that rights to the use of water for beneficial or useful purpose might be acquired by appropriation, and the court has held that this law abrogated the common law of riparian rights (*Crawford Company v. Hathaway*, 93 N. W., 791). This law provided for the posting and filing of notices of intended diversions, but did not require the filing of claims for rights previously acquired.

**CLIMATIC CONDITIONS.**

Nebraska lies in the semiarid region. The eastern part of the state receives sufficient rainfall for the growth of crops in most seasons; while the extreme western part receives so little rainfall that irrigation is generally practiced where water is available, although crops are grown without irrigation.

The normal annual precipitation is about 30 inches at the eastern line of the state, and decreases very regularly to the westward to about 15 inches at the Nebraska-Wyoming line. About three-fourths of the annual precipitation occurs within the growing season, the spring and early summer rains being general while the late summer precipitation occurs in local and irregular showers.

In the western part of the state in summer the relative humidity is low, and temperatures and wind velocities are high, and these conditions result in heavy demands for moisture to maintain plant growth.

The line of 20-inch normal annual precipitation follows approximately the one-hundredth meridian of longitude, and this marks approximately the eastern extension of the general practice of irrigation.

For the state as a whole the precipitation in 1919 was slightly above the normal but the excess occurred in the winter, and in the western part of the state there was a marked deficiency in May and August, with no excess in June and July.

**WATER SUPPLY FOR IRRIGATION.**

Western Nebraska consists of high, rolling prairies cut by the valleys of the North Platte, the South Platte, the Niobrara, and the Republican Rivers. The streams named, and their tributaries, and the main Platte River, below the junction of the north and south branches, supply water to almost all of the land irrigated.

The North Platte and its tributaries supplied water to nearly 85 per cent of the land irrigated in 1919. This river rises in the mountains of northern Colorado, flows through Wyoming and then into Nebraska, and is used for irrigation in all three states. The flow of the river in eastern Wyoming and in Nebraska is regulated by the Pathfinder Reservoir of the United States Reclamation Service, and stored water is furnished to lands along the main Platte as well as to those along the North Platte. The supply is usually ample for the lands under existing canals, and a large extension of the North Platte project of the United States Reclamation Service, covering land in both Wyoming and Nebraska, is under construction. Stored water from Pathfinder Reservoir also serves a large area under numerous private canals, mainly

in Nebraska. Before the construction of the Pathfinder Reservoir the North Platte in Nebraska carried very heavy flood discharges in the spring and very little water in the late summer.

The South Platte also rises in the mountains of Colorado, and is used extensively for irrigation in the state, the area irrigated from the stream and tributaries in Colorado in 1919 being more than 1,000,000 acres. The South Platte is a typical plain stream, having its source in the mountains, being subject to heavy floods in the early summer with the melting of the snows, and having a greatly reduced flow in the late summer, and the summer flow largely lost in its sandy bed and by evaporation. The natural condition has been much changed by the storage of flood waters and the use of water in Colorado. The storage of flood waters has greatly reduced the flood flow in Nebraska, while return seepage from the irrigated lands in Colorado has tended to increase the regular flow of the stream in both summer and winter. No storage has been provided on this stream in Nebraska, although there is a large quantity of water available for storage.

The Platte River is formed by the uniting of the north and south forks, and is of the same character as its branches—it has a large flood flow in spring and early summer, and is very low in late summer, sometimes having no visible flow. The regulation of the North Platte and return seepage to that stream are increasing the summer flow, and stored water from the Pathfinder Reservoir is available for canals taking water from the main stream.

The Niobrara, which rises in Wyoming and flows along the northern border of Nebraska, is a plain stream but a considerable part of its drainage area is composed of sand hills which absorb the rains and snows. As a consequence the water drains into the stream gradually, and it has a remarkably uniform flow, giving rise to its original name, "The river which flows."

The Republican River rises on the plains in Colorado, enters Nebraska near the southwest corner of the state, flows eastward near the southern line of the state for about 275 miles, and crosses the line into Kansas. During the spring the river is subject to heavy floods and it is very low in summer. It is used to some extent for irrigation in both Colorado and Nebraska, although in both states crops are grown in its drainage basin without irrigation. Very little provision for storing flood water has been made.

In the stream valleys water for irrigation can be obtained from wells with low lifts but on the high plains the ground water is at such great depths that the cost of pumping is prohibitive.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                       |                        | AREA IRRIGATED. |                       |                              |                            |                                     |
|--------------|------------------|-----------------------|------------------------|-----------------|-----------------------|------------------------------|----------------------------|-------------------------------------|
|              | Number.          | Per cent of increase. | Per cent of all farms. | Acres.          | Per cent of increase. | Per cent of total land area. | Per cent of land in farms. | Per cent of improved land in farms. |
| 1920.....    | 3,021            | 63.1                  | 2.4                    | 442,690         | 73.0                  | 0.9                          | 1.0                        | 1.9                                 |
| 1910.....    | 1,852            | —4.1                  | 1.4                    | 255,950         | 72.3                  | 0.5                          | 0.7                        | 1.0                                 |
| 1900.....    | 1,932            | 802.8                 | 1.6                    | 143,538         | .....                 | 0.3                          | 0.5                        | 0.8                                 |
| 1890.....    | 214              | .....                 | 0.2                    | 11,744          | .....                 | .....                        | 0.1                        | 0.1                                 |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Number of enterprises. | Area included in enterprises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                     | Area enterprises were capable of irrigating in 1920 (acres). |
|--------------------|------------------------|---|-------------------------|-------------------------------------|--|
|                    |                        |   | Acres.                  | Per cent of acreage in enterprises. |  |
| Total.....         | 470                    | 766,768                                     | 442,690                 | 57.7                                | 562,468  |
| Before 1860.....   | 1                      | 30  | 30                      | 100.0                               | 30   |
| 1870-1879.....     | 4                      | 1,515                                       | 1,090                   | 71.9                                | 1,115  |
| 1880-1889.....     | 61                     | 117,177                                     | 104,100                 | 88.8                                | 105,817  |
| 1890-1899.....     | 191                    | 375,191                                     | 191,229                 | 51.0                                | 258,341  |
| 1900-1904.....     | 58                     | 33,808                                      | 21,580                  | 63.8                                | 40,979   |
| 1905-1909.....     | 26                     | 192,888                                     | 98,704                  | 51.2                                | 124,540  |
| 1910-1914.....     | 62                     | 27,184                                      | 19,788                  | 72.8                                | 23,241   |
| 1915-1919.....     | 36                     | 6,103                                       | 2,746                   | 45.0                                | 3,784  |
| Not reported.....  | 31                     | 12,872                                      | 3,423                   | 26.6                                | 4,621  |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                  | AREA IRRIGATED (ACRES), |                  |           |                        | Area enterprises were capable of irrigating in 1920 (acres). | Area included in enterprises, 1920 (acres). |
|---|-------------------------|------------------|-----------|------------------------|--|---|
|   | 1919                    | 1909             | Increase. |                        |  |   |
|   |                         |                  | Amount.   | Per cent. <sup>1</sup> |  |   |
| Total.....                              | 442,690                 | 255,950          | 186,740   | 73.0                   | 562,468  | 766,768                                     |
| Stream, gravity.....                    | 435,567                 | 254,105          | 181,462   | 71.4                   | 550,491  | 750,931                                     |
| Stream, pumped.....                     | 1,115                   | 18               | 1,097     | .....                  | 2,468  | 2,755                                       |
| Stream, pumped and gravity.....         | 850                     | ( <sup>2</sup> ) | 850       | .....                  | 1,140  | 1,140                                       |
| Wells, pumped.....                      | 546                     | 139              | 407       | 292.8                  | 1,148  | 1,228                                       |
| Lake, gravity.....                      | .....                   | .....            | .....     | .....                  | 30   | 30  |
| Springs.....                            | 2,050                   | 686              | 1,364     | 198.8                  | 3,141  | 4,546                                       |
| Stored storm water.....                 | 1,200                   | 1,002            | 198       | 19.8                   | 1,870  | 1,900                                       |
| City water.....                         | 7                       | ( <sup>2</sup> ) | 7         | .....                  | 7  | 7   |
| Seepage.....                            | 120                     | ( <sup>2</sup> ) | 120       | .....                  | 120  | 120   |
| Stream, gravity, and pumped wells.....  | 115                     | ( <sup>2</sup> ) | 115       | .....                  | 230  | 320   |
| Stream, gravity, and flowing wells..... | .....                   | ( <sup>2</sup> ) | .....     | .....                  | 160  | 160   |
| Other mixed.....                        | 1,120                   | ( <sup>2</sup> ) | 1,120     | .....                  | 1,663  | 3,631                                       |

<sup>1</sup> Per cent not shown when base is less than 100.

<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

The provisions of law relating to internal improvements were extended to irrigation canals by a law of 1877. This empowered canal companies to issue bonds and to condemn rights of way for canals.

Nebraska enacted an irrigation district law in 1895. This law has been amended from time to time, and is

still in force. Very few districts have been organized to develop new enterprises, but many have been organized to take over works already built, many cooperative enterprises having been organized into districts. The land watered by such enterprises is reported under districts in Table 5.

Nebraska has not accepted the conditions of the Federal Carey Act (act of Aug. 18, 1894).

In addition to the area credited to the United States Reclamation Service in Table 5, that service supplies water to a large but varying area under the Warren Act and special contracts providing for supplying water to lands that receive their principal supply from other sources.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                 | CENSUS OF—           |                  | INCREASE. <sup>1</sup> |           |
|---|----------------------|------------------|------------------------|-----------|
|   | 1920                 | 1910             | Acres.                 | Per cent. |
| ACREAGE IRRIGATED.                              |                      |                  |                        |           |
| Total.....                                      | 442,690              | 255,950          | 186,740                | 73.0      |
| Individual and partnership.....                 | 68,140               | 45,227           | 22,913                 | 50.7      |
| Cooperative.....                                | 55,408               | 78,605           | —23,197                | —29.5     |
| Irrigation district.....                        | 206,206              | 70,448           | 129,758                | 169.7     |
| Commercial.....                                 | 25,335               | 24,834           | 501                    | 2.0       |
| U. S. Reclamation Service.....                  | <sup>2</sup> 87,558  | 30,536           | 57,022                 | 186.7     |
| U. S. Indian Service.....                       | .....                | 300              | —300                   | .....     |
| Other.....                                      | 43                   | ( <sup>3</sup> ) | 43                     | .....     |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |                      |                  |                        |           |
| Total.....                                      | 562,468              | 429,225          | 133,243                | 31.0      |
| Individual and partnership.....                 | 96,465               | 64,472           | 31,993                 | 49.6      |
| Cooperative.....                                | 102,242              | 108,260          | —6,018                 | —39.2     |
| Irrigation district.....                        | 220,859              | 77,228           | 143,631                | 186.0     |
| Commercial.....                                 | 27,332               | 52,724           | —25,392                | —48.2     |
| U. S. Reclamation Service.....                  | <sup>2</sup> 115,487 | 66,241           | 49,246                 | 74.3      |
| U. S. Indian Service.....                       | .....                | 300              | —300                   | .....     |
| Other.....                                      | 83                   | ( <sup>3</sup> ) | 83                     | .....     |
| ACREAGE INCLUDED IN ENTERPRISES.                |                      |                  |                        |           |
| Total.....                                      | 766,768              | 680,133          | 86,635                 | 12.7      |
| Individual and partnership.....                 | 124,098              | 86,305           | 37,793                 | 43.8      |
| Cooperative.....                                | 145,444              | 240,009          | —94,565                | —39.4     |
| Irrigation district.....                        | 244,383              | 91,076           | 153,307                | 168.3     |
| Commercial.....                                 | 76,925               | 154,623          | —77,698                | —50.2     |
| U. S. Reclamation Service.....                  | <sup>2</sup> 175,820 | 107,520          | 68,300                 | 63.5      |
| U. S. Indian Service.....                       | .....                | 600              | —600                   | .....     |
| Other.....                                      | 98                   | ( <sup>3</sup> ) | 98                     | .....     |

<sup>1</sup> A minus sign (—) denotes decrease.

<sup>2</sup> Does not include land supplied with stored water under the Warren Act.

<sup>3</sup> Not included in 1910 classification.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Nebraska relating to water rights are summarized in the following paragraphs:

Upon its organization the territory of Nebraska adopted the common law of England, so far as it was applicable and not inconsistent with the Constitution of the United States, with the organic law of the territory, or with any law passed by the legislature. The supreme court of the state held that this included the common law rule as to riparian rights, and that this rule held until abrogated by statute.

In 1889 a law was enacted providing that rights to the use of water for beneficial or useful purpose might be acquired by appropriation, and the court has held that this law abrogated the common law of riparian rights (Crawford Company v. Hathaway, 93 N. W., 791). This law provided for the posting and filing of notices of intended diversions, but did not require the filing of claims for rights previously acquired.

In 1895 the state board of irrigation was created, and from that time parties wishing to acquire rights have been required to apply to the board for permits to appropriate water, and to submit proof of the completion of works in accordance with the permits. Certificates defining rights acquired are issued by the board.

The board was given the power to adjudicate rights to water, the procedure being left to the board.

In 1919 the functions of the board of irrigation were assigned to a new department of public works, but the general features of the system of water rights were not changed.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                                 | 1919    |                       | 1909,<br>per cent<br>of total. |
|--|---------|-----------------------|--------------------------------|
|  | Acres.  | Per cent<br>of total. |                                |
| Total.....                             | 442,690 | 100.0                 | 100.0                          |
| Appropriation and use.....             | 42,141  | 9.5                   | 8.8                            |
| Notice filed and posted.....           | 16,517  | 3.7                   | 9.9                            |
| Adjudicated by court.....              | 9,280   | 2.1                   | 18.8                           |
| Permit from state.....                 | 231,806 | 53.0                  | 59.6                           |
| Certificate or license from state..... | 117,960 | 26.6                  | 2.7                            |
| Riparian rights.....                   | 618     | 0.1                   | (1)                            |
| Underground.....                       | 546     | 0.1                   | (1)                            |
| Other and mixed.....                   | 13      | (2)                   | (1)                            |
| Not reported.....                      | 20,809  | 4.7                   | (1)                            |

<sup>1</sup> This class was not included in the tabulation in 1910. All land for which the class of water rights was not reported was included in "appropriation and use."  
<sup>2</sup> Less than one-tenth of 1 per cent.

#### ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.                              | AREA IRRIGATED (ACRES). |         |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|--|-------------------------|---------|------------------------------------|---|--|
|  | 1919                    | 1902    | Per cent of increase. <sup>1</sup> |   |  |
| Total.....                                   | 442,690                 | 245,910 | 89.0                               | 766,768                                     | 562,468  |
| Hat Creek.....                               | 2,938                   | 22,649  | 10.9                               | 3,755                                       | 3,705  |
| White River.....                             | 8,008                   | 29,799  | -17.5                              | 21,922                                      | 16,939   |
| Nebraska River.....                          | 5,633                   | 27,210  | -21.0                              | 28,511                                      | 9,820  |
| Platte River and tributaries.....            | 490,623                 | 211,830 | 89.1                               | 678,053                                     | 501,435  |
| Platte River direct.....                     | 37,532                  | 30,887  | 21.5                               | 151,377                                     | 68,732   |
| North Platte River and tributaries.....      | 323,045                 | 146,197 | 123.0                              | 470,258                                     | 389,140  |
| North Platte River direct.....               | 291,736                 | 139,900 | 122.9                              | 436,013                                     | 349,766  |
| Blue River.....                              | 7,376                   | 4,929   | 49.6                               | 7,301                                       | 7,391  |
| Pumpkin Creek.....                           | 7,273                   | 2,314   | 214.3                              | 10,554                                      | 9,168  |
| Other tributaries of North Platte River..... | 19,660                  | 28,054  | 144.1                              | 25,900                                      | 22,815   |
| South Platte River and tributaries.....      | 35,290                  | 19,473  | 81.2                               | 42,262                                      | 40,542   |
| South Platte River direct.....               | 17,061                  | 10,861  | 57.1                               | 18,623                                      | 15,590   |
| Lodgepole Creek.....                         | 18,229                  | 8,612   | 111.7                              | 23,639                                      | 21,952   |
| Loup River.....                              | 1,177                   | 12,872  | -90.9                              | 4,512                                       | 2,377  |
| Other tributaries of Platte River.....       | 579                     | 22,461  | -76.5                              | 644   | 644  |
| Kansas River and tributaries.....            | 25,428                  | 14,455  | 75.9                               | 34,527                                      | 30,569   |
| Big Blue River.....                          | 19                      | (3)     | (4)                                | 44  | 44   |
| Republican River.....                        | 25,409                  | (3)     | (4)                                | 34,483                                      | 30,525   |

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Includes springs and wells.

<sup>3</sup> Main stream and tributaries shown as one item in 1902.

The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

#### CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.             | Per cent of increase. <sup>1</sup> | AVERAGE PER ACRE. |                       |
|--------------|---------------------|------------------------------------|-------------------|-----------------------|
|              |                     |                                    | Amount.           | Per cent of increase. |
| 1920.....    | \$13,909,185        | 78.4                               | \$24.73           | 36.1                  |
| 1910.....    | 7,798,310           | 495.0                              | 18.17             | 106.0                 |
| 1900.....    | 1,310,698           |                                    | 8.82              | 110.7                 |
| 1890.....    | <sup>2</sup> 47,798 |                                    | <sup>3</sup> 4.07 |                       |

<sup>1</sup> Per cent not shown when more than 1,000.

<sup>2</sup> Based on average for "subhumid" region. Average for Nebraska not shown separately in 1890.

<sup>3</sup> Average for "subhumid" region.

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$13,909,185 | 100.0              | \$24.73           |
| Before 1860.....   | 500          | (1)                | 16.67             |
| 1870-1879.....     | 21,583       | 0.2                | 19.36             |
| 1880-1889.....     | 1,659,694    | 11.9               | 15.68             |
| 1890-1899.....     | 2,075,677    | 14.9               | 8.03              |
| 1900-1904.....     | 321,927      | 2.3                | 7.80              |
| 1905-1909.....     | 8,685,843    | 62.4               | 69.74             |
| 1910-1914.....     | 444,144      | 3.2                | 19.11             |
| 1915-1919.....     | 180,314      | 1.3                | 47.05             |
| Not reported.....  | 520,103      | 3.7                | 112.55            |

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|--------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre.  | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$13,909,185            | 100.0              | \$24.73            | 394,392                                  | \$1.48                              |
| Stream, gravity.....                    | 13,619,775              | 97.9               | 24.74              | 389,699                                  | 1.48                                |
| Stream, pumped.....                     | 39,581                  | 0.3                | 16.04              | 572                                      | 2.86                                |
| Stream, pumped and gravity.....         | 18,700                  | 0.1                | 16.40              | 850                                      | 1.04                                |
| Wells, pumped.....                      | 23,250                  | 0.2                | 20.25              | 436                                      | 5.16                                |
| Lake, gravity.....                      | <sup>2</sup> 100,300    | 0.7                | <sup>3</sup> 10.00 |  |                                     |
| Springs.....                            | 24,497                  | 0.2                | 7.80               | 1,700                                    | 1.14                                |
| Stored storm water.....                 | 40,429                  | 0.3                | 21.62              | 895                                      | 0.36                                |
| City water.....                         | 1,000                   | (3)                | 142.88             |  |                                     |
| Sewage.....                             | 313                     | (3)                | 2.61               |  |                                     |
| Stream, gravity, and pumped wells.....  | 5,035                   | (3)                | 21.89              | 10                                       | 3.00                                |
| Stream, gravity, and flowing wells..... | 6,902                   | (3)                | 43.14              |  |                                     |
| Other mixed.....                        | 29,403                  | 0.2                | 17.68              | 230                                      | 2.63                                |

<sup>1</sup> Based on area irrigated in 1919.

<sup>2</sup> Capital invested includes \$100,000 for which no acreage is reported which is not included in computing average capital per acre.

<sup>3</sup> Less than one-tenth of 1 per cent.

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                              | 1920         | 1902             | INCREASE. <sup>1</sup> |           |
|--|--------------|------------------|------------------------|-----------|
|  |              |                  | Amount.                | Per cent. |
| Total.....                                   | \$13,909,185 | \$2,463,748      | \$11,445,437           | 464.6     |
| Hat Creek.....                               | 85,243       | * 19,090         | 66,153                 | 346.5     |
| White River.....                             | 183,849      | * 155,924        | 27,925                 | 17.6      |
| Niobrara River.....                          | 349,874      | * 72,900         | 276,974                | 379.9     |
| Platte River and tributaries.....            | 12,894,088   | 1,982,149        | 10,911,939             | 550.5     |
| Platte River direct.....                     | 488,642      | 565,470          | -76,828                | -13.6     |
| North Platte River and tributaries.....      | 11,834,793   | 967,110          | 10,867,623             | .....     |
| North Platte River direct.....               | 11,661,687   | 991,875          | 10,770,062             | .....     |
| Blue River.....                              | 31,050       | 22,620           | 8,430                  | 37.3      |
| Pumpkin Creek.....                           | 92,060       | 19,925           | 72,135                 | 362.0     |
| Other tributaries of North Platte River..... | 149,686      | * 32,690         | 116,996                | 357.9     |
| South Platte River and tributaries.....      | 444,413      | 101,240          | 343,173                | 339.0     |
| South Platte River direct.....               | 87,712       | 53,000           | 34,712                 | 63.6      |
| Lodgepole Creek.....                         | 356,701      | 47,040           | 309,661                | 648.7     |
| Loup River.....                              | 21,300       | 320,615          | -299,315               | -93.4     |
| Other tributaries of Platte River.....       | 5,000        | * 27,714         | -22,714                | -82.0     |
| Kansas River and tributaries.....            | 396,631      | 233,685          | 162,946                | 69.7      |
| Big Blue River.....                          | 1,625        | ( <sup>3</sup> ) | .....                  | .....     |
| Republican River.....                        | 395,006      | ( <sup>3</sup> ) | .....                  | .....     |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.<sup>2</sup> Includes springs and wells.<sup>3</sup> Main stream and tributaries shown as one item in 1902.

In classifying capital invested by type of enterprise (Table 12) the average capital invested per acre is not presented, for the reason that it is difficult to arrive at a correct figure.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$13,909,185            | 100.0              | 394,392                                  | \$1.48                              |
| Individual and partnership..... | 1,146,227               | 8.2                | 47,530                                   | 1.42                                |
| Cooperative.....                | 547,104                 | 3.9                | 54,298                                   | 0.95                                |
| Irrigation district.....        | 2,811,474               | 20.2               | 187,186                                  | 1.24                                |
| Commercial.....                 | 726,590                 | 5.2                | 25,335                                   | 1.10                                |
| U. S. Reclamation Service.....  | 8,674,250               | 62.4               | 80,000                                   | 2.54                                |
| Other.....                      | 3,570                   | ( <sup>2</sup> )   | 43                                       | 11.86                               |

<sup>1</sup> Based on area irrigated in 1919. <sup>2</sup> Less than one-tenth of 1 per cent.

The United States Reclamation Service supplies stored water to enterprises controlled by agencies of

most of the other classes shown in the table and a part of its expenditure is properly chargeable to those lands; but it is not possible to tell how much should be so charged or how it should be distributed among the various classes since the area served varies from season to season.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |         |
|--|---------|
| Number of enterprises reporting land drained or needing drainage.....  | 24      |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 376,518 |
| Acreage for which drains have been installed.....  | 10,793  |
| Additional acreage needing drainage.....   | 26,806  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 2.9     |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 1.4     |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 4.9     |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.  | Measured. | Not measured. |
|---|---------|-----------|---------------|
| Average volume of water entering canals, second-foot..... | 2,655   | 2,154     | 501           |
| Area irrigated in 1919.....acres..                        | 171,080 | 135,500   | 35,580        |
| Average number of acres per second-foot.....              | 64      | 63        | 71            |
| Total quantity of water entering canals...acre-feet..     | 975,071 | 894,316   | 80,755        |
| Area irrigated in 1919.....acres..                        | 232,620 | 199,650   | 32,970        |
| Average quantity of water per acre....acre-feet..         | 4.2     | 4.5       | 2.4           |
| Total quantity of water delivered.....acre-feet..         | 445,585 | 188,089   | 257,496       |
| Area irrigated in 1919.....acres..                        | 185,795 | 76,987    | 108,808       |
| Average quantity delivered per acre....acre-feet..        | 2.4     | 2.4       | 2.1           |



## IRRIGATION—NEBRASKA.

## IRRIGATION WORKS.

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|--------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                    |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Number. | Capacity (gallons per minute). |
| Total.....         | 260                       | 73                      | 513           | 11,665                  | 1,780           | 913              | 1,545           | 59          | 197,890               | 3.8                         | 34            | 24,701                         | 51              | 959                            | 54      | 73,686                         |
| Before 1860.....   | 5                         | 2                       | 2             | 39                      | 4               | 3                | 3               | 1           | 3                     |                             |               |                                |                 |                                |         |                                |
| 1870-1879.....     | 5                         |                         | 6             | 12                      | 10              | 9                | 7               |             |                       |                             |               |                                |                 |                                |         |                                |
| 1880-1889.....     | 42                        | 2                       | 71            | 2,748                   | 284             | 105              | 370             | 2           | 70                    | 0.4                         |               |                                |                 |                                |         |                                |
| 1890-1899.....     | 91                        | 22                      | 215           | 4,814                   | 904             | 489              | 438             | 19          | 14,244                | 0.8                         | 2             | 3,480                          | 4               | 69                             | 4       | 7,480                          |
| 1900-1904.....     | 45                        | 11                      | 63            | 4,479                   | 115             | 62               | 64              | 10          | 75,928                | 0.3                         | 1             | 300                            | 3               | 75                             | 3       | 5,800                          |
| 1905-1909.....     | 14                        | 7                       | 28            | 2,827                   | 227             | 138              | 599             | 7           | 212                   |                             | 1             | 2,100                          | 4               | 38                             | 4       | 3,000                          |
| 1910-1914.....     | 26                        | 15                      | 56            | 488                     | 126             | 37               | 41              | 9           | 6,764                 | 2.0                         | 18            | 11,950                         | 19              | 480                            | 21      | 35,100                         |
| 1915-1919.....     | 15                        | 8                       | 38            | 152                     | 48              | 22               | 13              | 3           | 100,300               | 0.3                         | 12            | 6,871                          | 20              | 290                            | 21      | 21,200                         |
| Not reported.....  | 17                        | 6                       | 34            | 108                     | 62              | 28               | 10              | 8           | 369                   |                             |               |                                | 1               | 7                              | 1       | 100                            |

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                                 |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Number. | Capacity (gallons per minute). |
| Total.....                      | 260                       | 73                      | 513           | 11,665                  | 1,780           | 913              | 1,545           | 59          | 197,890               | 3.8                         | 34            | 24,701                         | 51              | 959                            | 54      | 73,686                         |
| Individual and partnership..... | 223                       | 61                      | 434           | 1,892                   | 697             | 470              | 268             | 46          | 3,487                 | 3.3                         | 33            | 23,601                         | 47              | 926                            | 50      | 72,271                         |
| Cooperative.....                | 11                        | 4                       | 32            | 1,276                   | 222             | 52               | 79              | 1           | 13,000                |                             |               |                                |                 |                                |         |                                |
| Irrigation district.....        | 11                        | 3                       | 28            | 4,878                   | 551             | 251              | 569             | 1           | 6,000                 | 0.4                         |               |                                |                 |                                |         |                                |
| Commercial.....                 | 12                        | 2                       | 14            | 928                     | 124             | 29               | 59              | 5           | 100,256               | 0.1                         |               |                                |                 |                                |         |                                |
| U. S. Reclamation Service.....  | 3                         | 3                       | 3             | 2,690                   | 185             | 111              | 570             | 6           | 75,167                |                             | 1             | 1,100                          | 4               | 33                             | 4       | 1,415                          |
| Other.....                      |                           |                         | 2             | 1                       | 1               |                  |                 |             |                       |                             |               |                                |                 |                                |         |                                |

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                              | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       | Pipe lines, length (miles). | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |                      |
|--|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|-----------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|----------------------|
|  |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |                             | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Number. | Capacity (gallons per minute). | Average lift (feet). |
| Total.....                                   | 260                       | 73                      | 513           | 11,665                  | 1,780           | 913              | 1,545           | 59          | 197,890               | 3.8                         | 34            | 24,701                         | 51              | 959                            | 54      | 73,686                         | 24                   |
| Hat Creek.....                               | 11                        | 2                       | 40            | 25                      | 44              | 1                | 1               | 6           | 109                   |                             |               |                                |                 |                                |         |                                |                      |
| White River.....                             | 63                        | 23                      | 81            | 237                     | 131             | 104              | 66              | 17          | 1,302                 | 0.4                         | 2             | 2,200                          | 3               | 53                             | 3       | 4,000                          | 35                   |
| Nebraska River.....                          | 27                        | 10                      | 44            | 204                     | 88              | 92               | 36              | 1           | 13,005                | 0.1                         |               |                                | 1               | 8                              | 1       | 480                            | 8                    |
| Platte River and tributaries.....            | 131                       | 29                      | 309           | 10,593                  | 1,379           | 661              | 1,412           | 31          | 183,312               | 0.9                         | 19            | 14,501                         | 33              | 437                            | 36      | 36,003                         | 27                   |
| Platte River direct.....                     | 4                         | 1                       | 26            | 1,776                   | 207             | 36               | 137             | 1           | 1                     |                             |               |                                |                 |                                |         |                                |                      |
| North Platte River and tributaries.....      | 66                        | 17                      | 178           | 7,769                   | 978             | 418              | 1,169           | 13          | 175,235               | 0.5                         | 14            | 10,551                         | 13              | 180                            | 14      | 14,580                         | 31                   |
| North Platte River direct.....               | 25                        | 5                       | 71            | 7,052                   | 782             | 315              | 1,087           | 9           | 175,169               | 0.5                         |               |                                | 5               | 81                             | 6       | 7,000                          | 15                   |
| Blue River.....                              | 3                         |                         | 5             | 138                     | 27              |                  |                 |             |                       |                             |               |                                | 4               | 71                             | 5       | 6,400                          | 8                    |
| Pumpkin Creek.....                           | 13                        | 7                       | 43            | 209                     | 71              | 44               | 23              |             |                       |                             |               |                                |                 |                                |         |                                |                      |
| Other tributaries of North Platte River..... | 25                        | 5                       | 59            | 369                     | 98              | 59               | 59              | 4           | 66                    |                             |               |                                | 1               | 10                             | 1       | 600                            | 35                   |
| South Platte River and tributaries.....      | 57                        | 5                       | 96            | 949                     | 175             | 202              | 100             | 12          | 7,156                 | 0.1                         | 5             | 3,990                          | 5               | 108                            | 5       | 9,682                          | 17                   |
| South Platte River direct.....               | 3                         |                         | 6             | 598                     | 39              | 95               | 18              |             |                       |                             |               |                                | 2               | 86                             | 2       | 1,850                          | 25                   |
| Lodgepole Creek.....                         | 54                        | 5                       | 90            | 351                     | 136             | 107              | 82              | 12          | 7,156                 | 0.1                         | 4             | 1,850                          | 3               | 70                             | 3       | 7,832                          | 11                   |
| Loup River.....                              | 3                         | 5                       | 7             | 91                      | 16              | 5                | 6               | 3           | 60                    |                             | 1             | 2,100                          | 3               | 49                             | 7       | 4,280                          | 17                   |
| Other tributaries of Platte River.....       | 1                         | 1                       | 2             | 8                       | 3               |                  |                 | 2           | 860                   | 0.3                         |               |                                | 3               | 21                             | 4       | 461                            | 30                   |
| Kansas River and tributaries.....            | 28                        | 9                       | 39            | 606                     | 138             | 55               | 30              | 4           | 162                   | 2.4                         | 13            | 8,000                          | 14              | 461                            | 14      | 33,203                         | 26                   |
| Big Blue River.....                          |                           |                         | 2             | 5                       | 1               |                  |                 |             |                       | 0.4                         |               |                                | 2               | 30                             | 2       | 1,000                          | 18                   |
| Republican River.....                        | 28                        | 9                       | 37            | 601                     | 137             | 55               | 30              | 4           | 162                   | 2.0                         | 13            | 8,000                          | 12              | 431                            | 12      | 32,203                         | 27                   |



# IRRIGATION - NEBRASKA.

9

## CROPS.

TABLE 18. ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP. |                                       | AREA HARVESTED. |                              |        |                              |                                    | QUANTITY HARVESTED. |         |                              |         |                              |                                    |  |
|-------|---------------------------------------|-----------------|------------------------------|--------|------------------------------|------------------------------------|---------------------|---------|------------------------------|---------|------------------------------|------------------------------------|--|
|       |                                       | 1919            |                              | 1909   |                              | Per cent of increase. <sup>1</sup> | Unit.               | 1919    |                              | 1909    |                              | Per cent of increase. <sup>1</sup> |  |
|       |                                       | Acres.          | Per cent of total for state. | Acres. | Per cent of total for state. |                                    |                     | Amount. | Per cent of total for state. | Amount. | Per cent of total for state. |                                    |  |
| 1     | Cereals:                              |                 |                              |        |                              |                                    |                     |         |                              |         |                              |                                    |  |
| 2     | Corn.....                             | 26,798          | 0.4                          | 21,532 | 0.3                          | 24.3                               | Bu.....             | 626,004 | 0.4                          | 563,857 | 0.3                          | 11.0                               |  |
| 3     | Oats.....                             | 12,875          | 0.6                          | 18,704 | 0.8                          | -31.5                              | Bu.....             | 364,083 | 0.6                          | 555,048 | 1.0                          | -34.4                              |  |
| 4     | Winter wheat.....                     | 15,321          | 0.4                          | 9,015  | 0.3                          | 178.1                              | Bu.....             | 321,419 | 0.6                          | 170,952 | 0.4                          | 180.7                              |  |
| 5     | Spring wheat.....                     | 9,718           | 1.8                          |        |                              |                                    | Bu.....             | 158,405 | 3.9                          |         |                              |                                    |  |
| 6     | Barley.....                           | 3,610           | 1.7                          | 3,405  | 3.1                          | 3.3                                | Bu.....             | 105,958 | 2.4                          | 90,308  | 4.5                          | 17.3                               |  |
| 7     | Rye.....                              | 1,463           | 0.4                          | 427    | 0.7                          | 228.6                              | Bu.....             | 17,630  | 0.5                          | 7,475   | 1.1                          | 135.0                              |  |
| 8     | Hay and forage:                       |                 |                              |        |                              |                                    |                     |         |                              |         |                              |                                    |  |
| 9     | Alfalfa.....                          | 60,476          | 5.0                          | 31,842 | 4.6                          | 89.9                               | Tons...             | 135,942 | 6.1                          | 81,225  | 5.3                          | 67.4                               |  |
| 10    | Other tame or cultivated grasses..... | 1,205           | 0.8                          | (2)    |                              |                                    | Tons...             | 1,506   | 0.7                          | (2)     |                              |                                    |  |
| 11    | Wild, salt, or prairie grasses.....   | 14,956          | 0.5                          | 37,019 | 1.2                          | -59.6                              | Tons...             | 12,797  | 0.5                          | 38,796  | 1.3                          | -67.0                              |  |
| 12    | Small grains cut for hay.....         | 942             | 1.2                          | (2)    |                              |                                    | Tons...             | 867     | 1.1                          | (2)     |                              |                                    |  |
|       | Corn cut for forage.....              | 1,450           | 0.5                          | (2)    |                              |                                    | Tons...             | 2,023   | 0.7                          | (2)     |                              |                                    |  |
|       | Kafir, sorghum, etc., for forage..... | 1,392           | 0.5                          | (2)    |                              |                                    | Tons...             | 3,385   | 0.6                          | (2)     |                              |                                    |  |
| 13    | Vegetables:                           |                 |                              |        |                              |                                    |                     |         |                              |         |                              |                                    |  |
|       | Potatoes.....                         | 6,671           | 7.1                          | 6,077  | 5.5                          | 9.8                                | Bu.....             | 720,833 | 16.2                         | 888,766 | 10.9                         | -18.9                              |  |
| 14    | Miscellaneous:                        |                 |                              |        |                              |                                    |                     |         |                              |         |                              |                                    |  |
|       | Sugar beets grown for sugar.....      | 12,959          | 78.8                         | 3,114  | 74.5                         |                                    | Tons...             | 445,521 | 80.3                         | 36,849  | 92.7                         |                                    |  |

| CROP. |                                       | AVERAGE YIELD PER ACRE, 1919. |            |                       |                    |                                |  | VALUE.    |                              |           |                              |                                    |  |
|-------|---------------------------------------|-------------------------------|------------|-----------------------|--------------------|--------------------------------|--|-----------|------------------------------|-----------|------------------------------|------------------------------------|--|
|       |                                       | Unit.                         | For state. | On nonirrigated land. | On irrigated land. |                                |  | 1919      |                              | 1909      |                              | Per cent of increase. <sup>1</sup> |  |
|       |                                       |                               |            |                       | Average.           | Per cent of average for state. | Per cent of average on non-irrigated land. | Amount.   | Per cent of total for state. | Amount.   | Per cent of total for state. |                                    |  |
| 1     | Cereals:                              |                               |            |                       |                    |                                |  |           |                              |           |                              |                                    |  |
| 2     | Corn.....                             | Bu.....                       | 23.9       | 23.0                  | 23.4               | 97.9                           | 97.9                                       | \$845,183 | 0.4                          | \$200,241 | 0.3                          | 191.2                              |  |
| 3     | Oats.....                             | Bu.....                       | 20.5       | 20.5                  | 28.3               | 95.9                           | 95.9                                       | 273,082   | 0.6                          | 219,389   | 1.1                          | 24.5                               |  |
| 4     | Winter wheat.....                     | Bu.....                       | 14.3       | 14.3                  | 21.0               | 140.9                          | 146.9                                      | 691,050   | 0.6                          | 135,554   | 0.3                          | 601.0                              |  |
| 5     | Spring wheat.....                     | Bu.....                       | 7.7        | 7.6                   | 16.3               | 214.5                          | 217.3                                      | 340,571   | 3.9                          |           |                              |                                    |  |
| 6     | Barley.....                           | Bu.....                       | 20.9       | 20.7                  | 29.4               | 140.7                          | 142.0                                      | 116,554   | 2.4                          | 40,801    | 4.7                          | 185.7                              |  |
| 7     | Rye.....                              | Bu.....                       | 9.1        | 9.0                   | 12.6               | 138.5                          | 140.0                                      | 24,042    | 0.5                          | 4,024     | 1.2                          | 433.8                              |  |
| 8     | Hay and forage:                       |                               |            |                       |                    |                                |  |           |                              |           |                              |                                    |  |
| 9     | Alfalfa.....                          | Tons...                       | 1.81       | 1.81                  | 2.25               | 123.0                          | 124.3                                      | 2,582,808 | 6.1                          | 497,656   | 4.6                          | 419.0                              |  |
| 10    | Other tame or cultivated grasses..... | Tons...                       | 1.38       | 1.39                  | 1.25               | 90.6                           | 80.9                                       | 18,825    | 0.7                          | (2)       |                              |                                    |  |
| 11    | Wild, salt, or prairie grasses.....   | Tons...                       | 0.80       | 0.80                  | 0.86               | 107.5                          | 107.5                                      | 172,760   | 0.5                          | 254,216   | 1.8                          | -32.0                              |  |
| 12    | Small grains cut for hay.....         | Tons...                       | 1.02       | 1.02                  | 0.92               | 90.2                           | 90.2                                       | 11,271    | 1.1                          | (2)       |                              |                                    |  |
|       | Corn cut for forage.....              | Tons...                       | 1.63       | 1.63                  | 2.00               | 122.7                          | 122.7                                      | 30,692    | 0.7                          | (2)       |                              |                                    |  |
|       | Kafir, sorghum, etc., for forage..... | Tons...                       | 2.10       | 2.10                  | 2.43               | 115.7                          | 115.7                                      | 32,158    | 0.6                          | (2)       |                              |                                    |  |
| 13    | Vegetables:                           |                               |            |                       |                    |                                |  |           |                              |           |                              |                                    |  |
|       | Potatoes.....                         | Bu.....                       | 47.2       | 42.6                  | 108.1              | 229.0                          | 253.8                                      | 1,729,999 | 16.2                         | 274,910   | 7.3                          | 529.3                              |  |
| 14    | Miscellaneous:                        |                               |            |                       |                    |                                |  |           |                              |           |                              |                                    |  |
|       | Sugar beets grown for sugar.....      | Tons...                       | 10.18      | 9.47                  | 10.37              | 101.9                          | 109.5                                      | 4,677,971 | 80.3                         | 152,310   | 84.8                         |                                    |  |

| CROP. |                                       | AVERAGE YIELD PER ACRE, 1919. |            |                       |                    |                                |  | VALUE.    |                              |                  |                              |                                    |  |
|-------|---------------------------------------|-------------------------------|------------|-----------------------|--------------------|--------------------------------|--|-----------|------------------------------|------------------|------------------------------|------------------------------------|--|
|       |                                       | Unit.                         | For state. | On nonirrigated land. | On irrigated land. |                                |  | 1919      |                              | 1909             |                              | Per cent of increase. <sup>1</sup> |  |
|       |                                       |                               |            |                       | Average.           | Per cent of average for state. | Per cent of average on non-irrigated land. | Amount.   | Per cent of total for state. | Amount.          | Per cent of total for state. |                                    |  |
| 1     | Cereals:                              |                               |            |                       |                    |                                |  |           |                              |                  |                              |                                    |  |
| 2     | Corn.....                             | Bu.....                       | 23.9       | 23.0                  | 23.4               | 97.9                           | 97.9                                       | \$845,186 | 0.4                          | \$200,241        | 0.3                          | 191.2                              |  |
| 3     | Oats.....                             | Bu.....                       | 20.5       | 20.5                  | 28.3               | 95.9                           | 95.9                                       | 273,062   | 0.6                          | 219,389          | 1.1                          | 24.5                               |  |
| 4     | Winter wheat.....                     | Bu.....                       | 14.3       | 14.3                  | 21.0               | 140.9                          | 140.9                                      | 691,050   | 0.6                          | 135,554          | 0.3                          | 661.0                              |  |
| 5     | Spring wheat.....                     | Bu.....                       | 7.7        | 7.6                   | 16.3               | 214.5                          | 217.3                                      | 340,571   | 3.9                          |                  | 4.7                          | 185.7                              |  |
| 6     | Barley.....                           | Bu.....                       | 20.9       | 20.7                  | 29.4               | 140.7                          | 142.0                                      | 116,554   | 2.4                          | 40,801           | 4.3                          | 185.7                              |  |
| 7     | Rye.....                              | Bu.....                       | 9.1        | 9.0                   | 12.6               | 138.5                          | 140.0                                      | 24,682    | 0.5                          | 4,624            | 1.2                          | 433.8                              |  |
| 8     | Hay and forage:                       |                               |            |                       |                    |                                |  |           |                              |                  |                              |                                    |  |
| 9     | Alfalfa.....                          | Tons...                       | 1.81       | 1.81                  | 2.25               | 123.0                          | 124.3                                      | 2,582,808 | 6.1                          | 497,650          | 4.6                          | 419.0                              |  |
| 10    | Other tame or cultivated grasses..... | Tons...                       | 1.38       | 1.39                  | 1.25               | 90.6                           | 80.9                                       | 18,825    | 0.7                          | ( <sup>2</sup> ) | .....                        | .....                              |  |
| 11    | Wild, salt, or prairie grasses.....   | Tons...                       | 0.80       | 0.80                  | 0.86               | 107.5                          | 107.5                                      | 172,780   | 0.5                          | 254,216          | 1.8                          | -32.0                              |  |
| 12    | Small grains cut for hay.....         | Tons...                       | 1.02       | 1.02                  | 0.92               | 90.2                           | 90.2                                       | 11,271    | 1.1                          | ( <sup>3</sup> ) | .....                        | .....                              |  |
| 13    | Corn cut for forage.....              | Tons...                       | 1.63       | 1.63                  | 2.00               | 122.7                          | 122.7                                      | 30,692    | 0.7                          | ( <sup>3</sup> ) | .....                        | .....                              |  |
| 14    | Kafir, sorghum, etc., for forage..... | Tons...                       | 2.10       | 2.10                  | 2.43               | 115.7                          | 115.7                                      | 32,158    | 0.6                          | ( <sup>4</sup> ) | .....                        | .....                              |  |
| 15    | Vegetables:                           |                               |            |                       |                    |                                |  |           |                              |                  |                              |                                    |  |
| 16    | Potatoes.....                         | Bu.....                       | 47.2       | 42.6                  | 108.1              | 229.0                          | 253.8                                      | 1,729,099 | 16.2                         | 274,910          | 7.3                          | 520.3                              |  |
| 17    | Miscellaneous:                        |                               |            |                       |                    |                                |  |           |                              |                  |                              |                                    |  |
| 18    | Sugar beets grown for sugar.....      | Tons...                       | 10.18      | 9.47                  | 10.37              | 101.0                          | 109.5                                      | 4,677,971 | 80.3                         | 152,310          | 84.8                         | .....                              |  |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.

<sup>2</sup> Not reported separately in 1909.

## IRRIGATION—NEBRASKA.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100, or when per cent is more than 1,000.]

|   | THE STATE. | Banner. | Box Butte. | Buffalo. | Chase.  | Cherry.   | Cheyenne. |
|---|------------|---------|------------|----------|---------|-----------|-----------|
| 1 Number of all farms in 1920.....  | 124,417    | 301     | 641        | 2,376    | 705     | 1,664     | 854       |
| 2 Number of farms irrigated in 1919.....  | 3,021      | 6       | 5          | 29       | 15      | 5         | 8         |
| 3 Per cent of all farms.....  | 2.4        | 2.0     | 0.8        | 1.2      | 2.1     | 0.3       | 0.9       |
| 4 Number of farms irrigated in 1909.....  | 1,852      | 10      | 7          | 1        | 14      | 18        | 33        |
| 5 Per cent of increase, 1909-1919.....  | 63.1       |         |            |          |         |           |           |
| <b>LAND AND FARM AREA.</b>  |            |         |            |          |         |           |           |
| 6 Approximate land area.....acres..   | 49,157,120 | 474,880 | 688,640    | 604,800  | 575,360 | 3,826,560 | 764,160   |
| 7 All land in farms.....acres..   | 42,235,475 | 447,629 | 646,509    | 570,881  | 571,027 | 2,981,685 | 513,414   |
| 8 Improved land in farms.....acres..  | 23,109,624 | 136,669 | 129,438    | 433,371  | 173,346 | 591,881   | 262,395   |
| 9 Area irrigated in 1919.....acres..  | 442,690    | 2,703   | 2,162      | 3,019    | 2,292   | 501       | 5,247     |
| 10 Per cent of improved land in farms.....  | 1.9        | 2.0     | 1.7        | 0.7      | 1.3     | 0.1       | 2.0       |
| 11 Area irrigated in 1909.....acres..   | 255,950    | 1,915   | 1,171      | 2        | 3,226   | 546       | 3,635     |
| 12 Per cent of increase, 1909-1919.....   | 73.0       | 41.1    | 84.6       |          | -29.0   | -8.2      | 44.3      |
| 13 Area enterprises were capable of irrigating in 1920.....acres..  | 562,468    | 3,283   | 3,062      | 3,059    | 4,311   | 1,301     | 5,778     |
| 14 Area enterprises were capable of irrigating in 1910.....acres..  | 429,225    | 1,965   | 1,173      | 2        | 4,767   | 1,046     | 3,995     |
| 15 Per cent of increase, 1910-1920.....   | 31.0       | 67.1    | 161.0      |          | -9.6    | 24.4      | 44.6      |
| 16 Area included in enterprises in 1920.....acres..   | 766,768    | 4,299   | 3,802      | 6,419    | 4,491   | 1,373     | 5,958     |
| 17 Area included in enterprises in 1910.....acres..   | 680,133    | 2,110   | 1,373      | 4        | 6,187   | 1,046     | 4,345     |
| 18 Per cent of increase, 1910-1920.....   | 12.7       | 103.7   | 176.9      |          | -27.4   | 31.3      | 37.1      |
| <b>IRRIGATION WORKS.</b>  |            |         |            |          |         |           |           |
| 19 Independent enterprises:   |            |         |            |          |         |           |           |
| 20 Number, 1920.....  | 470        | 15      | 5          | 4        | 13      | 5         | 36        |
| 21 Number, 1910.....  | 474        | 16      | 6          | 1        | 6       | 13        | 25        |
| 22 Main ditches:  |            |         |            |          |         |           |           |
| 23 Number, 1920.....  | 513        | 18      | 6          | 1        | 13      | 4         | 47        |
| 24 Number, 1910.....  | 420        | 16      | 6          | 1        | 6       | 3         | 37        |
| 25 Length, 1920.....miles..   | 1,780      | 31      | 19         | 16       | 36      | 7         | 46        |
| 26 Length, 1910.....miles..   | 1,459      | 18      | 13         | 1        | 24      | 9         | 33        |
| 27 Capacity, 1920.....second-feet..   | 11,665     | 76      | 86         | 160      | 107     | 15        | 78        |
| 28 Capacity, 1910.....second-feet..   | 9,378      | 39      | 24         | 1        | 86      | 30        | 95        |
| 29 Laterals:  |            |         |            |          |         |           |           |
| 30 Number, 1920.....  | 913        | 29      | 9          |          | 15      |           | 57        |
| 31 Number, 1910.....  | 1,038      | 2       | 3          |          | 9       |           | 41        |
| 32 Length, 1920.....miles..   | 1,645      | 13      | 6          |          | 4       |           | 48        |
| 33 Length, 1910.....miles..   | 1,269      | 1       | 2          |          | 3       |           | 15        |
| 34 Reservoirs:  |            |         |            |          |         |           |           |
| 35 Number, 1920.....  | 59         | 1       |            | 2        | 2       |           | 4         |
| 36 Number, 1910.....  | 44         | 1       |            |          | 1       | 1         | 8         |
| 37 Capacity, 1920.....acre-feet..   | 197,690    | 40      |            | 860      | 152     |           | 95        |
| 38 Capacity, 1910.....acre-feet..   | 2,098      | 240     |            |          | 1       | 13        | 40        |
| 39 Flowing wells:   |            |         |            |          |         |           |           |
| 40 Number, 1920.....  |            |         |            |          |         |           |           |
| 41 Number, 1910.....  |            |         |            |          |         |           |           |
| 42 Capacity, 1920.....gallons per minute..  |            |         |            |          |         |           |           |
| 43 Capacity, 1910.....gallons per minute..  |            |         |            |          |         |           |           |
| 44 Pumped wells:  |            |         |            |          |         |           |           |
| 45 Number, 1920.....  | 34         |         |            | 1        | 1       |           |           |
| 46 Number, 1910.....  | 66         | 8       | 2          |          |         | 13        |           |
| 47 Capacity, 1920.....gallons per minute..  | 24,701     |         |            | 450      | 300     |           |           |
| 48 Capacity, 1910.....gallons per minute..  | 3,363      | 30      | 30         |          |         | 80        |           |
| 49 Pumping plants:  |            |         |            |          |         |           |           |
| 50 Number, 1920.....  | 51         |         |            | 3        | 2       | 1         |           |
| 51 Number, 1910.....  | 75         |         |            | 1        |         |           |           |
| 52 Engine capacity, 1920.....horsepower..   | 959        | 8       | 2          |          |         | 13        |           |
| 53 Engine capacity, 1910.....horsepower..   | 140        |         |            | 18       | 40      | 8         |           |
| 54 Pump capacity, 1920.....gallons per minute..   | 73,688     | 8       | 3          | 4        |         | 8         |           |
| 55 Pump capacity, 1910.....gallons per minute..   | 5,866      |         |            | 836      | 6,300   | 480       |           |
| 56 Average lift, 1920.....feet..  | 24         | 30      | 30         | 20       |         | 80        |           |
| 57  |            |         |            | 23       | 19      | 8         |           |
| <b>CAPITAL INVESTED.</b>  |            |         |            |          |         |           |           |
| 58 Capital invested to Jan. 1, 1920.....dollars..   | 13,909,185 | 47,760  | 32,410     | 301,750  | 39,095  | 6,310     | 49,137    |
| 59 Capital invested to July 1, 1910.....dollars..   | 7,798,310  | 13,754  | 6,115      | 205      | 28,273  | 2,493     | 19,388    |
| 60 Per cent of increase, 1910-1920.....   | 78.4       | 247.2   | 430.0      |          | 38.3    | 153.1     | 153.4     |
| 61 Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 24.73      | 14.55   | 10.58      | 98.64    | 9.07    | 4.85      | 8.50      |
| 62 Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 18.17      | 7.00    | 5.21       | 102.50   | 5.93    | 2.38      | 4.85      |
| <b>ESTIMATED FINAL COST.</b>  |            |         |            |          |         |           |           |
| 63 Estimated final cost of existing enterprises in 1920.....dollars..   | 18,030,154 | 49,260  | 32,410     | 301,750  | 41,095  | 6,310     | 49,437    |
| 64 Estimated final cost of existing enterprises in 1910.....dollars..   | 9,485,231  | 13,754  | 6,115      | 205      | 28,273  | 2,493     | 19,388    |
| 65 Per cent of increase, 1910-1920.....   | 90.1       | 253.2   | 430.0      |          | 45.4    | 153.1     | 155.0     |
| 66 Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 23.51      | 11.46   | 8.52       | 47.01    | 9.15    | 4.60      | 8.30      |
| 67 Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 13.95      | 6.52    | 4.45       | 51.25    | 4.57    | 2.38      | 4.46      |

# IRRIGATION—NEBRASKA.

11

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS; AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |  | Dawes.  | Dawson. | Deuel.  | Dundy.  | Garden. <sup>1</sup> | Hitchcock. | Keith.  |
|------------------------------|--|---------|---------|---------|---------|----------------------|------------|---------|
| 1                            | Number of all farms in 1920.....   | 728     | 1,934   | 384     | 661     | 714                  | 776        | 673     |
| 2                            | Number of farms irrigated in 1919.....   | 58      | 330     | 40      | 27      | 97                   | 96         | 111     |
| 3                            | Per cent of all farms.....   | 8.0     | 17.1    | 10.4    | 4.1     | 13.6                 | 12.4       | 16.5    |
| 4                            | Number of farms irrigated in 1909.....   | 67      | 109     | 31      | 28      | 70                   | 102        | 98      |
| 5                            | Per cent of increase, 1909-1919.....   |         | 202.8   |         |         |                      | -5.9       |         |
| <b>LAND AND FARM AREA.</b>   |  |         |         |         |         |                      |            |         |
| 6                            | Approximate land area.....acres..  | 897,280 | 630,400 | 280,960 | 593,280 | 1,079,680            | 463,360    | 683,520 |
| 7                            | All land in farms.....acres..  | 822,158 | 570,874 | 202,689 | 474,055 | 884,328              | 413,283    | 614,842 |
| 8                            | Improved land in farms.....acres..   | 136,939 | 377,185 | 98,194  | 179,082 | 226,316              | 202,767    | 218,703 |
| 9                            | Area irrigated in 1919.....acres..   | 9,005   | 33,700  | 10,317  | 9,045   | 20,488               | 9,786      | 25,832  |
| 10                           | Per cent of improved land in farms.....  | 6.6     | 8.9     | 10.5    | 5.1     | 9.1                  | 4.8        | 11.8    |
| 11                           | Area irrigated in 1909.....acres..   | 7,029   | 12,742  | 4,745   | 3,069   | 16,164               | 12,210     | 13,140  |
| 12                           | Per cent of increase, 1909-1919.....   | 28.1    | 164.5   | 117.4   | 194.7   |                      | -19.9      | 66.6    |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 19,052  | 64,725  | 11,755  | 10,918  | 25,554               | 10,226     | 31,466  |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 12,389  | 30,933  | 4,660   | 6,006   | 21,604               | 12,850     | 19,581  |
| 15                           | Per cent of increase, 1910-1920.....   | 53.8    | 109.2   | 152.3   | 81.8    |                      | -20.4      | 60.7    |
| 16                           | Area included in enterprises in 1920.....acres..   | 24,326  | 141,610 | 13,155  | 14,118  | 26,714               | 10,576     | 33,974  |
| 17                           | Area included in enterprises in 1910.....acres..   | 12,896  | 126,809 | 9,568   | 6,121   | 47,429               | 21,250     | 36,160  |
| 18                           | Per cent of increase, 1910-1920.....   | 88.6    | 11.7    | 37.5    | 130.6   |                      | -50.2      | -6.0    |
| <b>IRRIGATION WORKS.</b>     |  |         |         |         |         |                      |            |         |
| Independent enterprises:     |  |         |         |         |         |                      |            |         |
| 19                           | Number, 1920.....  | 88      | 13      | 21      | 12      | 31                   | 3          | 35      |
| 20                           | Number, 1910.....  | 78      | 8       | 7       | 16      | 33                   | 5          | 26      |
| Main ditches:                |  |         |         |         |         |                      |            |         |
| 21                           | Number, 1920.....  | 90      | 19      | 25      | 11      | 34                   | 3          | 38      |
| 22                           | Number, 1910.....  | 75      | 3       | 5       | 12      | 34                   | 5          | 24      |
| 23                           | Length, 1920.....miles..   | 149     | 152     | 39      | 46      | 128                  | 33         | 111     |
| 24                           | Length, 1910.....miles..   | 113     | 67      | 16      | 45      | 119                  | 56         | 93      |
| 25                           | Capacity, 1920.....second-feet..   | 282     | 1,145   | 296     | 203     | 480                  | 160        | 722     |
| 26                           | Capacity, 1910.....second-feet..   | 232     | 600     | 72      | 161     | 816                  | 217        | 410     |
| Laterals:                    |  |         |         |         |         |                      |            |         |
| 27                           | Number, 1920.....  | 132     | 17      | 49      | 18      | 37                   | 1          | 114     |
| 28                           | Number, 1910.....  | 99      | 8       | 6       | 8       | 38                   | 1          | 13      |
| 29                           | Length, 1920.....miles..   | 82      | 39      | 35      | 16      | 37                   |            | 40      |
| 30                           | Length, 1910.....miles..   | 32      | 71      | 8       | 5       | 17                   | 2          | 20      |
| Reservoirs:                  |  |         |         |         |         |                      |            |         |
| 31                           | Number, 1920.....  | 17      |         | 2       |         | 2                    |            | 1       |
| 32                           | Number, 1910.....  | 7       | 1       |         | 2       | 1                    |            | 2       |
| 33                           | Capacity, 1920.....acre-feet..   | 1,302   |         | 3       |         | 100,000              |            | 5       |
| 34                           | Capacity, 1910.....acre-feet..   | 220     | 1       |         | 12      | 2                    |            | 2       |
| Flowing wells:               |  |         |         |         |         |                      |            |         |
| 35                           | Number, 1920.....  |         |         |         |         |                      |            |         |
| 36                           | Number, 1910.....  |         |         |         |         |                      |            |         |
| 37                           | Capacity, 1920.....gallons per minute..  |         |         |         |         |                      |            |         |
| 38                           | Capacity, 1910.....gallons per minute..  |         |         |         |         |                      |            |         |
| Pumped wells:                |  |         |         |         |         |                      |            |         |
| 39                           | Number, 1920.....  | 2       | 8       | 2       |         |                      |            | 3       |
| 40                           | Number, 1910.....  | 1       | 5       |         |         | 4                    |            | 2       |
| 41                           | Capacity, 1920.....gallons per minute..  | 2,200   | 3,901   | 2,450   |         |                      |            | 1,500   |
| 42                           | Capacity, 1910.....gallons per minute..  | 10      | 80      |         |         | 100                  |            | 5       |
| Pumping plants:              |  |         |         |         |         |                      |            |         |
| 43                           | Number, 1920.....  | 3       | 9       | 4       |         | 3                    | 1          | 2       |
| 44                           | Number, 1910.....  | 1       | 5       |         |         | 4                    |            | 2       |
| 45                           | Engine capacity, 1920.....horsepower..   | 53      | 97      | 78      |         | 64                   | 25         | 35      |
| 46                           | Engine capacity, 1910.....horsepower..   | 1       | 8       |         |         | 10                   |            | 2       |
| 47                           | Pump capacity, 1920.....gallons per minute..   | 4,000   | 5,430   | 8,182   |         | 5,500                | 2,500      | 2,400   |
| 48                           | Pump capacity, 1910.....gallons per minute..   | 10      | 80      |         | 54      | 100                  |            | 5       |
| 49                           | Average lift, 1920.....feet..  | 25      | 36      | 16      |         | 9                    | 10         | 13      |
| <b>CAPITAL INVESTED.</b>     |  |         |         |         |         |                      |            |         |
| 50                           | Capital invested to Jan. 1, 1920.....dollars..   | 211,145 | 170,435 | 59,613  | 111,800 | 229,001              | 162,500    | 205,734 |
| 51                           | Capital invested to July 1, 1910.....dollars..   | 70,479  | 230,250 | 44,967  | 41,479  | 89,323               | 216,350    | 84,200  |
| 52                           | Per cent of increase, 1910-1920.....   | 199.6   | -26.0   | 32.6    | 169.5   |                      | -24.9      | 144.3   |
| 53                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 11.08   | 2.63    | 5.07    | 10.24   | 8.96                 | 15.89      | 6.54    |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 5.69    | 7.44    | 9.65    | 6.91    | 4.13                 | 10.84      | 4.30    |
| <b>ESTIMATED FINAL COST.</b> |  |         |         |         |         |                      |            |         |
| 55                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 243,245 | 270,435 | 59,613  | 112,300 | 270,201              | 162,500    | 221,334 |
| 56                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 70,479  | 230,250 | 44,967  | 41,479  | 89,323               | 216,350    | 84,200  |
| 57                           | Per cent of increase, 1910-1920.....   | 245.1   | 17.5    | 32.6    | 170.7   |                      | -24.9      | 162.9   |
| 58                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 10.00   | 1.91    | 4.53    | 7.95    | 10.11                | 15.36      | 6.51    |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 5.47    | 1.82    | 4.70    | 6.78    | 1.88                 | 10.18      | 2.33    |

<sup>1</sup> Part annexed to Grant County in 1919.

## IRRIGATION—NEBRASKA.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |  | Kimball. | Lincoln.  | Morrill.  | Red-<br>willow. | Scotts<br>Bluff. | Sherman. | Sioux.    | All other<br>counties. |
|------------------------------|--|----------|-----------|-----------|-----------------|------------------|----------|-----------|------------------------|
| 1                            | Number of all farms in 1920.....   | 456      | 2,024     | 957       | 1,091           | 1,391            | 1,337    | 842       | 103,908                |
| 2                            | Number of farms irrigated in 1919.....   | 50       | 203       | 397       | 33              | 1,166            | 6        | 312       | 27                     |
| 3                            | Per cent of all farms.....   | 11.0     | 10.0      | 41.5      | 3.0             | 83.8             | 0.4      | 37.1      | (1)                    |
| 4                            | Number of farms irrigated in 1909.....   | 18       | 98        | 109       | 17              | 702              | 1        | 234       | 85                     |
| 5                            | Per cent of increase 1909-1919.....  |          |           | 264.2     |                 | 66.1             |          | 33.3      |                        |
| <b>LAND AND FARM AREA.</b>   |  |          |           |           |                 |                  |          |           |                        |
| 6                            | Approximate land area.....acres..  | 613,120  | 1,623,040 | 996,880   | 460,800         | 402,720          | 366,720  | 1,315,200 | 31,845,760             |
| 7                            | All land in farms.....acres..  | 347,591  | 1,383,879 | 647,543   | 420,737         | 281,492          | 339,005  | 1,079,327 | 28,012,527             |
| 8                            | Improved land in farms.....acres..   | 115,174  | 512,778   | 152,555   | 257,025         | 157,176          | 244,043  | 108,353   | 18,895,634             |
| 9                            | Area irrigated in 1919.....acres..   | 9,101    | 35,246    | 55,216    | 4,013           | 173,245          | 850      | 29,796    | 1,126                  |
| 10                           | Per cent of improved land in farms.....  | 7.9      | 6.9       | 36.2      | 1.6             | 110.2            | 0.3      | 27.5      | (1)                    |
| 11                           | Area irrigated in 1909.....acres..   | 3,432    | 34,760    | 29,445    | 2,003           | 100,301          | 3        | 5,576     | 836                    |
| 12                           | Per cent of increase, 1909-1919.....   | 165.2    | 1.4       | 87.5      | 100.3           | 72.7             |          | 434.4     | 34.7                   |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 11,117   | 41,811    | 70,645    | 4,700           | 196,229          | 1,200    | 39,793    | 2,483                  |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 3,507    | 38,240    | 56,990    | 10,003          | 191,206          | 3        | 7,170     | 1,135                  |
| 15                           | Per cent of increase, 1910-1920.....   | 217.0    | 9.3       | 24.0      | —53.0           | 2.6              |          | 455.0     | 118.8                  |
| 16                           | Area included in enterprises in 1920.....acres..   | 11,224   | 45,421    | 100,588   | 4,928           | 251,647          | 1,500    | 47,307    | 13,338                 |
| 17                           | Area included in enterprises in 1910.....acres..   | 3,901    | 55,820    | 70,296    | 10,003          | 224,185          | 3        | 39,159    | 1,468                  |
| 18                           | Per cent of increase, 1910-1920.....   | 187.7    | —18.6     | 43.1      | —50.7           | 12.2             |          | 20.8      | 808.6                  |
| <b>IRRIGATION WORKS.</b>     |  |          |           |           |                 |                  |          |           |                        |
| 19                           | Independent enterprises:   |          |           |           |                 |                  |          |           |                        |
| 20                           | Number, 1920.....  | 16       | 10        | 48        | 9               | 28               | 1        | 54        | 23                     |
|                              | Number, 1910.....  | 26       | 8         | 36        | 1               | 20               | 1        | 76        | 71                     |
| 21                           | Main ditches:  |          |           |           |                 |                  |          |           |                        |
| 22                           | Number, 1920.....  | 23       | 10        | 48        | 8               | 30               | 1        | 65        | 19                     |
| 23                           | Number, 1910.....  | 26       | 9         | 39        | 1               | 22               |          | 74        | 22                     |
| 24                           | Length, 1920.....miles..   | 64       | 103       | 225       | 21              | 404              | 8        | 125       | 17                     |
| 25                           | Length, 1910.....miles..   | 42       | 134       | 191       | 20              | 326              |          | 100       | 38                     |
| 26                           | Capacity, 1920.....second-feet..   | 174      | 710       | 1,386     | 66              | 4,754            | 31       | 558       | 176                    |
|                              | Capacity, 1910.....second-feet..   | 104      | 1,175     | 1,058     | 150             | 3,923            |          | 151       | 34                     |
| 27                           | Laterals:  |          |           |           |                 |                  |          |           |                        |
| 28                           | Number, 1920.....  | 20       | 27        | 187       | 14              | 100              | 3        | 48        | 36                     |
| 29                           | Number, 1910.....  | 36       | 12        | 215       |                 | 465              |          | 69        | 13                     |
| 30                           | Length, 1920.....miles..   | 11       | 107       | 343       | 8               | 635              | 6        | 107       | 8                      |
|                              | Length, 1910.....miles..   | 18       | 45        | 253       |                 | 765              |          | 23        | 4                      |
| 31                           | Reservoirs:  |          |           |           |                 |                  |          |           |                        |
| 32                           | Number, 1920.....  | 7        | 1         | 2         | 1               | 4                |          | 8         | 5                      |
| 33                           | Number, 1910.....  |          |           |           |                 | 1                |          | 16        | 3                      |
| 34                           | Capacity, 1920.....acre-feet..   | 7,058    | 4         | 4         | 10              | 75,165           |          | 132       | 13,060                 |
|                              | Capacity, 1910.....acre-feet..   |          |           |           |                 | 1,000            |          | 500       | 7                      |
| 35                           | Flowing wells:   |          |           |           |                 |                  |          |           |                        |
| 36                           | Number, 1920.....  |          |           |           |                 |                  |          |           |                        |
| 37                           | Number, 1910.....  |          |           |           |                 |                  |          |           |                        |
| 38                           | Capacity, 1920.....gallons per minute..  |          |           |           |                 |                  |          |           |                        |
|                              | Capacity, 1910.....gallons per minute..  |          |           |           |                 |                  |          |           |                        |
| 39                           | Pumped wells:  |          |           |           |                 |                  |          |           |                        |
| 40                           | Number, 1920.....  |          |           |           | 11              |                  |          |           | 6                      |
| 41                           | Number, 1910.....  |          |           |           | 5               |                  | 1        |           | 23                     |
| 42                           | Capacity, 1920.....gallons per minute..  |          |           |           | 4,700           |                  |          |           | 9,200                  |
|                              | Capacity, 1910.....gallons per minute..  |          |           | 2,500     | 30              | 165              | 25       |           | 308                    |
| 43                           | Pumping plants:  |          |           |           |                 |                  |          |           |                        |
| 44                           | Number, 1920.....  |          | 1         |           | 7               |                  |          |           | 16                     |
| 45                           | Number, 1910.....  |          |           |           | 5               |                  |          |           | 25                     |
| 46                           | Engine capacity, 1920.....horsepower..   |          | 10        |           | 312             |                  | 1        |           | 210                    |
| 47                           | Engine capacity, 1910.....horsepower..   |          |           | 20        | 3               |                  | 3        |           | 51                     |
| 48                           | Pump capacity, 1920.....gallons per minute..   |          | 600       |           | 18,403          |                  |          |           | 10,055                 |
| 49                           | Pump capacity, 1910.....gallons per minute..   |          |           | 2,500     | 30              | 165              | 25       | 412       | 1,825                  |
|                              | Average lift, 1920.....feet..  |          | 35        |           | 28              |                  |          |           |                        |
| <b>CAPITAL INVESTED.</b>     |  |          |           |           |                 |                  |          |           |                        |
| 50                           | Capital invested to Jan. 1, 1920.....dollars..   | 270,500  | 330,481   | 2,502,018 | 74,450          | 7,037,085        | 12,000   | 1,978,842 | 77,119                 |
| 51                           | Capital invested to July 1, 1910.....dollars..   | 15,778   | 255,950   | 337,191   | 50,477          | 6,204,582        | 54       | 69,122    | 17,880                 |
| 52                           | Per cent of increase, 1910-1920.....   |          | 29.1      | 642.0     | 47.5            | 13.4             |          |           | 331.3                  |
| 53                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 24.33    | 7.90      | 35.42     | 15.84           | 35.86            | 10.00    | 49.73     | 31.06                  |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 4.50     | 6.69      | 5.92      | 5.05            | 32.45            | 18.00    | 9.64      | 15.75                  |
| <b>ESTIMATED FINAL COST.</b> |  |          |           |           |                 |                  |          |           |                        |
| 55                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 270,500  | 330,481   | 3,029,213 | 75,450          | 9,585,622        | 12,000   | 2,727,029 | 179,969                |
| 56                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 15,778   | 255,950   | 337,191   | 50,477          | 7,891,503        | 54       | 69,122    | 17,880                 |
| 57                           | Per cent of increase, 1910-1920.....   |          | 29.1      | 798.4     | 49.5            | 21.5             |          |           | 906.5                  |
| 58                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 24.10    | 7.28      | 30.12     | 15.31           | 38.09            | 8.00     | 57.65     | 13.49                  |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 4.04     | 4.59      | 4.80      | 5.05            | 35.20            | 18.00    | 1.77      | 12.18                  |

<sup>1</sup> Less than one-tenth of 1 per cent.

## IRRIGATION : NEVADA

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 7     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 8     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 8     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 8     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 11    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises, irrigation works, and capital invested in irrigation enterprises, 1920 and 1910. | 12    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 5     |  |       |
| Acreage, by drainage basins.....                       | 6     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of Nevada collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of show-

ing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

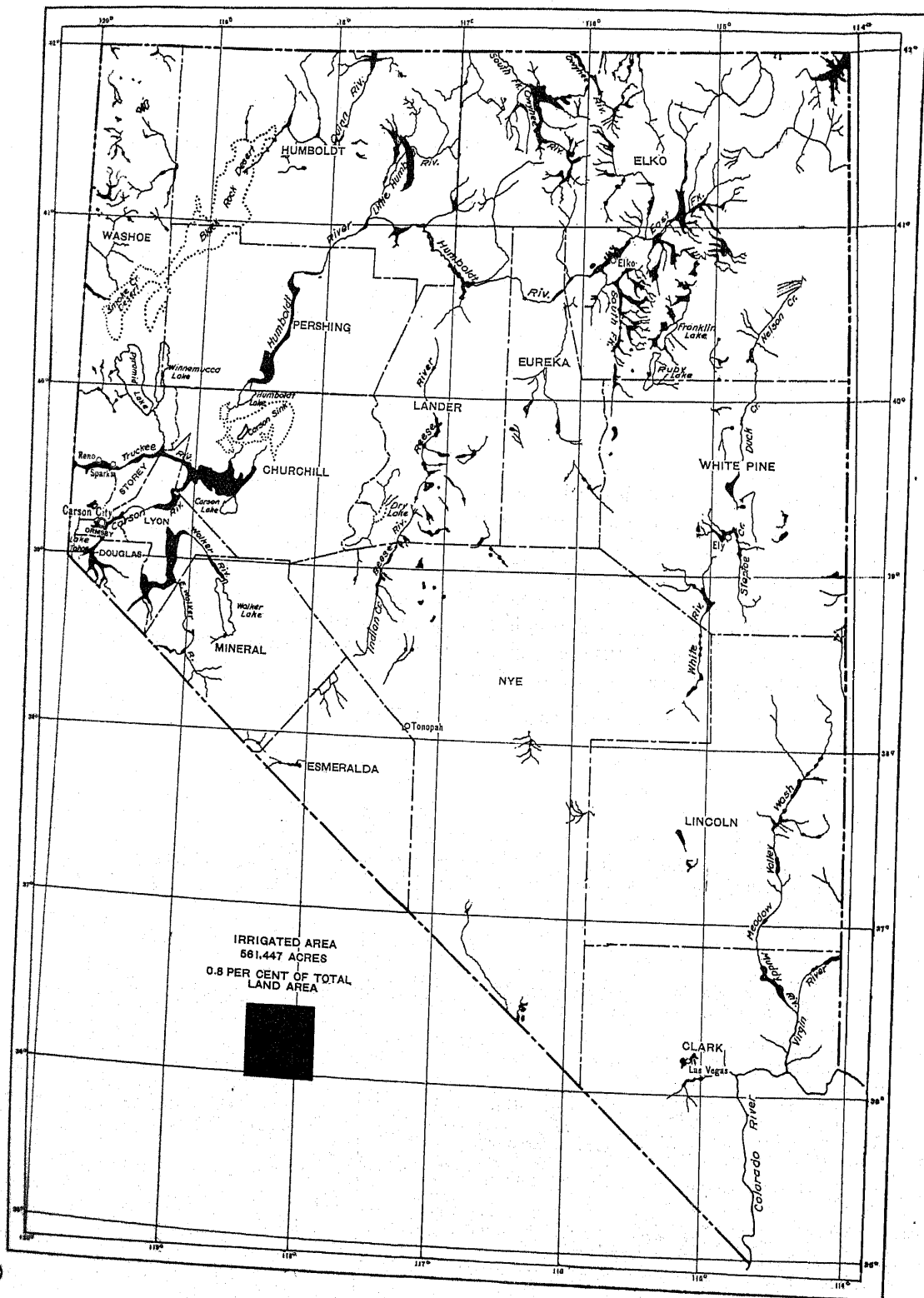
TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.  | CENSUS OF—     |                  | INCREASE. <sup>1</sup> |           |
|--|----------------|------------------|------------------------|-----------|
|  | 1920           | 1910             | Amount.                | Per cent. |
| Number of all farms.....   | 3, 163         | 2, 689           | 474                    | 17. 6     |
| Approximate land area of state..... acres..  | 70, 285, 440   | 70, 285, 440     |                        |           |
| All land in farms..... acres..   | 2, 357, 163    | 2, 714, 757      | —357, 594              | —13. 2    |
| Improved land in farms..... acres..  | 594, 741       | 752, 117         | —157, 376              | —20. 9    |
| Number of farms irrigated.....   | 2, 718         | 2, 406           | 312                    | 13. 0     |
| Area irrigated..... acres..  | 561, 447       | 701, 833         | —140, 386              | —20. 0    |
| Area enterprises were capable of irrigating..... acres..                               | 704, 708       | 840, 962         | —136, 254              | —16. 2    |
| Area included in enterprises..... acres..  | 1, 382, 036    | 1, 232, 142      | 149, 894               | 12. 2     |
| Per cent irrigated:  |                |                  |                        |           |
| Number of all farms.....   | 85. 9          | 89. 5            | —3. 6                  |           |
| Approximate land area of state.....  | 0. 8           | 1. 0             | —0. 2                  |           |
| Land in farms.....   | 23. 8          | 25. 9            | —2. 1                  |           |
| Improved land in farms.....  | 94. 4          | 93. 3            | 1. 1                   |           |
| Excess of area enterprises were capable of irrigating over area irrigated..... acres.. | 122, 161       | 139, 129         | —16, 968               | —12. 2    |
| Excess of area included in enterprises over area irrigated..... acres..                | 801, 589       | 530, 309         | 271, 280               | 51. 2     |
| Area of irrigated land reported as available for settlement..... acres..               | 139, 352       | ( <sup>2</sup> ) |                        |           |
| Capital invested.....  | \$14, 754, 280 | \$6, 721, 924    | \$8, 032, 356          | 119. 5    |
| Average per acre enterprises were capable of irrigating.....                           | \$20. 94       | \$7. 99          | \$12. 95               | 162. 1    |
| Estimated final cost of existing enterprises.....                                      | \$22, 648, 747 | \$12, 188, 756   | \$10, 459, 991         | 85. 8     |
| Average per acre included in enterprises.....  | \$16. 39       | \$9. 89          | \$6. 50                | 65. 7     |
| Average cost of operation and maintenance per acre.....                                | \$0. 79        | \$0. 97          | —\$0. 18               | —18. 6    |

<sup>1</sup>A minus sign (—) denotes decrease.<sup>2</sup> Not reported in 1910.

# NEVADA

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.



**CLIMATIC CONDITIONS.**

Except for small areas on the extreme western border, the surface of the state of Nevada consists of broken ranges of mountains, with broad, sage-covered valleys between. Along the western border the state extends into the Sierra Nevada Mountains.

Precipitation is heavy in the Sierra Nevadas, particularly snowfall in the winter, and, as is usually the case, immediately to the east of the mountains precipitation drops suddenly, then increases gradually to the east, the driest part of the state being in the lowest part, which lies near the western border. A very small area on the western border of the state receives more than 15 inches of precipitation annually, a narrow strip east of that receives from 12 to 15 inches, another narrow strip receives from 9 to 12 inches, followed by another that receives from 6 to 9 inches. East of this, and extending along the southwestern border of the state and taking in the whole southern end, is a wide zone that receives less than 6 inches of precipitation annually. East and north of this the amount increases, rising to 12 to 15 inches in a section lying just east of the center of the state. Taking the state as a whole the average annual precipitation is less than 10 inches. More than half of this occurs in the winter, the summers being extremely dry and hot. In the Sierra Nevada Mountains the snowfall in winter is very heavy and the snow lies well into the summer.

The year 1919 was one of the driest years on record, the average precipitation for the state being about 7 inches, while the normal is about 9.5 inches. April and May were warm months, and the snow melted earlier than usual, thus decreasing the supply of water later in the season. The drouth was detrimental to crops where stored water was not available, and to pastures and ranges generally.

The state has a wide range of temperature. The extreme southern point of the state is semitropical, the growing season extending seven or eight months, while in some of the higher valleys in the Sierras it is but two or three months. In most of the valleys of the state the growing season is about six months.

In only very small areas in the state can crops be grown without irrigation in normal years.

**WATER SUPPLY FOR IRRIGATION.**

Except for a small area in the extreme southern point of the state, which is in the Colorado River drainage, and a somewhat larger area along the northern border of the state, which is in the Snake River drainage, the state of Nevada lies within the Great Basin and has no outlet to the sea. The rivers rise in the mountains and lose their waters by evaporation and seepage along their channels or flow into lakes or sinks, where the water evaporates, leaving large deposits of salt and other alkalis.

The principal streams are Humboldt River, which rises in the northeastern part of the state and flows in a southwesterly direction to the sinks in the western part of the state, and Truckee, Carson, and Walker Rivers, which rise in the Sierra Nevada Mountains in California and flow in an easterly direction to the sinks in the same part of the state.

Humboldt River, rising in the extreme northeastern part of the state, flows in a westerly and southwesterly direction, breaking through successive ranges of mountains which have a general north and south direction, forming a succession of valleys along the river. Tributaries reach the river from both north and south, draining the valleys between the mountain ranges. The discharge of the Humboldt and its tributaries is typical of such streams, being high in spring, when the snow melts, and very low in the summer. Without storage, crops are limited to such as mature early; in fact, the larger part of the irrigation along the Humboldt consists of flooding wild-grass meadows when the stream is in flood. Schemes for storage have been discussed but never carried out.

Truckee River rises in Lake Tahoe, which lies on the boundary between Nevada and California, and after a northerly course in the mountains in California, turns eastward into Nevada, where it waters considerable land in Truckee Meadows, near Reno, and below is diverted into the drainage basin of Carson River, to supply a part of the land in the Newlands Project of the United States Reclamation Service. Plans for using Lake Tahoe for storing water for summer use are delayed by controversies between water users in Nevada and the owners of land around the lake in California. Storage for a part of Truckee River water is provided for in Lahontan Reservoir of the United States Reclamation Service.

Carson and Walker Rivers also rise in the Sierra Nevadas in California and flow in a northeasterly direction into Carson Lake and Walker Lake, respectively, after being used for irrigation in the valleys through which they pass. Complete use of these streams requires storage, which has not yet been provided, except that some of the water of Carson River is stored in Lahontan Reservoir.

In the extreme southern part of the state Virgin River and its tributary, Muddy River, supply small areas, and in the northern part of the state tributaries of Snake River water small areas.

In by far the larger part of the state there is little or no surface water available for irrigation, but some of the streams water small areas before losing their water in the deserts.

In several of the valleys of the state wells have been put down and water obtained for small areas. No doubt much more land can be watered from this source if the value of the crops justifies the expense.

## FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                       |                        | AREA IRRIGATED. |                                    |                              |                            |                                     |
|--------------|------------------|-----------------------|------------------------|-----------------|------------------------------------|------------------------------|----------------------------|-------------------------------------|
|              | Number.          | Per cent of increase. | Per cent of all farms. | Acres.          | Per cent of increase. <sup>1</sup> | Per cent of total land area. | Per cent of land in farms. | Per cent of improved land in farms. |
| 1920.....    | 2,718            | 13.0                  | 85.9                   | 561,447         | -20.0                              | 0.8                          | 23.8                       | 94.4                                |
| 1910.....    | 2,406            | 26.2                  | 89.5                   | 701,833         | 39.2                               | 1.0                          | 25.9                       | 93.3                                |
| 1900.....    | 1,906            | 63.3                  | 87.3                   | 504,168         | 124.7                              | 0.7                          | 19.7                       | 88.0                                |
| 1890.....    | 1,167            |                       | 91.4                   | 224,408         |                                    | 0.3                          | 13.5                       | 31.0                                |

<sup>1</sup> A minus sign (-) denotes decrease.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Number of enterprises. | Area included in enterprises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                     | Area enterprises were capable of irrigating in 1920 (acres). |
|--------------------|------------------------|---|-------------------------|-------------------------------------|--|
|                    |                        |   | Acres.                  | Per cent of acreage in enterprises. |  |
| Total.....         | 1,015                  | 1,382,036                                   | 561,447                 | 40.6                                | 704,708  |
| Before 1890.....   | 23                     | 5,993                                       | 4,782                   | 79.8                                | 5,072  |
| 1890-1899.....     | 131                    | 456,730                                     | 171,817                 | 37.5                                | 183,064  |
| 1870-1879.....     | 147                    | 228,749                                     | 124,723                 | 54.5                                | 142,042  |
| 1880-1889.....     | 114                    | 178,291                                     | 83,562                  | 46.0                                | 124,227  |
| 1890-1899.....     | 52                     | 21,452                                      | 9,081                   | 42.3                                | 11,708   |
| 1900-1904.....     | 58                     | 238,961                                     | 60,897                  | 25.5                                | 89,530   |
| 1905-1909.....     | 29                     | 23,253                                      | 18,770                  | 80.7                                | 19,465   |
| 1910-1914.....     | 133                    | 56,456                                      | 24,833                  | 44.0                                | 35,034   |
| 1915-1919.....     | 132                    | 53,214                                      | 13,937                  | 26.2                                | 36,045   |
| Not reported.....  | 196                    | 118,937                                     | 49,545                  | 41.7                                | 58,521   |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                  | AREA IRRIGATED (ACRES). |                  |                        |           | Area enterprises were capable of irrigating in 1920 (acres). | Area included in enterprises, 1920 (acres). |
|---|-------------------------|------------------|------------------------|-----------|--|---|
|   | 1919                    | 1909             | Increase. <sup>1</sup> |           |  |   |
|   |                         |                  | Amount.                | Per cent. |  |   |
| Total .....                             | 561, 447                | 701, 833         | -140, 386              | -20.0     | 704, 708   | 1, 382, 036                                 |
| Stream, gravity.....                    | 466, 812                | 661, 299         | -194, 487              | -29.4     | 585, 105   | 1, 130, 770                                 |
| Stream, pumped.....                     | 2, 647                  | 463              | 2, 184                 | 471.7     | 2, 675   | 4, 330                                      |
| Stream, pumped and gravity.....         | 720                     | ( <sup>2</sup> ) | 720                    | -----     | 720  | 740   |
| Wells, pumped.....                      | 295                     | 37               | 258                    | -----     | 524  | 1, 546                                      |
| Wells, flowing.....                     | 811                     | 150              | 661                    | 440.7     | 1, 210   | 5, 577                                      |
| Wells, flowing and pumped.....          | 65                      | ( <sup>2</sup> ) | 65                     | -----     | 70   | 332   |
| Lake, gravity.....                      | 445                     | 500              | -55                    | -11.0     | 1, 410   | 4, 516                                      |
| Lake, pumped.....                       |                         | 406              | -406                   | -----     |  |   |
| Springs.....                            | 21, 987                 | 38, 840          | -16, 853               | -43.4     | 25, 659  | 72, 179                                     |
| Stored storm water.....                 | 17, 348                 | 138              | 17, 210                | -----     | 17, 508  | 23, 648                                     |
| City water.....                         | 14                      | ( <sup>2</sup> ) | 14                     | -----     | 20   | 20  |
| Sewage.....                             | 88                      | ( <sup>2</sup> ) | 88                     | -----     | 88   | 708   |
| Stream, gravity, and pumped wells.....  | 4, 957                  | ( <sup>2</sup> ) | 4, 957                 | -----     | 8, 024   | 22, 764                                     |
| Stream, gravity, and flowing wells..... | 82                      | ( <sup>2</sup> ) | 82                     | -----     | 82   | 592   |
| Other mixed.....                        | 45, 176                 | ( <sup>2</sup> ) | 45, 176                | -----     | 61, 613  | 114, 314                                    |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when base is less than 10% or when per cent is more than 1,000.<sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF ENTERPRISE.

In 1889 Nevada enacted a law dividing the state into internal improvements districts, and provided for the issuing of bonds by such districts. The next

legislature, in 1891, enacted a district law similar to those enacted by other Western states, and this has been amended from time to time. But one district is reported in the state, and this was organized to take over works already built. This accounts, in part, for the decrease in the acreage reported for individual and cooperative enterprises in Table 5. The land in the Newlands Project of the United States Reclamation Service has been organized into an irrigation district, but this land is credited to the Reclamation Service in Table 5, because the Government built the works and still controls them to a large extent.

Nevada accepted the terms of the Federal Carey Act (act of Congress, Aug. 18, 1894) in 1895, but no land is reported as being supplied with water under this law.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE:  
1920 AND 1910.

| ITEM AND CLASS.                                 | CENSUS OF— |                  | INCREASE. <sup>1</sup> |           |
|---|------------|------------------|------------------------|-----------|
|   | 1920       | 1910             | Acres.                 | Per cent. |
| ACREAGE IRRIGATED.                              |            |                  |                        |           |
| Total.....                                      | 561,447    | 701,833          | -140,386               | -20.0     |
| Individual and partnership.....                 | 355,901    | 581,406          | -225,505               | -38.8     |
| Cooperative.....                                | 69,877     | 78,966           | -9,089                 | -11.5     |
| Irrigation district.....                        | 80,000     |                  | 80,000                 |           |
| Commercial.....                                 | 5,990      | 8,884            | -2,874                 | -32.4     |
| U. S. Reclamation Service.....                  | 44,324     | 30,000           | 14,324                 | 47.7      |
| U. S. Indian Service.....                       | 5,321      | 2,597            | 2,724                  | 104.9     |
| State.....                                      | 12         | ( <sup>2</sup> ) | 12                     |           |
| City.....                                       | 22         | ( <sup>2</sup> ) | 22                     |           |
| ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING. |            |                  |                        |           |
| Total.....                                      | 704,708    | 840,962          | -136,254               | -16.2     |
| Individual and partnership.....                 | 453,900    | 649,841          | -195,941               | -30.2     |
| Cooperative.....                                | 85,483     | 88,255           | -2,772                 | -3.1      |
| Irrigation district.....                        | 80,000     |                  | 80,000                 |           |
| Commercial.....                                 | 7,240      | 9,300            | -2,060                 | -22.2     |
| U. S. Reclamation Service.....                  | 69,850     | 90,185           | -20,335                | -22.5     |
| U. S. Indian Service.....                       | 8,195      | 3,381            | 4,814                  | 142.4     |
| State.....                                      | 12         | ( <sup>2</sup> ) | 12                     |           |
| City.....                                       | 28         | ( <sup>2</sup> ) | 28                     |           |
| ACREAGE INCLUDED IN ENTERPRISES.                |            |                  |                        |           |
| Total.....                                      | 1,382,036  | 1,232,142        | 149,894                | 12.2      |
| Individual and partnership.....                 | 807,045    | 844,128          | -37,083                | -4.4      |
| Cooperative.....                                | 93,253     | 123,269          | -30,016                | -27.9     |
| Irrigation district.....                        | 260,000    |                  | 260,000                |           |
| Commercial.....                                 | 14,240     | 24,500           | -10,260                | -41.9     |
| U. S. Reclamation Service.....                  | 192,000    | 216,185          | -24,185                | -11.2     |
| U. S. Indian Service.....                       | 15,390     | 18,060           | -2,670                 | -14.8     |
| State.....                                      | 80         | ( <sup>2</sup> ) | 80                     |           |
| City.....                                       | 28         | ( <sup>2</sup> ) | 28                     |           |

<sup>1</sup> A minus sign (-) denotes decrease. <sup>2</sup> Not included in classification in 1910.

## ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of Nevada relating to water rights are summarized in the following paragraphs:

In 1866 the legislature enacted a law requiring any person desiring to construct or maintain any ditch or flume to make a certificate describing the ditch, before some officer competent to take acknowledgments of deeds. No provision for recording these certificates was made.

The state of Nevada enacted in 1889 a law which was intended to provide for a complete record of water rights and for their administration. All parties claiming any interest in irrigation works were required to file statements of their claims on or before September 1, 1890, and parties wishing to build ditches or to enlarge

or extend existing ditches were required to file statements with the proper county recorders. The state was divided into districts, exclusive jurisdiction of controversies over water rights was given to the district courts, and the courts were to issue certificates to holders of rights. The law provided also for the appointment of commissioners to distribute water from streams in accordance with the decrees of the courts. This law was repealed in 1893, but many filings were made after that date.

In 1899 a new law on the subject of water rights was enacted. This law declared that "All natural water courses and natural lakes, and the waters thereof, which are not held in private ownership, belong to the state, and are subject to regulation and control by the state." It provided that rights to water might be acquired in the manner provided by the act, and not otherwise. The county commissioners and the county surveyor of each county were made a board of water commissioners for their county. Applications to appropriate water were to be made to these boards "but in no case shall permission to appropriate water be granted, except there be a surplus of water remaining in the source of supply over and above their existing vested and accrued rights." It was left to the discretion of each county board to determine whether the county should avail itself of the provision of the act. The act was not generally put into effect.

Another new water law was enacted in 1903. This law declared that the waters of all watercourses and lakes belong to the "public," rather than to the "state," and were subject to appropriation for beneficial use, and the use of water is made a public use. This law created the office of state engineer, and made it the duty of the engineer to prepare for each stream in the state a list of the appropriations of water according to their priority. County recorders were required to supply to the engineer transcripts of all claims on record in their respective offices, and the engineer was to get copies of all decrees rendered by the courts. The state engineer was to examine the lands irrigated and irrigable on each stream, make his list of rights on the basis of the claims filed, court decrees, and his own surveys, and issue certificates to claimants defining their rights. Appeal to the courts was provided for. This law has been amended in such a way that the findings of the engineer are submitted to the court and the court issues a decree defining rights.

This law was amended in 1905, and sections were added requiring parties wishing to acquire rights to make application to the state engineer for permits. The law provided for the submitting of proof of completion of works in accordance with the permits and for the issuing and recording of certificates showing the rights acquired. This law was repealed and reenacted in substance by the act of February 26, 1907, and that law was superseded by the act of March 22, 1913, which was the same in its general effect. The law of 1913 has been amended in some particulars, but the general system provided in that and previous laws is still in force. Riparian rights are not recognized in Nevada.

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                                 | 1919    |                       | 1909,<br>per cent<br>of total. |
|--|---------|-----------------------|--------------------------------|
|  | Acres.  | Per cent<br>of total. |                                |
| Total.....                             | 561,447 | 100.0                 | 100.0                          |
| Appropriation and use.....             | 200,556 | 35.7                  | 86.9                           |
| Notice filed and posted.....           | 52,027  | 9.3                   | 5.5                            |
| Adjudicated by court.....              | 161,175 | 28.7                  | 1.4                            |
| Permit from state.....                 | 106,857 | 19.0                  | 1.4                            |
| Certificate or license from state..... | 6,866   | 1.2                   | 4.8                            |
| Underground.....                       | 1,244   | 0.2                   |                                |
| Other and mixed.....                   | 1,705   | 0.3                   |                                |
| Not reported.....                      | 31,217  | 5.6                   |                                |

<sup>1</sup> This class was not included in the tabulation for 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

#### ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams. This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1902.

| DRAINAGE BASIN.                          | AREA IRRIGATED (ACRES). |         |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|--|-------------------------|---------|------------------------------------|---|--|
|  | 1919                    | 1902    | Per cent of increase. <sup>1</sup> |   |  |
| Total.....                               | 561,447                 | 570,001 | -1.5                               | 1,382,036                                   | 704,798  |
| Quinn River.....                         | 9,935                   | 38,150  | -74.0                              | 19,035                                      | 13,452   |
| Owyhee River.....                        | 57,632                  | 8,625   | 568.2                              | 143,090                                     | 62,385   |
| Bruneau River.....                       | 1,297                   | 1,065   | 21.8                               | 2,708                                       | 2,125  |
| Salmon River.....                        | 25,000                  | 12,180  |                                    |   |  |
| Goose Creek.....                         |                         | 2,000   |                                    | 50,000                                      | 50,000   |
| Humboldt River and tributaries.....      | 197,778                 | 219,767 | -10.0                              | 348,573                                     | 231,251  |
| Humboldt River direct.....               | 69,186                  | 97,742  | -29.2                              | 84,049                                      | 77,725   |
| East Fork of Humboldt River.....         | 33,473                  | 11,680  | 186.6                              | 74,264                                      | 43,649   |
| La Moille Creek.....                     | 22,278                  | 7,765   | 186.9                              | 40,610                                      | 20,065   |
| North Fork of Humboldt River.....        | 7,940                   | 3,060   | 100.5                              | 28,697                                      | 10,470   |
| South Fork of Humboldt River.....        | 33,052                  | 26,733  | 23.6                               | 48,338                                      | 41,261   |
| Pine Creek.....                          | 3,250                   | 1,010   | 221.8                              | 3,530                                       | 3,250  |
| Reese River.....                         | 11,178                  | 14,906  | -25.0                              | 40,789                                      | 10,898   |
| Little Humboldt River.....               | 6,350                   | 31,562  | -79.9                              | 6,790                                       | 6,350  |
| Other tributaries of Humboldt River..... | 11,071                  | 24,409  | -54.6                              | 21,526                                      | 11,582   |
| Truckee River and tributaries.....       | 20,002                  | 40,541  | -50.7                              | 34,659                                      | 20,020   |
| Truckee River direct.....                | 14,606                  | 32,748  | -55.4                              | 28,040                                      | 15,436   |
| Steamboat Creek.....                     | 3,152                   | 7,000   | -55.0                              | 3,298                                       | 3,218  |
| Other tributaries of Truckee River.....  | 2,244                   | 793     | 183.0                              | 3,321                                       | 2,266  |
| Carson River and tributaries.....        | 70,980                  | 70,267  | 1.0                                | 226,641                                     | 99,045   |
| Carson River direct.....                 | 4,860                   | 48,155  | -89.9                              | 9,567                                       | 7,200  |
| West Fork of Carson River.....           | 7,463                   | 8,476   | -12.0                              | 7,691                                       | 7,523  |
| East Fork of Carson River.....           | 11,028                  | 9,524   | 15.8                               | 11,128                                      | 11,128   |
| Other tributaries of Carson River.....   | 47,629                  | 4,112   |                                    | 198,255                                     | 73,794   |
| Walker River and tributaries.....        | 113,364                 | 54,055  | 109.7                              | 357,937                                     | 139,207  |
| Walker River direct.....                 | 94,240                  | 28,282  | 233.2                              | 294,990                                     | 98,500   |
| East Walker River.....                   | 5,574                   | 13,355  | -58.3                              | 8,637                                       | 6,767  |
| West Walker River.....                   | 12,980                  | 12,348  | 5.1                                | 51,850                                      | 32,590   |
| Other tributaries of Walker River.....   | 570                     | 70      |                                    | 2,460                                       | 1,350  |
| Colorado River and tributaries.....      | 8,546                   | 11,481  | -25.6                              | 21,342                                      | 10,338   |
| Colorado River direct.....               |                         | 890     |                                    |   |  |
| Virgin River.....                        | 7,865                   | 4,090   | 92.3                               | 17,259                                      | 9,460  |
| Other tributaries of Colorado River..... | 681                     | 6,501   | -89.5                              | 4,083                                       | 878  |
| Independent streams.....                 | 56,913                  | 111,890 | -49.1                              | 176,851                                     | 75,385   |
| Duck Creek.....                          | 6,252                   | 4,109   | 52.2                               | 13,855                                      | 7,872  |
| Steptoe Creek.....                       | 3,708                   | 6,705   | -44.7                              | 12,069                                      | 3,628  |
| Other independent streams.....           | 46,953                  | 101,076 | -53.5                              | 150,927                                     | 63,885   |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.

<sup>2</sup> Includes springs and wells.

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. <sup>1</sup> | AVERAGE PER ACRE. |                                    |
|--------------|--------------|------------------------------------|-------------------|------------------------------------|
|              |              |                                    | Amount.           | Per cent of increase. <sup>1</sup> |
| 1920.....    | \$14,754,280 | 119.5                              | \$20.94           | 162.1                              |
| 1910.....    | 6,721,924    | 337.2                              | 7.99              | 162.0                              |
| 1900.....    | 1,537,559    | -9.6                               | 3.05              | -59.8                              |
| 1890.....    | 1,700,975    |                                    | 7.58              |                                    |

<sup>1</sup> A minus sign (-) denotes decrease.

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN: 1920 AND 1902.

| DRAINAGE BASIN.                          | 1920         | 1902        | INCREASE. <sup>1</sup> |           |
|--|--------------|-------------|------------------------|-----------|
|  |              |             | Amount.                | Per cent. |
| Total.....                               | \$14,754,280 | \$1,706,212 | \$13,048,068           | 764.7     |
| Quinn River.....                         | 50,548       | 61,100      | -10,552                | -17.3     |
| Owyhee River.....                        | 192,772      | 15,145      | 177,627                |           |
| Bruneau River.....                       | 42,210       | 3,890       | 38,320                 | 935.1     |
| Salmon River.....                        | 393,755      | 14,840      | -14,840                |           |
| Goose Creek.....                         |              | 3,000       | 390,755                |           |
| Humboldt River and tributaries.....      | 1,751,566    | 763,110     | 988,456                | 129.5     |
| Humboldt River direct.....               | 739,995      | 486,730     | 253,265                | 52.0      |
| East Fork of Humboldt River.....         | 202,071      | 7,610       | 194,461                |           |
| La Moille Creek.....                     | 91,280       | 14,840      | 76,440                 | 515.1     |
| North Fork of Humboldt River.....        | 57,403       | 10,045      | 47,358                 | 471.5     |
| South Fork of Humboldt River.....        | 288,162      | 53,870      | 234,292                | 434.9     |
| Pine Creek.....                          | 2,809        | 2,450       | 359                    | 14.7      |
| Reese River.....                         | 79,120       | 36,815      | 42,305                 | 114.9     |
| Little Humboldt River.....               | 2,544        | 53,530      | -51,036                | -95.3     |
| Other tributaries of Humboldt River..... | 288,182      | 97,170      | 191,012                | 196.6     |
| Truckee River and tributaries.....       | 594,187      | 296,435     | 297,752                | 100.4     |
| Truckee River direct.....                | 485,900      | 253,470     | 232,430                | 91.7      |
| Steamboat Creek.....                     | 42,070       | 39,870      | 2,400                  | 6.0       |
| Other tributaries of Truckee River.....  | 66,217       | 3,295       | 62,922                 |           |
| Carson River and tributaries.....        | 8,024,300    | 142,703     | 7,881,597              |           |
| Carson River direct.....                 | 61,055       | 95,913      | -34,858                | -36.3     |
| West Fork of Carson River.....           | 14,169       | 14,610      | -441                   | -8.0      |
| East Fork of Carson River.....           | 48,786       | 13,695      | 35,091                 | 256.2     |
| Other tributaries of Carson River.....   | 7,900,290    | 18,485      | 7,881,805              |           |
| Walker River and tributaries.....        | 1,661,484    | 179,995     | 1,481,489              | 823.1     |
| Walker River direct.....                 | 1,466,889    | 71,425      | 1,395,464              |           |
| East Walker River.....                   | 68,565       | 58,890      | 9,705                  | 16.5      |
| West Walker River.....                   | 107,622      | 49,060      | 58,562                 | 119.4     |
| Other tributaries of Walker River.....   | 18,408       | 2,650       | 17,758                 |           |
| Colorado River and tributaries.....      | 415,953      | 35,290      | 380,663                |           |
| Colorado River direct.....               |              | 3,000       | -3,000                 |           |
| Virgin River.....                        | 357,542      | 12,415      | 345,127                |           |
| Other tributaries of Colorado River..... | 58,411       | 19,875      | 38,536                 | 193.9     |
| Independent streams.....                 | 1,627,505    | 190,704     | 1,436,801              | 753.4     |
| Duck Creek.....                          | 252,851      | 10,700      | 242,151                |           |
| Stephens Creek.....                      | 189,986      | 19,940      | 170,046                | 852.8     |
| Other independent streams.....           | 1,184,668    | 160,064     | 1,024,604              | 640.1     |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.<sup>2</sup> Includes springs and wells.

TABLE 10.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$14,754,280 | 100.0              | \$20.94           |
| Before 1860.....   | 55,645       | 0.4                | 10.97             |
| 1860-1869.....     | 2,400,682    | 16.3               | 13.11             |
| 1870-1879.....     | 1,599,890    | 10.8               | 11.26             |
| 1880-1889.....     | 1,026,933    | 7.0                | 8.27              |
| 1890-1899.....     | 134,494      | 0.9                | 11.49             |
| 1900-1904.....     | 8,149,026    | 55.2               | 91.02             |
| 1905-1909.....     | 244,493      | 1.7                | 12.56             |
| 1910-1914.....     | 576,638      | 3.9                | 16.46             |
| 1915-1919.....     | 234,932      | 1.6                | 6.52              |
| Not reported.....  | 331,547      | 2.2                | 5.67              |

TABLE 11.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$14,754,280            | 100.0              | \$21.58           | 460,317                                  | \$0.79                              |
| Stream, gravity.....                    | 12,493,231              | 84.7               | 22.28             | 384,358                                  | 0.65                                |
| Stream, pumped.....                     | 119,900                 | 0.8                | 44.82             | 897                                      | 1.76                                |
| Stream, pumped and gravity.....         | 8,000                   | 0.1                | 11.11             | 720                                      | 0.76                                |
| Wells, pumped.....                      | 19,900                  | 0.1                | 37.98             | 236                                      | 12.10                               |
| Wells, flowing.....                     | 50,575                  | 0.4                | 41.80             | 157                                      | 6.56                                |
| Wells, flowing and pumped.....          | 5,500                   | ( <sup>2</sup> )   | 78.57             | 65                                       | 61.77                               |
| Lake, gravity.....                      | 234,851                 | 1.6                | 48.93             | 130                                      | 19.63                               |
| Springs.....                            | 568,000                 | 3.9                | 22.14             | 17,840                                   | 1.74                                |
| Stored storm water.....                 | 164,350                 | 1.1                | 9.39              | 15,548                                   | 0.37                                |
| City water.....                         | 300                     | ( <sup>2</sup> )   | 15.00             |  |                                     |
| Sewage.....                             | 620                     | ( <sup>2</sup> )   | 7.05              | 80                                       | 0.44                                |
| Stream, gravity, and pumped wells.....  | 181,887                 | 1.2                | 22.67             | 1,246                                    | 1.57                                |
| Stream, gravity, and flowing wells..... | 3,400                   | ( <sup>2</sup> )   | 41.46             | 82                                       | 1.46                                |
| Other mixed.....                        | 903,766                 | 6.1                | 14.67             | 38,968                                   | 1.54                                |

<sup>1</sup> Based on area irrigated in 1919.<sup>2</sup> Less than one-tenth of 1 per cent.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$14,754,280            | 100.0              | 460,317                                  | \$0.79                              |
| Individual and partnership..... | 4,014,570               | 27.2               | 265,626                                  | 0.80                                |
| Cooperative.....                | 1,019,047               | 6.9                | 62,664                                   | 0.75                                |
| Irrigation district.....        | 1,246,611               | 8.5                | 80,000                                   | 0.05                                |
| Commercial.....                 | 340,559                 | 2.3                | 4,240                                    | 2.86                                |
| U. S. Reclamation Service.....  | 7,953,537               | 53.9               | 44,324                                   | 1.94                                |
| U. S. Indian Service.....       | 178,536                 | 1.2                | 3,451                                    | 0.30                                |
| State.....                      | 1,000                   | ( <sup>2</sup> )   | 12                                       | 12.50                               |
| City.....                       | 420                     | ( <sup>2</sup> )   |  |                                     |

<sup>1</sup> Based on area irrigated in 1919.<sup>2</sup> Less than one-tenth of 1 per cent.



## IRRIGATION—NEVADA.

9

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                      | 1,523                     | 82                      | 2,032         | 10,554                  | 3,123           | 2,064            | 1,245           | 134         | 504,428               |
| Individual and partnership..... | 1,451                     | 71                      | 1,928         | 4,094                   | 2,489           | 1,686            | 641             | 120         | 120,295               |
| Cooperative.....                | 22                        | 9                       | 47            | 2,758                   | 165             | 186              | 174             | 12          | 34,133                |
| Irrigation district.....        | 40                        |                         | 40            |                         | 320             | 50               | 100             |             |                       |
| Commercial.....                 | 4                         |                         | 4             | 318                     | 63              |                  |                 |             |                       |
| U. S. Indian Service.....       | 4                         |                         | 6             | 184                     | 35              | 15               | 18              |             |                       |
| U. S. Reclamation Service.....  | 2                         | 2                       | 3             | 3,200                   | 51              | 125              | 312             | 2           | 350,000               |
| State.....                      |                           |                         | 2             |                         |                 | 2                |                 |             |                       |
| City.....                       |                           |                         | 2             |                         |                 |                  |                 |             |                       |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |  |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|--|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.                                 |
|                                 |                             |                |                                |               |                                |                 |                                | Number. Capacity (gallons per minute). |
| Total.....                      | 33.0                        | 123            | 21,942                         | 129           | 6,798                          | 64              | 409                            | 72 35,266                              |
| Individual and partnership..... | 27.0                        | 108            | 21,812                         | 48            | 6,573                          | 59              | 403                            | 61 35,046                              |
| Cooperative.....                | 4.1                         | 15             | 130                            | 29            | 5                              | 4               | 6                              | 9                                      |
| Commercial.....                 | 0.1                         |                |                                | 50            |                                |                 |                                |  |
| U. S. Indian Service.....       | 1.8                         |                |                                | 2             | 220                            | 1               |                                | 2 220                                  |
| State.....                      |                             |                |                                |               |                                |                 |                                |  |

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920.

| DRAINAGE BASIN.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|--|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|  |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total.....                               | 1,523                     | 82                      | 2,032         | 10,554                  | 3,123           | 2,064            | 1,245           | 134         | 504,428               |
| Quinn River.....                         | 5                         | 1                       | 14            | 98                      | 22              | 20               | 16              | 2           |                       |
| Owyhee River.....                        | 181                       | 2                       | 202           | 525                     | 245             | 170              | 90              | 1           | 1,000                 |
| Bruneau River.....                       | 31                        | 1                       | 39            | 55                      | 32              | 7                | 2               | 1           | 50                    |
| Goose Creek.....                         | 35                        |                         | 3             | 100                     | 100             | 35               | 70              | 3           | 30,000                |
| Humboldt River and tributaries.....      | 715                       | 12                      | 1,040         | 1,204                   | 1,292           | 965              | 281             | 27          | 42,791                |
| Humboldt River direct.....               | 55                        | 3                       | 51            | 384                     | 147             | 303              | 119             | 5           | 32,025                |
| East Fork of Humboldt River.....         | 195                       | 2                       | 226           | 75                      | 188             | 241              | 44              | 4           | 688                   |
| La Moille Creek.....                     | 173                       |                         | 196           | 90                      | 193             | 128              | 41              |             |                       |
| North Fork of Humboldt River.....        | 47                        |                         | 62            | 48                      | 109             | 86               | 22              |             |                       |
| South Fork of Humboldt River.....        | 161                       |                         | 281           | 297                     | 354             | 96               | 29              | 4           | 7,974                 |
| Pine Creek.....                          | 47                        |                         | 1             |                         |                 | 2                | 1               |             |                       |
| Reese River.....                         | 47                        |                         | 170           | 155                     | 237             | 13               | 4               |             |                       |
| Little Humboldt River.....               | 6                         |                         | 4             |                         | 4               |                  |                 |             |                       |
| Other tributaries of Humboldt River..... | 31                        | 7                       | 49            | 155                     | 60              | 96               | 21              | 14          | 2,104                 |
| Truckee River and tributaries.....       | 54                        | 5                       | 40            | 2,465                   | 158             | 21               | 14              | 8           | 201                   |
| Truckee River direct.....                | 23                        | 2                       | 26            | 426                     | 134             | 17               | 11              | 1           | 2                     |
| Steamboat Creek.....                     | 6                         | 1                       | 8             | 2,001                   | 14              | 4                | 3               | 1           |                       |
| Other tributaries of Truckee River.....  | 25                        | 2                       | 6             | 38                      | 10              |                  |                 | 6           | 199                   |
| Carson River and tributaries.....        | 128                       | 12                      | 95            | 3,853                   | 170             | 179              | 340             | 14          | 400,060               |
| Carson River direct.....                 | 12                        | 8                       | 13            | 227                     | 27              | 36               | 15              | 7           |                       |
| West Fork of Carson River.....           | 19                        |                         | 27            | 85                      | 17              |                  |                 |             |                       |
| East Fork of Carson River.....           | 34                        |                         | 39            | 324                     | 50              |                  |                 |             |                       |
| Other tributaries of Carson River.....   | 63                        | 4                       | 16            | 3,217                   | 76              | 143              | 325             | 7           | 400,060               |
| Walker River and tributaries.....        | 70                        | 14                      | 120           | 1,267                   | 498             | 96               | 157             | 4           | 1,503                 |
| Walker River direct.....                 | 44                        |                         | 47            | 515                     | 368             | 60               | 127             |             |                       |
| East Walker River.....                   | 5                         |                         | 43            | 186                     | 65              | 1                | 3               | 1           | 3                     |
| West Walker River.....                   | 11                        | 1                       | 10            | 551                     | 51              | 11               | 25              | 1           | 1,500                 |
| Other tributaries of Walker River.....   | 10                        | 13                      | 20            | 15                      | 14              | 24               | 2               | 2           |                       |
| Colorado River and tributaries.....      | 35                        | 5                       | 83            | 141                     | 94              | 182              | 102             | 16          | 558                   |
| Virgin River.....                        | 35                        | 5                       | 59            | 119                     | 86              | 126              | 101             | 5           | 354                   |
| Other tributaries of Colorado River..... |                           |                         | 24            | 22                      | 8               | 56               | 1               | 11          | 204                   |
| Independent streams.....                 | 269                       | 30                      | 396           | 846                     | 512             | 389              | 173             | 58          | 28,265                |
| Duck Creek.....                          | 14                        | 1                       | 21            | 45                      | 36              | 17               | 12              | 1           | 50                    |
| Steptoe Creek.....                       | 14                        |                         | 17            | 47                      | 48              | 20               | 13              | 3           | 4,000                 |
| Other independent streams.....           | 241                       | 29                      | 358           | 754                     | 428             | 352              | 148             | 54          | 24,215                |

## IRRIGATION—NEVADA.

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920—Continued.

| DRAINAGE BASIN.                          | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |                            |
|--|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|----------------------------|
|  |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average<br>lift<br>(feet). |
|  |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |                            |
| Total.....                               | 33.0                              | 123            | 21,942                               | 129           | 6,798                                | 64              | 409                                      | 72      | 35,266                               | 22                         |
| Quinn River.....                         |                                   |                |                                      | 10            | 50                                   | 3               | 4  | 5       |                                      | 25                         |
| Washoe River.....                        | 0.1                               |                |                                      | 1             | 25                                   | 1               | 6  | 1       | 350                                  | 30                         |
| Bruneau River.....                       | 0.6                               |                |                                      |               |                                      |                 |  |         |                                      |                            |
| Humboldt River and tributaries.....      | 15.7                              | 12             | 805                                  | 18            | 2,540                                | 18              | 71                                       | 19      | 22,495                               | 30                         |
| Humboldt River direct.....               | 2.0                               | 2              |                                      | 8             | 1,495                                | 8               | 34                                       | 8       | 2,345                                | 32                         |
| East Fork of Humboldt River.....         |                                   |                |                                      | 1             | 25                                   | 1               |  | 1       | 25                                   | 12                         |
| North Fork of Humboldt River.....        | 0.4                               |                |                                      | 1             |                                      | 1               | 8  | 1       |                                      | 30                         |
| South Fork of Humboldt River.....        |                                   |                |                                      | 1             | 100                                  | 1               | 5  | 1       | 100                                  | 12                         |
| Pine Creek.....                          |                                   |                |                                      | 1             | 10                                   | 1               | 10                                       |         | 10                                   |                            |
| Reese River.....                         |                                   | 4              | 190                                  | 4             |                                      | 3               |  | 3       |                                      |                            |
| Other tributaries of Humboldt River..... | 13.3                              | 6              | 615                                  | 2             | 910                                  | 3               | 14                                       | 4       | 20,015                               | 39                         |
| Truckee River and tributaries.....       | 0.9                               |                |                                      | 1             | 250                                  | 1               | 6  | 1       | 250                                  | 8                          |
| Truckee River direct.....                | 0.7                               |                |                                      |               |                                      |                 |  |         |                                      |                            |
| Other tributaries of Truckee River.....  | 0.2                               |                |                                      | 1             | 250                                  | 1               | 6  | 1       | 250                                  | 8                          |
| Carson River and tributaries.....        | 4.1                               | 3              | 22                                   | 1             | 50                                   | 12              | 134                                      | 13      | 1,650                                | 12                         |
| Carson River direct.....                 | 0.6                               |                |                                      | 1             | 50                                   | 3               | 53                                       | 3       | 50                                   | 17                         |
| East Fork of Carson River.....           |                                   |                |                                      |               |                                      | 1               |  | 1       |                                      |                            |
| Other tributaries of Carson River.....   | 3.5                               | 3              | 22                                   |               |                                      | 8               | 81                                       | 9       | 1,600                                | 11                         |
| Walker River and tributaries.....        |                                   | 26             | 242                                  | 71            | 5                                    | 2               | 2  | 2       |                                      | 10                         |
| Walker River direct.....                 |                                   |                |                                      | 50            |                                      |                 |  |         |                                      |                            |
| West Walker River.....                   |                                   | 17             | 240                                  | 20            | 5                                    | 2               | 2  | 2       |                                      | 10                         |
| Other tributaries of Walker River.....   |                                   | 9              | 2                                    | 1             |                                      |                 |  |         |                                      |                            |
| Colorado River and tributaries.....      | 7.2                               | 53             | 18,872                               | 7             | 705                                  | 8               | 72                                       | 9       | 4,878                                | 21                         |
| Virgin River.....                        | 4.4                               |                |                                      | 5             | 230                                  | 6               | 43                                       | 7       | 2,245                                | 15                         |
| Other tributaries of Colorado River..... | 2.8                               | 53             | 18,872                               | 2             | 475                                  | 2               | 29                                       | 2       | 2,633                                | 38                         |
| Independent streams.....                 | 4.4                               | 29             | 2,001                                | 20            | 3,173                                | 19              | 114                                      | 22      | 5,643                                | 20                         |
| Duck Creek.....                          |                                   |                |                                      |               |                                      |                 |  |         |                                      |                            |
| Steppe Creek.....                        | 0.1                               | 2              | 794                                  | 6             | 2,285                                | 5               | 56                                       | 8       | 2,405                                | 20                         |
| Other independent streams.....           |                                   |                |                                      | 4             | 503                                  | 4               | 17                                       | 4       | 1,203                                | 23                         |
|  | 4.3                               | 27             | 1,207                                | 10            | 385                                  | 10              | 41                                       | 10      | 1,975                                | 17                         |



## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 and 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP.                               | AREA HARVESTED.               |                              |                        |                              |                                    | QUANTITY HARVESTED.                       |           |                              |           |                                    |
|-------------------------------------|-------------------------------|------------------------------|------------------------|------------------------------|------------------------------------|---|-----------|------------------------------|-----------|------------------------------------|
|                                     | 1919                          |                              | 1909                   |                              | Per cent of increase. <sup>1</sup> | Unit.                                     | 1919      |                              | 1909      | Per cent of increase. <sup>1</sup> |
|                                     | Acres.                        | Per cent of total for state. | Acres.                 | Per cent of total for state. |                                    |   | Amount.   | Per cent of total for state. | Amount.   | Per cent of total for state.       |
| <b>Cereals:</b>                     |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Winter wheat.....                   | 2,921                         | 83.9                         | 14,010                 | 98.2                         | 42.6                               | Bu.....                                   | 60,220    | 87.7                         | 392,472   | 99.1                               |
| Spring wheat.....                   | 17,062                        | 92.2                         | 7,285                  | 92.8                         | -65.7                              | Bu.....                                   | 377,248   | 95.4                         | 307,618   | 91.8                               |
| Oats.....                           | 2,501                         | 84.1                         | 11,852                 | 97.1                         | -56.5                              | Bu.....                                   | 64,873    | 86.5                         | 401,450   | 97.4                               |
| Barley.....                         | 5,156                         | 92.1                         |                        |                              |                                    | Bu.....                                   | 138,793   | 93.6                         |           |                                    |
| <b>Hay and forage:</b>              |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Alfalfa.....                        | 112,166                       | 95.7                         | 89,904                 | 99.7                         | 24.8                               | Tons...                                   | 318,906   | 96.3                         | 237,536   | 99.6                               |
| Timothy alone.....                  | 4,229                         | 94.8                         | 10,437                 | 99.8                         | -59.5                              | Tons...                                   | 4,855     | 95.6                         | 16,217    | 75.8                               |
| Timothy and clover mixed.....       | 14,059                        | 95.8                         | 9,442                  | 55.1                         | 48.9                               | Tons...                                   | 19,351    | 96.5                         | 15,607    | 59.7                               |
| Clover alone.....                   | 487                           | 92.7                         |                        |                              |                                    | Tons...                                   | 768       | 64.4                         |           |                                    |
| Other tame grasses.....             | 29,114                        | 95.3                         | 7,259                  | 27.7                         | 301.1                              | Tons...                                   | 31,306    | 96.6                         | 11,107    | 27.5                               |
| Annual legumes cut for hay.....     | 706                           | 91.2                         | 1,775                  | 42.4                         | 253.2                              | Tons...                                   | 545       | 92.2                         | 2,362     | 43.5                               |
| Small grains cut for hay.....       | 5,564                         | 79.0                         |                        |                              |                                    | Tons...                                   | 6,272     | 84.1                         |           |                                    |
| Wild, salt, or prairie grasses..... | 134,389                       | 75.8                         | 195,381                | 98.8                         | -31.2                              | Tons...                                   | 122,146   | 82.6                         | 188,582   | 99.6                               |
| <b>Vegetables:</b>                  |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Potatoes.....                       | 2,823                         | 77.6                         | 4,711                  | 96.9                         | -40.1                              | Bu.....                                   | 410,001   | 83.5                         | 728,227   | 95.0                               |
|                                     |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| CROP.                               | AVERAGE YIELD PER ACRE, 1919. |                              |                        |                              |                                    |   | VALUE.    |                              |           |                                    |
|                                     | Unit.                         | For state.                   | On non-irrigated land. | On irrigated land.           |                                    |   | 1919      |                              | 1909      | Per cent of increase. <sup>1</sup> |
|                                     |                               |                              |                        | Average.                     | Per cent of average for state.     | Per cent of average on nonirrigated land. | Amount.   | Per cent of total for state. | Amount.   |                                    |
| <b>Cereals:</b>                     |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Winter wheat.....                   | Bu.....                       | 19.7                         | 15.1                   | 20.6                         | 104.6                              | 136.4                                     | \$133,506 | 87.7                         | \$393,144 | 99.2                               |
| Spring wheat.....                   | Bu.....                       | 21.4                         | 12.7                   | 22.1                         | 103.3                              | 174.0                                     | 867,670   | 95.4                         |           |                                    |
| Oats.....                           | Bu.....                       | 25.2                         | 21.5                   | 25.9                         | 102.8                              | 120.5                                     | 74,604    | 86.5                         | 175,987   | 91.7                               |
| Barley.....                         | Bu.....                       | 26.5                         | 21.3                   | 26.9                         | 101.5                              | 126.3                                     | 242,888   | 93.6                         | 302,229   | 97.4                               |
| <b>Hay and forage:</b>              |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Alfalfa.....                        | Tons...                       | 2.83                         | 2.42                   | 2.84                         | 100.4                              | 117.4                                     | 6,537,573 | 96.3                         | 1,951,293 | 99.8                               |
| Timothy alone.....                  | Tons...                       | 1.14                         | 0.97                   | 1.15                         | 100.9                              | 118.6                                     | 111,665   | 95.6                         | 127,553   | 77.8                               |
| Timothy and clover mixed.....       | Tons...                       | 1.37                         | 1.12                   | 1.38                         | 100.7                              | 123.2                                     | 445,073   | 96.5                         | 133,871   | 59.2                               |
| Clover alone.....                   | Tons...                       | 1.54                         | 1.47                   | 1.58                         | 102.6                              | 107.5                                     | 16,896    | 64.4                         |           |                                    |
| Other tame grasses.....             | Tons...                       | 1.06                         | 0.76                   | 1.08                         | 101.9                              | 142.1                                     | 641,773   | 96.6                         | 91,240    | 27.6                               |
| Annual legumes cut for hay.....     | Tons...                       | 0.76                         | 0.68                   | 0.77                         | 101.3                              | 113.2                                     | 9,810     | 92.2                         | 28,059    | 33.5                               |
| Small grains cut for hay.....       | Tons...                       | 1.06                         | 0.80                   | 1.13                         | 106.6                              | 141.2                                     | 116,032   | 84.1                         |           |                                    |
| Wild, salt, or prairie grasses..... | Tons...                       | 0.83                         | 0.60                   | 0.91                         | 109.6                              | 151.7                                     | 2,259,701 | 82.6                         | 1,407,590 | 99.1                               |
| <b>Vegetables:</b>                  |                               |                              |                        |                              |                                    |   |           |                              |           |                                    |
| Potatoes.....                       | Bu.....                       | 134.9                        | 98.9                   | 145.2                        | 107.6                              | 146.8                                     | 918,402   | 83.5                         | 394,651   | 99.5                               |

<sup>1</sup> A minus sign (—) denotes decrease.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                          |   | THE<br>STATE. | Churchill. | Clark.    | Doug-<br>las. | Elko.      | Esmie-<br>ralda. <sup>1</sup> | Eureka.   | Hum-<br>boldt. <sup>2</sup> | Lander.   |
|--------------------------|---|---------------|------------|-----------|---------------|------------|-------------------------------|-----------|-----------------------------|-----------|
| 1                        | Number of all farms in 1920.....  | 3,163         | 498        | 162       | 129           | 543        | 19                            | 60        | 132                         | 64        |
| 2                        | Number of farms irrigated in 1919.....  | 2,718         | 448        | 149       | 124           | 459        | 10                            | 52        | 93                          | 54        |
| 3                        | Per cent of all farms.....  | 85.9          | 90.0       | 92.0      | 96.1          | 84.5       | 52.6                          | 86.7      | 70.5                        | 84.4      |
| 4                        | Number of farms irrigated in 1909.....  | 2,406         | 326        | 145       | 132           | 359        | 99                            | 58        | 270                         | 54        |
| 5                        | Per cent of increase, 1909-1919.....  | 13.0          | 37.4       | 2.8       | -6.1          | 27.9       |                               |           |                             |           |
| LAND AND FARM AREA.      |   |               |            |           |               |            |                               |           |                             |           |
| 6                        | Approximate land area..... acres..  | 70,285,440    | 3,232,000  | 5,148,800 | 469,120       | 10,917,760 | 2,184,320                     | 2,660,480 | 6,274,560                   | 3,661,440 |
| 7                        | All land in farms..... acres..  | 2,357,163     | 108,307    | 13,544    | 119,211       | 718,102    | 13,977                        | 86,197    | 393,865                     | 133,566   |
| 8                        | Improved land in farms..... acres..   | 594,741       | 35,870     | 5,646     | 27,277        | 183,721    | 3,457                         | 25,121    | 76,788                      | 16,342    |
| 9                        | Area irrigated in 1919..... acres..   | 561,447       | 41,739     | 5,206     | 23,412        | 202,724    | 1,685                         | 5,086     | 27,884                      | 10,400    |
| 10                       | Per cent of improved land in farms.....   | 94.4          | 116.4      | 92.2      | 85.8          | 110.3      | 48.7                          | 20.2      | 36.3                        | 63.6      |
| 11                       | Area irrigated in 1909..... acres..   | 701,833       | 35,114     | 8,116     | 32,181        | 183,552    | 14,011                        | 18,715    | 207,753                     | 23,342    |
| 12                       | Per cent of increase, 1909-1919.....  | -20.0         | 18.9       | -35.9     | -27.2         | 10.4       |                               | -72.8     |                             | -55.4     |
| 13                       | Area enterprises were capable of irrigating in 1920..... acres..  | 704,708       | 65,661     | 6,282     | 24,472        | 263,403    | 2,290                         | 5,134     | 31,695                      | 10,245    |
| 14                       | Area enterprises were capable of irrigating in 1910..... acres..  | 840,962       | 42,622     | 16,844    | 35,548        | 189,253    | 14,106                        | 21,973    | 228,845                     | 24,085    |
| 15                       | Per cent of increase, 1910-1920.....  | -16.2         | 54.1       | -62.7     | -31.2         | 39.2       |                               | -76.6     |                             | -57.5     |
| 16                       | Area included in enterprises in 1920..... acres..   | 1,382,036     | 171,681    | 10,512    | 43,191        | 434,582    | 9,316                         | 5,404     | 45,331                      | 28,637    |
| 17                       | Area included in enterprises in 1910..... acres..   | 1,232,142     | 52,030     | 22,016    | 37,649        | 262,315    | 26,538                        | 23,608    | 304,152                     | 54,285    |
| 18                       | Per cent of increase, 1910-1920.....  | 12.2          | 230.0      | -52.3     | 14.7          | 65.7       |                               | -77.1     |                             | -47.2     |
| 19                       | Area of irrigated land reported as available for settlement..... acres..                                    | 139,352       | 87,451     | 1,230     | 19,220        |            | 550                           |           | 1,764                       |           |
| IRRIGATION WORKS.        |   |               |            |           |               |            |                               |           |                             |           |
| Independent enterprises: |   |               |            |           |               |            |                               |           |                             |           |
| 20                       | Number, 1920.....   | 1,015         | 14         | 37        | 78            | 367        | 7                             | 24        | 63                          | 41        |
| 21                       | Number, 1910.....   | 1,347         | 22         | 28        | 128           | 341        | 34                            | 57        | 205                         | 60        |
| Main ditches:            |   |               |            |           |               |            |                               |           |                             |           |
| 22                       | Number, 1920.....   | 2,032         | 8          | 42        | 77            | 1,194      | 5                             | 1         | 50                          | 140       |
| 23                       | Number, 1910.....   | 994           | 17         | 32        | 142           | 172        | 39                            | 36        | 199                         | 70        |
| 24                       | Length, 1920..... miles..   | 3,123         | 79         | 47        | 88            | 1,428      | 5                             | 3         | 69                          | 194       |
| 25                       | Length, 1910..... miles..   | 1,938         | 78         | 65        | 213           | 211        | 85                            | 55        | 379                         | 118       |
| 26                       | Capacity, 1920..... second-feet..   | 10,554        | 3,141      | 110       | 460           | 1,297      | 31                            | 18        | 307                         | 39        |
| 27                       | Capacity, 1910..... second-feet..   | 17,579        | 1,656      | 203       | 1,688         | 1,529      | 236                           | 280       | 3,368                       | 2,654     |
| Laterals:                |   |               |            |           |               |            |                               |           |                             |           |
| 28                       | Number, 1920.....   | 2,064         | 127        | 116       | 2             | 1,053      |                               |           | 75                          | 10        |
| 29                       | Number, 1910.....   | 1,581         | 78         | 30        | 24            | 803        | 8                             | 23        | 66                          | 29        |
| 30                       | Length, 1920..... miles..   | 1,245         | 302        | 79        | 5             | 370        |                               |           | 29                          | 4         |
| 31                       | Length, 1910..... miles..   | 1,213         | 191        | 12        | 17            | 200        | 25                            | 15        | 102                         | 13        |
| Reservoirs:              |   |               |            |           |               |            |                               |           |                             |           |
| 32                       | Number, 1920.....   | 134           | 8          | 13        | 7             | 21         |                               |           | 16                          |           |
| 33                       | Number, 1910.....   | 109           | 2          | 5         | 4             | 9          |                               | 21        | 15                          | 8         |
| 34                       | Capacity, 1920..... acre-feet..   | 504,428       | 350,009    | 214       |               | 40,068     |                               |           | 7,452                       |           |
| 35                       | Capacity, 1910..... acre-feet..   | 323,953       | 300,010    | 7         | 5,043         | 3,007      |                               | 1,014     | 5,283                       | 1         |
| Flowing wells:           |   |               |            |           |               |            |                               |           |                             |           |
| 36                       | Number, 1920.....   | 123           | 6          | 53        | 2             | 2          |                               |           | 20                          | 1         |
| 37                       | Number, 1910.....   | 19            | 2          | 6         |               |            |                               |           |                             |           |
| 38                       | Capacity, 1920..... gallons per minute..  | 21,942        | 615        | 18,872    | 22            |            |                               |           | 400                         | 11        |
| 39                       | Capacity, 1910..... gallons per minute..  | 1,302         | 54         | 1,210     |               |            |                               |           |                             | 25        |
| Pumped wells:            |   |               |            |           |               |            |                               |           |                             |           |
| 40                       | Number, 1920.....   | 129           |            | 2         |               | 9          |                               |           | 13                          | 5         |
| 41                       | Number, 1910.....   | 6             |            |           |               |            | 1                             |           | 3                           |           |
| 42                       | Capacity, 1920..... gallons per minute..  | 6,798         |            | 475       |               | 645        |                               |           | 1,050                       | 10        |
| 43                       | Capacity, 1910..... gallons per minute..  | 1,349         |            |           |               |            | 5                             |           | 1,076                       |           |
| Pumping plants:          |   |               |            |           |               |            |                               |           |                             |           |
| 44                       | Number, 1920.....   | 64            | 1          | 3         | 7             | 9          |                               |           | 7                           | 4         |
| 45                       | Number, 1910.....   | 18            | 1          | 4         | 2             |            |                               |           | 3                           |           |
| 46                       | Engine capacity, 1920..... horsepower..   | 409           | 6          | 41        | 108           | 32         | 1                             |           | 22                          | 10        |
| 47                       | Engine capacity, 1910..... horsepower..   | 693           | 8          | 72        | 100           |            | 2                             |           | 303                         |           |
| 48                       | Pump capacity, 1920..... gallons per minute..   | 35,266        |            | 4,633     |               | 1,720      |                               |           | 20,200                      | 10        |
| 49                       | Pump capacity, 1910..... gallons per minute..   | 24,295        | 490        | 6,750     | 4,000         |            | 5                             |           | 1,076                       |           |
| 50                       | Average lift, 1920..... feet..  | 22            | 6          | 28        | 16            | 23         |                               |           | 26                          |           |
| CAPITAL INVESTED.        |   |               |            |           |               |            |                               |           |                             |           |
| 51                       | Capital invested to Jan. 1, 1920..... dollars..   | 14,754,280    | 7,774,129  | 352,332   | 94,311        | 1,447,201  | 26,849                        | 25,211    | 271,719                     | 79,332    |
| 52                       | Capital invested to July 1, 1910..... dollars..   | 6,721,924     | 1,621,996  | 61,009    | 64,696        | 384,096    | 137,092                       | 25,396    | 556,998                     | 188,431   |
| 53                       | Per cent of increase, 1910-1920.....  | 119.5         | 379.3      | 477.5     | 45.8          | 276.8      |                               | -0.7      |                             | -57.9     |
| 54                       | Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 20.94         | 118.40     | 56.09     | 3.85          | 5.49       | 11.72                         | 4.91      | 8.57                        | 7.74      |
| 55                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. | 7.99          | 38.06      | 3.62      | 1.82          | 2.03       | 9.72                          | 1.16      | 2.43                        | 7.82      |
| ESTIMATED FINAL COST.    |   |               |            |           |               |            |                               |           |                             |           |
| 56                       | Estimated final cost of existing enterprises in 1920..... dollars..   | 22,648,747    | 13,809,936 | 515,332   | 109,311       | 1,475,376  | 26,849                        | 25,211    | 314,719                     | 79,332    |
| 57                       | Estimated final cost of existing enterprises in 1910..... dollars..   | 12,188,756    | 7,016,828  | 67,009    | 64,696        | 385,096    | 150,092                       | 25,396    | 608,998                     | 188,431   |
| 58                       | Per cent of increase, 1910-1920.....  | 85.8          | 96.8       | 669.0     | 69.0          | 283.1      |                               | -0.7      |                             | -57.9     |
| 59                       | Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 10.39         | 80.44      | 49.02     | 2.53          | 3.39       | 2.88                          | 4.67      | 6.94                        | 2.77      |
| 60                       | Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. | 9.89          | 134.86     | 3.04      | 1.72          | 1.47       | 5.66                          | 1.08      | 2.00                        | 3.47      |

<sup>1</sup> Part taken to form Mineral County in 1911.<sup>2</sup> Part taken to form Pershing County in 1919.

# IRRIGATION—NEVADA.

13

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.]

|                              |  | Lincoln.  | Lyon.     | Mineral. <sup>1</sup> | Nye.       | Ormsby. | Pershing. <sup>2</sup> | Storey. | Washoe.   | White Pine. |
|------------------------------|--|-----------|-----------|-----------------------|------------|---------|------------------------|---------|-----------|-------------|
| 1                            | Number of all farms in 1920.....   | 145       | 297       | 92                    | 152        | 49      | 115                    | 14      | 481       | 211         |
| 2                            | Number of farms irrigated in 1919.....   | 131       | 275       | 89                    | 110        | 37      | 109                    | 12      | 381       | 185         |
| 3                            | Per cent of all farms.....   | 90.3      | 92.6      | 96.7                  | 72.4       | 75.5    | 94.8                   | 85.7    | 79.2      | 87.7        |
| 4                            | Number of farms irrigated in 1909.....   | 113       | 196       | —                     | 106        | 39      | —                      | 19      | 326       | 164         |
| 5                            | Per cent of increase, 1909-1919.....   | 15.9      | 40.3      | —                     | 8.8        | —       | —                      | —       | 16.9      | 12.8        |
| <b>LAND AND FARM AREA.</b>   |  |           |           |                       |            |         |                        |         |           |             |
| 6                            | Approximate land area.....acres..  | 6,727,040 | 965,760   | 2,572,160             | 11,708,160 | 99,840  | 3,873,920              | 160,640 | 4,000,640 | 5,028,800   |
| 7                            | All land in farms.....acres..  | 31,105    | 145,371   | 27,621                | 95,002     | 9,972   | 130,968                | 1,833   | 230,052   | 98,470      |
| 8                            | Improved land in farms.....acres..   | 9,264     | 52,280    | 9,056                 | 19,759     | 3,027   | 50,141                 | 699     | 45,036    | 31,257      |
| 9                            | Area irrigated in 1919.....acres..   | 5,826     | 110,902   | 5,212                 | 11,354     | 3,146   | 53,628                 | 172     | 28,801    | 24,270      |
| 10                           | Per cent of improved land in farms.....  | 62.9      | 212.1     | 57.6                  | 57.5       | 103.9   | 107.0                  | 24.6    | 64.0      | 77.6        |
| 11                           | Area irrigated in 1909.....acres..   | 9,907     | 62,148    | —                     | 19,978     | 2,426   | —                      | 891     | 50,904    | 32,795      |
| 12                           | Per cent of increase, 1909-1919.....   | -41.2     | 78.4      | —                     | -43.2      | 29.7    | —                      | -80.7   | -43.4     | -26.0       |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 10,752    | 136,475   | 7,662                 | 14,169     | 4,718   | 61,940                 | 268     | 31,610    | 27,932      |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 15,391    | 116,222   | —                     | 28,902     | 2,466   | —                      | 925     | 54,551    | 49,229      |
| 15                           | Per cent of increase, 1910-1920.....   | -30.1     | 17.4      | —                     | -51.0      | 91.3    | —                      | -71.0   | -42.1     | -43.3       |
| 16                           | Area included in enterprises in 1920.....acres..   | 20,366    | 332,810   | 12,937                | 70,601     | 7,410   | 62,795                 | 348     | 78,274    | 47,841      |
| 17                           | Area included in enterprises in 1910.....acres..   | 16,124    | 260,354   | —                     | 34,062     | 2,465   | —                      | 1,025   | 82,606    | 52,918      |
| 18                           | Per cent of increase, 1910-1920.....   | 26.3      | 27.8      | —                     | 107.3      | 200.5   | —                      | -66.0   | -5.2      | -9.6        |
| 19                           | Area of irrigated land reported as available for settlement.....acres..                                    | 2,300     | 16,537    | —                     | 1,620      | 1,380   | —                      | —       | 7,000     | 300         |
| <b>IRRIGATION WORKS.</b>     |  |           |           |                       |            |         |                        |         |           |             |
| Independent enterprises:     |  |           |           |                       |            |         |                        |         |           |             |
| 20                           | Number, 1920.....  | 49        | 40        | 23                    | 95         | 20      | 16                     | 4       | 87        | 50          |
| 21                           | Number, 1910.....  | 51        | 59        | —                     | 101        | 39      | —                      | 17      | 99        | 106         |
| Main ditches:                |  |           |           |                       |            |         |                        |         |           |             |
| 22                           | Number, 1920.....  | 54        | 79        | 49                    | 159        | 3       | 12                     | 4       | 84        | 71          |
| 23                           | Number, 1910.....  | 26        | 56        | —                     | 65         | 11      | —                      | 6       | 43        | 30          |
| 24                           | Length, 1920.....miles..   | 82        | 421       | 77                    | 156        | 5       | 60                     | 1       | 255       | 153         |
| 25                           | Length, 1910.....miles..   | 47        | 289       | —                     | 83         | 7       | —                      | 10      | 208       | 100         |
| 26                           | Capacity, 1920.....second-feet..   | 1,097     | 289       | —                     | 423        | 133     | 266                    | 2       | 2,612     | 282         |
| 27                           | Capacity, 1910.....second-feet..   | 78        | 4,014     | —                     | 147        | 28      | —                      | 51      | 1,104     | 543         |
| Laterals:                    |  |           |           |                       |            |         |                        |         |           |             |
| 28                           | Number, 1920.....  | 78        | 74        | 24                    | 77         | 51      | 190                    | 3       | 136       | 48          |
| 29                           | Number, 1910.....  | 16        | 269       | —                     | 91         | 12      | —                      | 1       | 17        | 64          |
| 30                           | Length, 1920.....miles..   | 38        | 161       | 14                    | 13         | 25      | 96                     | 1       | 61        | 57          |
| 31                           | Length, 1910.....miles..   | 10        | 520       | —                     | 34         | 4       | —                      | 1       | 29        | 40          |
| Reservoirs:                  |  |           |           |                       |            |         |                        |         |           |             |
| 32                           | Number, 1920.....  | 6         | 3         | 2                     | 13         | 5       | 3                      | 1       | 29        | 7           |
| 33                           | Number, 1910.....  | 2         | 4         | —                     | 13         | 6       | —                      | —       | 8         | 12          |
| 34                           | Capacity, 1920.....acre-feet..   | 354       | 1,500     | 5                     | 1,354      | 50,060  | 32,003                 | —       | 16,626    | 4,783       |
| 35                           | Capacity, 1910.....acre-feet..   | 3         | 2         | —                     | 1,083      | 203     | —                      | —       | 10,277    | 20          |
| Flowing wells:               |  |           |           |                       |            |         |                        |         |           |             |
| 36                           | Number, 1920.....  | —         | 26        | —                     | 9          | 1       | —                      | —       | —         | 3           |
| 37                           | Number, 1910.....  | —         | —         | —                     | —          | —       | —                      | —       | —         | —           |
| 38                           | Capacity, 1920.....gallons per minute..  | —         | 242       | —                     | 410        | —       | —                      | —       | —         | 1,356       |
| 39                           | Capacity, 1910.....gallons per minute..  | —         | —         | —                     | —          | —       | —                      | —       | —         | —           |
| Pumped wells:                |  |           |           |                       |            |         |                        |         |           |             |
| 40                           | Number, 1920.....  | 5         | 21        | 53                    | 7          | 1       | 2                      | —       | 1         | 10          |
| 41                           | Number, 1910.....  | 1         | —         | —                     | —          | —       | —                      | —       | —         | —           |
| 42                           | Capacity, 1920.....gallons per minute..  | 230       | 5         | 25                    | 360        | 50      | 910                    | —       | 250       | 2,788       |
| 43                           | Capacity, 1910.....gallons per minute..  | 196       | —         | —                     | —          | —       | —                      | —       | —         | 72          |
| Pumping plants:              |  |           |           |                       |            |         |                        |         |           |             |
| 44                           | Number, 1920.....  | 5         | 3         | 1                     | 8          | 3       | 2                      | —       | 2         | 9           |
| 45                           | Number, 1910.....  | 2         | —         | —                     | 1          | —       | —                      | —       | 3         | 1           |
| 46                           | Engine capacity, 1920.....horsepower..   | 31        | 2         | —                     | 35         | 20      | 17                     | —       | 12        | 73          |
| 47                           | Engine capacity, 1910.....horsepower..   | 10        | —         | —                     | 1          | —       | —                      | —       | 193       | 4           |
| 48                           | Pump capacity, 1920.....gallons per minute..   | 245       | —         | 25                    | 350        | 1,650   | 915                    | —       | 1,850     | 3,668       |
| 49                           | Pump capacity, 1910.....gallons per minute..   | 588       | —         | —                     | 10         | —       | —                      | —       | 11,304    | 72          |
| 50                           | Average lift, 1920.....feet..  | 16        | 10        | 17                    | 19         | 10      | 78                     | —       | 11        | 21          |
| <b>CAPITAL INVESTED.</b>     |  |           |           |                       |            |         |                        |         |           |             |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 124,536   | 1,740,387 | 208,132               | 260,220    | 54,777  | 550,952                | 6,229   | 658,775   | 1,079,188   |
| 52                           | Capital invested to July 1, 1910.....dollars..   | 39,262    | 2,761,261 | —                     | 56,871     | 11,620  | —                      | 16,270  | 678,284   | 118,642     |
| 53                           | Per cent of increase, 1910-1920.....   | 217.2     | -37.0     | —                     | 357.6      | 371.4   | —                      | -61.7   | -2.9      | 809.6       |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 11.58     | 12.78     | 27.16                 | 18.37      | 11.61   | 8.89                   | 23.24   | 20.84     | 38.64       |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 2.55      | 23.76     | —                     | 1.97       | 4.71    | —                      | 17.59   | 12.43     | 2.41        |
| <b>ESTIMATED FINAL COST.</b> |  |           |           |                       |            |         |                        |         |           |             |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 141,936   | 2,934,907 | 213,132               | 303,445    | 55,777  | 554,952                | 9,819   | 832,725   | 1,245,988   |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 39,262    | 2,761,261 | —                     | 56,871     | 11,620  | —                      | 16,270  | 678,284   | 118,642     |
| 58                           | Per cent of increase, 1910-1920.....   | 261.5     | 6.3       | —                     | 433.6      | 380.0   | —                      | -39.6   | 22.8      | 950.2       |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 6.97      | 8.82      | 16.47                 | 4.30       | 7.53    | 8.84                   | 28.22   | 10.64     | 26.04       |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 2.44      | 10.61     | —                     | 1.67       | 4.71    | —                      | 15.87   | 8.21      | 2.24        |

<sup>1</sup> Formed from part of Esmeralda County in 1911.

<sup>2</sup> Formed from part of Humboldt County in 1919.

## IRRIGATION : NEW MEXICO

## STATISTICS FOR THE STATE AND ITS COUNTIES

Prepared under the supervision of WILLIAM LANE AUSTIN, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## CONTENTS.

|  | Page. |  | Page. |
|--|-------|--|-------|
| INTRODUCTION.....                                      | 1     | CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.....  | 7     |
| MAP SHOWING LOCATION AND EXTENT OF IRRIGATED LAND..... | 2     | DRAINAGE OF IRRIGATED LAND.....  | 8     |
| EXPLANATION OF TERMS.....                              | 3     | QUANTITY OF WATER USED.....  | 8     |
| CLIMATIC CONDITIONS.....                               | 4     | IRRIGATION WORKS.....  | 9     |
| WATER SUPPLY FOR IRRIGATION.....                       | 4     | CROPS.....   | 12    |
| FARMS AND ACREAGE IRRIGATED:                           |       | COUNTY TABLE.—Acreage irrigated, 1919 and 1909; and acreage in enterprises,<br>irrigation works, and capital invested in irrigation enterprises, 1920 and<br>1910..... | 13    |
| Acreage, by character of enterprise.....               | 5     |  |       |
| Acreage, by character of water rights.....             | 6     |  |       |
| Acreage, by drainage basin.....                        | 6     |  |       |

## INTRODUCTION.

This bulletin presents the statistics of irrigation for the state of New Mexico collected at the census of 1920. Statistics of acreage irrigated, of acreage, yield, and value of crops grown on irrigated land, and of cost of operation and maintenance relate to the year 1919; other items relate to the year 1920. Throughout the bulletin figures for the census of 1910 are given for purposes of comparison; and, for the purpose of

showing the historical development of irrigation, items which have been reported in censuses previous to 1910 are presented.

Statistics of number of farms irrigated and of acreage, yield, and value of crops grown on irrigated land were collected in the general census of agriculture. All other statistics were obtained in a special canvass of irrigation enterprises.

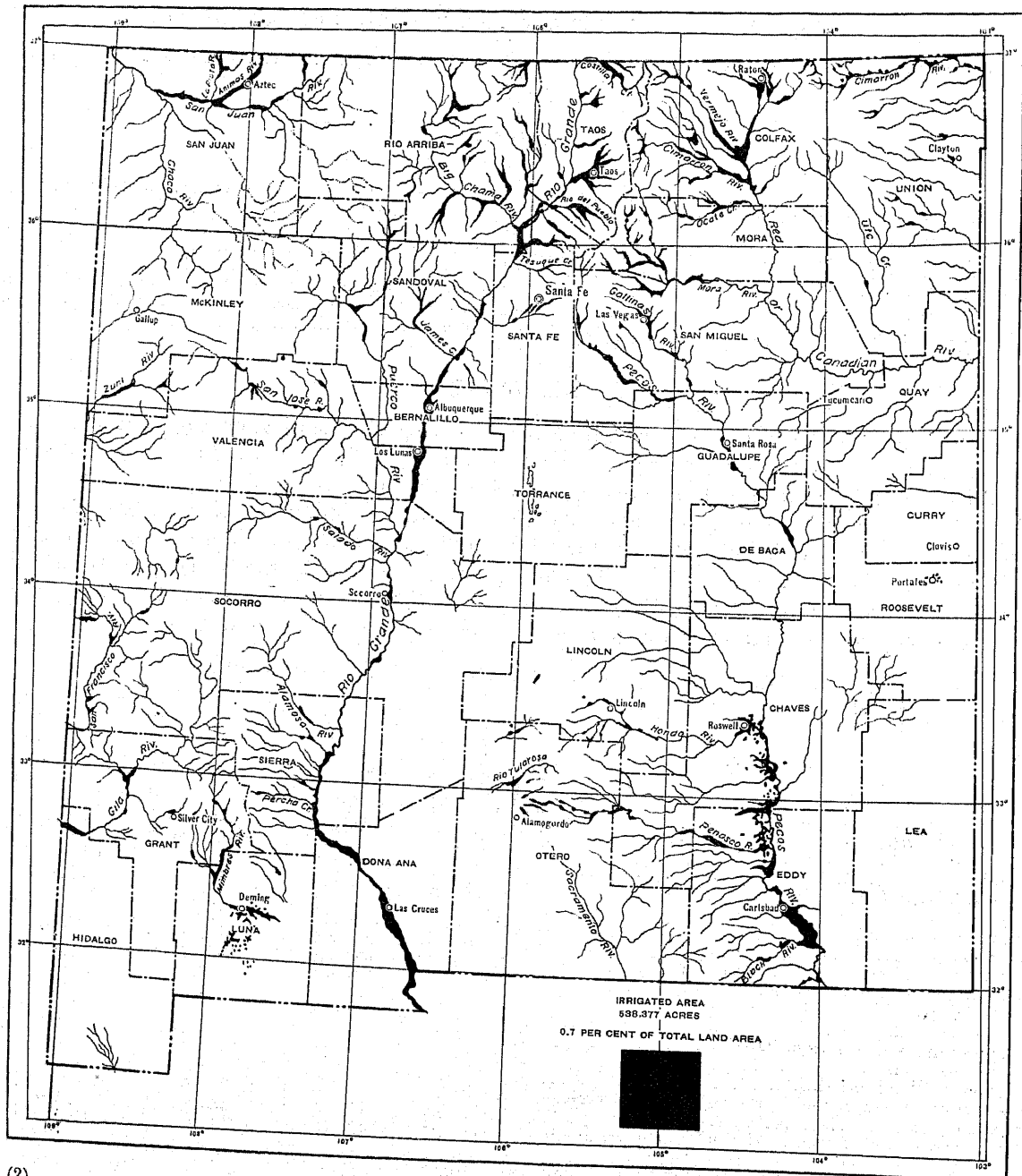
TABLE 1.—SUMMARY FOR THE STATE: 1920 AND 1910.

| ITEM.   | CENSUS OF—   |                  | INCREASE. <sup>1</sup> |           |
|---|--------------|------------------|------------------------|-----------|
|   | 1920         | 1910             | Amount.                | Per cent. |
| Number of all farms.....  | 29,844       | 35,676           | -5,832                 | -16.3     |
| Approximate land area of state.....acres..  | 78,401,920   | 78,401,920       |                        |           |
| All land in farms.....acres..   | 24,409,633   | 11,270,021       | 13,139,612             | 116.6     |
| Improved land in farms.....acres..  | 1,717,224    | 1,467,191        | 250,033                | 17.0      |
| Number of farms irrigated.....  | 11,390       | 12,795           | -1,405                 | -11.0     |
| Area irrigated.....acres..  | 538,377      | 461,718          | 76,659                 | 16.6      |
| Area enterprises were capable of irrigating.....acres..                               | 696,119      | 644,970          | 51,149                 | 7.9       |
| Area included in enterprises.....acres..  | 961,879      | 1,102,297        | -140,418               | -12.7     |
| Per cent irrigated:   |              |                  |                        |           |
| Number of all farms.....  | 38.2         | 35.9             | 2.3                    |           |
| Approximate land area of state.....   | 0.7          | 0.6              | 0.1                    |           |
| Land in farms.....  | 2.2          | 4.1              | -1.9                   |           |
| Improved land in farms.....   | 31.4         | 31.5             | -0.1                   |           |
| Excess of area enterprises were capable of irrigating over area irrigated.....acres.. | 157,742      | 183,252          | -25,510                | -13.9     |
| Excess of area included in enterprises over area irrigated.....acres..                | 423,502      | 640,579          | -217,077               | -33.9     |
| Area of irrigated land reported as available for settlement.....acres..               | 66,479       | ( <sup>2</sup> ) |                        |           |
| Capital invested.....   | \$18,210,412 | \$9,154,897      | \$9,055,515            | 98.9      |
| Average per acre enterprises were capable of irrigating.....                          | \$26.16      | \$14.19          | \$11.97                | 84.4      |
| Estimated final cost of existing enterprises.....                                     | \$20,440,646 | \$11,640,091     | \$8,800,555            | 75.6      |
| Average per acre included in enterprises.....   | \$21.25      | \$10.56          | \$10.69                | 101.2     |
| Average cost of operation and maintenance per acre.....                               | \$2.41       | \$1.36           | \$1.05                 | 77.2      |

<sup>1</sup> A minus sign (-) denotes decrease.<sup>2</sup> Not reported in 1910.

# NEW MEXICO

APPROXIMATE LOCATION AND EXTENT OF IRRIGATED LAND.



## EXPLANATION OF TERMS.

**Farms irrigated.**—The number of "farms irrigated" is the number on which irrigation is practiced, and for the purposes of this inquiry a "farm" is defined as for the general census of agriculture; that is, to be classed as a farm an establishment either must be 3 acres in extent or must have produced crops to the value of \$250 in 1919, or must have required for its agricultural operations the continuous services of at least one person. "Number of farms irrigated" as used in this report and in that of 1910, is equivalent to the term "number of irrigators" used in census reports on irrigation previous to 1910.

**Irrigation enterprise.**—An "enterprise" is an independent irrigation establishment and includes the works for supplying water and the land to which water is supplied or is to be supplied, except that the cost or value of the land is not included in the "capital invested."

**Acreage irrigated, in enterprises, and available for settlement.**—Acreage irrigated is the acreage to which water was actually applied in the season preceding the census year—1919 for the Fourteenth Census and 1909 for the Thirteenth Census.

Acreage to which enterprises were capable of supplying water relates to the season following the time of taking the census and, consequently, is based on estimates made by those controlling the enterprises.

Acreage included in enterprises represents the extent of the plans of those controlling enterprises.

Acreage of irrigated land reported as available for settlement relates to land within existing enterprises and not to land that is susceptible of reclamation and settlement by new enterprises or extensions of existing enterprises.

**Types of enterprises.**—The types of enterprises under which all data are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands. In addition to serving land within its own projects, the United States Reclamation Service supplies stored water to land within other enterprises.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who may own no interest in the works.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization.

**Capital invested.**—The capital invested in irrigation enterprises is that reported by the owners. For the larger works the capital invested is taken, in most cases, from books of account and represents the actual investment. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the capital reported represents the owners' estimates. The schedules used in 1910 called for "cost," while

the schedule used in the present census calls for "capital invested," but the instructions accompanying the schedules make these two terms equivalent. In both cases the investment includes cost of construction and of acquiring rights. The latter usually consists of filing fees only, but in some instances it includes the purchase price of rights. However, these cases are so rare that they are unimportant. The cost reported for 1900 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. For the Thirteenth and Fourteenth Censuses the average cost per acre is based on the acreage which enterprises were capable of irrigating in the census year and the cost to the date of the census—January 1, 1920, for the Fourteenth Census, and July 1, 1910, for the Thirteenth Census.

**Operation and maintenance.**—Cost of operation and maintenance was not reported on all schedules, and averages are based on the acreages for which cost is reported. No estimate of total cost of operation and maintenance for all irrigation enterprises has been made. In the case of enterprises operating pumping plants the cost of operation and maintenance includes cost of fuel and attendance.

**Water rights.**—The acreage irrigated has been classified by the character of rights under which water is received. The classes used are defined as follows:

"*Appropriation and use*" includes all rights acquired without formalities of any kind that have not been defined by the courts.

"*Notice filed and posted*" includes rights for which claims of some kind have been either posted or filed that have not been defined by the courts.

"*Adjudicated by court*" includes all rights that have been defined by the courts.

"*Permit from state*" includes all rights initiated under laws requiring any party wishing to acquire rights to obtain a permit from the state.

"*Certificate or license from the state*" includes rights acquired under laws providing for the issuing by the state of certificates or licenses defining rights acquired.

"*Riparian rights*" includes rights based on the ownership of riparian land.

"*Underground*" represents water taken from wells.

**Source of water supply.**—In classifying acreage by source of supply from which water for irrigation is obtained, in 1910 acreage was credited to what seemed to be the principal source of supply, while in the census of 1920 the attempt is made to represent the facts more nearly by presenting various mixed classes.

**Date of beginning.**—The date of beginning of irrigation enterprises is, in some cases, the date when construction began, and, in other cases, the date of filing a claim or of applying for a permit. If a filing or application for permit was made and work was begun and continued with reasonable diligence the date of filing is considered the date of beginning, otherwise the date of construction is taken as the date of beginning.

**Drainage basin.**—The drainage basin of a stream is all of the land drained by the stream and its tributaries.

**Units of quantity and capacity.**—Capacities of canals, reservoirs, wells, pumps, and engines, and quantities of water used are expressed in the units commonly used in engineering literature to express the same items. They are as follows:

*Capacities of canals and volumes of flowing water* are given in second-feet, a shorter equivalent for cubic feet per second.

*Capacities of wells and pumps* are given in gallons per minute. Four hundred and fifty gallons per minute equal 1 second-foot.

*Capacities of reservoirs* are given in acre-feet. An acre-foot is the quantity of water that will cover 1 acre to a depth of 1 foot. It equals 43,560 cubic feet.

*Capacities of engines and motors* are given in horsepower. One horsepower is the power required to lift 33,000 pounds through a vertical distance of 1 foot in 1 minute of time.

**CLIMATIC CONDITIONS.**

The climatic conditions having the greatest influence in determining the necessity for irrigation are the amount and seasonal distribution of precipitation, especially rainfall, although temperature, relative humidity, and wind movement have an influence.

The surface of New Mexico is very much broken, and the state does not lie in the path of the large storm movements of the country; consequently there is a great variety of both temperature and moisture conditions, depending on local influences.

The San Juan Valley, in the northwestern corner of the state, has the lowest precipitation in the state, the annual total falling below 6 inches in the lower valley. The precipitation increases with elevation to the north, east, and south of this valley, reaching about 15 inches where San Juan River crosses the Colorado-New Mexico boundary, and 20 inches in the mountains between the San Juan and the Rio Grande and on the high lands in the west-central part of the state.

The northeastern part of the state has the heaviest precipitation in the state. The precipitation of this section is mostly received in the form of showers during the months from April to September, inclusive, July and August being the months of greatest rainfall. The smallest precipitation in this section occurs in a strip passing along the eastern side of Colfax County, through central Mora and San Miguel Counties and eastern Guadalupe County. In this strip the annual precipitation falls below 14 inches in southern Colfax County, and averages 15 to 16 inches over the rest of the strip. To the east the annual precipitation increases to 16 or 18 inches in Union and Quay Counties. To the west of this strip of low precipitation the annual average increases to 18 inches in the western parts of Colfax, Mora, and San Miguel Counties, and exceeds 20 inches on the mountain slopes at an altitude of 8,000 feet.

The Rio Grande flows through the central part of the state from north to south. Over the greater part of the Rio Grande Valley the average annual precipitation is less than 10 inches; in the Pecos Valley it rises to about 15 inches; over the great plains east of the Pecos it ranges from 15 to 20 inches, while on the mountains between the two river valleys it ranges from 15 to more than 25 inches.

Over the high plateaus and mountains west of the Rio Grande the annual precipitation ranges from about 20 inches in the northern and higher elevations

to less than 10 inches on the lower plains near the Mexican boundary.

In the eastern part of the state fully 75 per cent of the annual precipitation occurs during the months from May to October, making it possible to grow cereals and forage crops without irrigation. In the state generally, the larger part of the precipitation occurs in the summer.

In 1919 the precipitation was far above the normal, the average for the state being nearly 21 inches, while the normal is between 15 and 16 inches.

**WATER SUPPLY FOR IRRIGATION.**

The Rio Grande flows through the state of New Mexico from north to south, slightly west of the center of the state. The river rises in the mountains of southern Colorado. In New Mexico it flows in a narrow valley, but at places the hills recede, forming a succession of valleys containing considerable areas of arable land. In its natural condition the river is subject to heavy floods when the snows in the mountains melt in spring and during heavy rains at other times, and at times between floods is dry, or nearly so. In 1907 the construction of the Elephant Butte Dam to store the flood water was begun, and the dam was completed in 1916. This reservoir supplies water in New Mexico only to the lower part of the valley, leaving the valleys above to use the stream in its natural condition. Water from the reservoir at Elephant Butte is used for lands in Texas, as well as New Mexico, and under treaty with Mexico a fixed quantity of water is to be supplied for land in that country.

The northeastern part of the state is drained by the Canadian River and its tributaries. This stream rises in the mountains and flows out onto the plains and, like other such streams, loses in the sands and by evaporation most of the water entering it in the mountains. Without storage it is not a reliable source of water for irrigation, except in flood seasons.

The southeastern part of the state is drained by the Pecos and its tributaries. Like the Rio Grande and the Canadian, the Pecos at times carries large floods and at other times carries very little water. Storage of water for use along the lower part of the stream in New Mexico has been provided by the United States Reclamation Service.

There has been a large development of both flowing and pumped wells in the Pecos Valley in the vicinity of Roswell, in Chaves County.



In the southwestern part of the state, near Deming, there has been a large development of underground water from pumped wells. Farther west the Gila and San Francisco Rivers supply water for land in their valleys. These rivers within New Mexico are perennial streams, furnishing a reliable supply of water.

San Juan River and its tributaries rise in high mountains in Colorado and New Mexico, and furnish an abundant supply of water for the San Juan Valley.

In the west-central part of the state there is a high plateau region that has many small streams rising in the hills and losing their waters in the valleys. There is so little water in this section that there is no large opportunity for irrigation.

Throughout the state there are many valleys containing large areas of fine land which have no surface supply of water. In many of these it is possible to obtain water from wells, and this may be done where the value of crops will justify the expense.

### FARMS AND ACREAGE IRRIGATED.

TABLE 2.—NUMBER OF FARMS AND ACREAGE IRRIGATED:  
1890 TO 1920.

| CENSUS YEAR. | FARMS IRRIGATED. |                                     |                        | AREA IRRIGATED. |                        |                              |                            |                                      |
|--------------|------------------|-------------------------------------|------------------------|-----------------|------------------------|------------------------------|----------------------------|--------------------------------------|
|              | Num-ber.         | Per cent of in-crease. <sup>1</sup> | Per cent of all farms. | Acres.          | Per cent of in-crease. | Per cent of total land area. | Per cent of land in farms. | Per cent of im-proved land in farms. |
| 1920.....    | 11,390           | -11.0                               | 38.2                   | 538,377         | 16.6                   | 0.7                          | 2.2                        | 31.4                                 |
| 1910.....    | 12,795           | 40.2                                | 35.9                   | 461,718         | 126.5                  | 0.6                          | 4.1                        | 31.5                                 |
| 1900.....    | 9,128            | 195.9                               | 74.1                   | 203,893         | 122.2                  | 0.3                          | 4.0                        | 62.4                                 |
| 1890.....    | 3,085            | .....                               | 69.2                   | 91,745          | .....                  | 0.1                          | 11.6                       | 34.9                                 |

<sup>1</sup> A minus sign (—) denotes decrease.

TABLE 3.—ACREAGE, CLASSIFIED BY DATE OF BEGINNING OF ENTERPRISES SUPPLYING WATER FOR IRRIGATION.

| DATE OF BEGINNING. | Num-ber of enter-prises. | Area included in enter-prises, 1920 (acres). | AREA IRRIGATED IN 1919. |                                      | Area enter-prises were capable of irrigating in 1920 (acres). |
|--------------------|--------------------------|--|-------------------------|--------------------------------------|---|
|                    |                          |  | Acres.                  | Per cent of acreage in enter-prises. |   |
| Total.....         | 2,391                    | 961,879                                      | 538,377                 | 56.0                                 | 696,119   |
| Before 1860.....   | 116                      | 46,962                                       | 28,062                  | 59.8                                 | 41,073  |
| 1860-1869.....     | 103                      | 34,775                                       | 26,597                  | 76.5                                 | 28,628  |
| 1870-1879.....     | 176                      | 51,249                                       | 33,720                  | 65.3                                 | 37,601  |
| 1880-1889.....     | 276                      | 98,832                                       | 71,909                  | 72.8                                 | 78,785  |
| 1890-1899.....     | 221                      | 82,523                                       | 55,225                  | 66.9                                 | 60,947  |
| 1900-1904.....     | 156                      | 49,681                                       | 27,312                  | 55.0                                 | 35,997  |
| 1905-1909.....     | 326                      | 145,064                                      | 71,848                  | 49.5                                 | 117,623   |
| 1910-1914.....     | 380                      | 195,842                                      | 89,720                  | 45.3                                 | 128,866   |
| 1915-1919.....     | 336                      | 153,439                                      | 60,919                  | 39.7                                 | 78,982  |
| Not reported.....  | 301                      | 103,462                                      | 73,067                  | 70.6                                 | 87,617  |

TABLE 4.—ACREAGE, CLASSIFIED BY SOURCE OF WATER SUPPLY:  
1919 AND 1909.

| CLASS.                                  | AREA IRRIGATED (ACRES). |         |                        |           | Area enter-prises were capable of irrigating in 1920 (acres). | Area included in enter-prises, 1920 (acres). |
|---|-------------------------|---------|------------------------|-----------|---|--|
|   | 1919                    | 1909    | Increase. <sup>1</sup> |           |   |  |
|   |                         |         | Amount.                | Per cent. |   |  |
| Total.....                              | 538,377                 | 461,718 | 76,659                 | 16.6      | 696,119   | 961,879                                      |
| Stream, gravity.....                    | 432,478                 | 397,059 | 35,419                 | 8.9       | 558,292   | 748,046                                      |
| Stream, pumped.....                     | 1,890                   | 1,533   | 357                    | 23.3      | 2,030   | 8,320  |
| Wells, pumped.....                      | 15,709                  | 5,952   | 9,757                  | 163.9     | 23,141  | 42,563                                       |
| Wells, flowing.....                     | 30,030                  | 48,877  | -18,847                | -38.6     | 33,394  | 50,968                                       |
| Wells, flowing and pumped.....          | 6,556                   | (2)     | 6,556                  | .....     | 7,452   | 9,084  |
| Lake, gravity.....                      | 1,945                   | 862     | 1,083                  | 125.6     | 12,245  | 23,150                                       |
| Springs.....                            | 10,791                  | 6,163   | 4,628                  | 75.1      | 11,127  | 19,332                                       |
| Stored storm water.....                 | 6,448                   | 1,272   | 5,176                  | 406.9     | 6,774   | 15,689                                       |
| City water.....                         | 40                      | (2)     | 40                     | .....     | 150   | 350  |
| Stream, gravity, and pumped wells.....  | 1,341                   | (2)     | 1,341                  | .....     | 1,584   | 1,792  |
| Stream, gravity, and flowing wells..... | 685                     | (2)     | 685                    | .....     | 685   | 740  |
| Other mixed.....                        | 29,787                  | (2)     | 29,787                 | .....     | 37,368  | 45,367                                       |
| Other and not reported.....             | 677                     | (2)     | 677                    | .....     | 977   | 878  |

<sup>1</sup> A minus sign (—) denotes decrease.

<sup>2</sup> Not included in classification in 1910.

### ACREAGE, BY CHARACTER OF ENTERPRISE.

Irrigation was practiced in parts of what is now New Mexico for hundreds of years before this territory became a part of the United States, and water for irrigation was supplied by "community ditches" or "public acequias," owned and controlled by the water users in accordance with old Spanish customs. New Mexico was organized as a territory in 1850, and in 1852 the territorial legislature enacted a law declaring "All rivers and streams of water in this territory, formerly known as public ditches (acequias), are hereby established and declared to be public ditches (acequias)." This law provided for annual elections of officers, under the supervision of justices of the peace, and contained regulations requiring each party receiving water to furnish labor for repairs and cleaning, and fixed fines for refusal or failure to furnish labor. Similar laws are still in force in New Mexico, and a large part of the irrigated land in the state is watered by such ditches. They are classed as cooperative in Table 5.

A law enacted in 1887 provided for the organization of corporations for constructing irrigation and other canals and the colonization and improvement of lands. Such companies were authorized to issue bonds and to collect rates for water, but were not empowered to levy and collect taxes, as are the irrigation districts provided for by the later laws. Such companies are classed as commercial in Table 5.

An irrigation district law containing the bonding and taxing powers was enacted in 1909. It has been amended from time to time, and revised in 1919.

The conditions of the Federal Carey Act (act of Congress, Aug. 18, 1894) were accepted in 1909.

The small area credited to the state belongs to a state institution and does not represent a scheme of state construction of irrigation works.

TABLE 5.—ACREAGE, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920 AND 1910.

| ITEM AND CLASS.  | CENSUS OF— |           | INCREASE. <sup>1</sup> |           |
|--|------------|-----------|------------------------|-----------|
|  | 1920       | 1910      | Acres.                 | Per cent. |
| <b>ACREAGE IRRIGATED.</b>                              |            |           |                        |           |
| Total.....   | 538,377    | 461,718   | 76,659                 | 16.6      |
| Individual and partnership.....                        | 151,351    | 144,212   | 7,139                  | 5.0       |
| Cooperative.....                                       | 264,610    | 251,911   | 12,699                 | 5.0       |
| Irrigation district.....                               | 15,008     | —         | 15,008                 | —         |
| Carey Act.....   | —          | —         | —                      | —         |
| Commercial.....  | 19,871     | 28,190    | -8,319                 | -29.5     |
| U. S. Reclamation Service.....                         | 77,678     | 13,398    | 64,280                 | 479.8     |
| U. S. Indian Service.....                              | 9,072      | 24,007    | -14,935                | -62.2     |
| State.....   | 77         | (2)       | 77                     | —         |
| City.....  | 600        | (2)       | 600                    | —         |
| Other.....   | 110        | (2)       | 110                    | —         |
| <b>ACREAGE ENTERPRISES WERE CAPABLE OF IRRIGATING.</b> |            |           |                        |           |
| Total.....   | 606,119    | 644,970   | 51,149                 | 7.9       |
| Individual and partnership.....                        | 215,618    | 185,283   | 30,335                 | 16.4      |
| Cooperative.....                                       | 305,540    | 355,327   | -49,787                | -14.0     |
| Irrigation district.....                               | 24,808     | —         | 24,808                 | —         |
| Carey Act.....   | 7,500      | —         | 7,500                  | —         |
| Commercial.....  | 33,743     | 58,150    | -24,407                | -42.0     |
| U. S. Reclamation Service.....                         | 96,761     | 21,467    | 75,294                 | 350.7     |
| U. S. Indian Service.....                              | 11,372     | 24,743    | -13,371                | -54.0     |
| State.....   | 77         | (2)       | 77                     | —         |
| City.....  | 600        | (2)       | 600                    | —         |
| Other.....   | 110        | (2)       | 110                    | —         |
| <b>ACREAGE INCLUDED IN ENTERPRISES.</b>                |            |           |                        |           |
| Total.....   | 961,879    | 1,102,297 | -140,418               | -12.7     |
| Individual and partnership.....                        | 313,170    | 295,171   | 17,999                 | 6.1       |
| Cooperative.....                                       | 404,028    | 482,054   | -78,026                | -16.2     |
| Irrigation district.....                               | 28,520     | 16,400    | 12,120                 | 73.9      |
| Carey Act.....   | 7,500      | 16,000    | -8,500                 | -53.1     |
| Commercial.....  | 67,050     | 224,950   | -157,900               | -70.2     |
| U. S. Reclamation Service.....                         | 127,226    | 30,267    | 96,959                 | 320.3     |
| U. S. Indian Service.....                              | 13,570     | 37,455    | -23,885                | -63.8     |
| State.....   | 77         | (2)       | 77                     | —         |
| City.....  | 600        | (2)       | 600                    | —         |
| Other.....   | 138        | (2)       | 138                    | —         |

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Not included in classification in 1910.

#### ACREAGE, BY CHARACTER OF WATER RIGHTS.

The laws of New Mexico relating to water rights are summarized in the following paragraphs:

The territory of New Mexico was organized under the act of Congress approved September 9, 1850, and the first territorial legislature passed an act declaring "All the inhabitants of the territory of New Mexico shall have the right to construct either private or common acequias, and to take water for said acequias from wherever they can."

A law enacted in 1891 required the filing of descriptions of all works built after the enactment of the law within 90 days after the beginning of construction, and provided that no right should accrue because of such construction until the filing was made.

In 1905 a law requiring filing in advance of construction was enacted.

In the same year a comprehensive water law was passed. It declared that "All natural waters within the limits of New Mexico are hereby declared to belong to the public, and no person shall be denied the right to appropriate said waters for beneficial use." It created the office of territorial engineer, and gave to this officer

supervision of the administration of the public waters of the territory. It created also a board of control, consisting of the engineer and six water commissioners, and gave to this board authority to adjudicate and define all existing rights to water. However, no funds for the enforcement of this law were appropriated, and it was inoperative.

In 1907 the act of 1905 was repealed and a new law differing in many respects was enacted. This law placed the adjudication of rights in the courts, but provided for the collection of information for such adjudication by the territorial engineer, and for the initiation of actions by the attorney general of the territory. Any party wishing to acquire rights was required to apply to the territorial engineer for a permit to appropriate water and to submit proof of the completion of works and of the use of water in accordance with the terms of the permit. When satisfactory proof of completion of works is made, a certificate of completion is issued by the engineer, and when satisfactory proof of use of water is submitted a license setting forth the rights acquired is issued by the engineer. This law is still in force.

New Mexico was admitted as a state in 1911. The state constitution adopted at that time contained the following sections relating to water rights (Art. XVI):

Sec. 1. "All existing rights to the use of any waters in this state for any useful or beneficial purpose are hereby recognized and confirmed."

Sec. 2. "The unappropriated water of every natural stream, perennial or torrential, within the state of New Mexico, is hereby declared to belong to the public and to be subject to appropriation for beneficial use, in accordance with the laws of the state. Priority of appropriation shall give the better right."

Sec. 3. "Beneficial use shall be the basis, the measure and the limit of the right to the use of water."

TABLE 6.—ACREAGE IRRIGATED, CLASSIFIED BY CHARACTER OF RIGHTS UNDER WHICH WATER IS RECEIVED: 1919 AND 1909.

| CLASS.                                 | 1919    |                       | 1909,<br>per cent<br>of total. |
|--|---------|-----------------------|--------------------------------|
|  | Acres.  | Per cent<br>of total. |                                |
| Total.....                             | 538,377 | 100.0                 | 100.0                          |
| Appropriation and use.....             | 152,746 | 28.4                  | 83.9                           |
| Notice filed and posted.....           | 54,356  | 10.1                  | 2.2                            |
| Adjudicated by court.....              | 91,807  | 17.1                  | 5.6                            |
| Permit from state.....                 | 103,459 | 19.2                  | 8.0                            |
| Certificate or license from state..... | 20,096  | 3.7                   | 0.1                            |
| Riparian rights.....                   | 400     | 0.1                   | 0.1                            |
| Underground.....                       | 52,325  | 9.7                   | (1)                            |
| Other and mixed.....                   | 8       | (2)                   | (1)                            |
| Not reported.....                      | 63,180  | 11.7                  | (1)                            |

<sup>1</sup> This class was not included in the tabulation in 1909. All land for which the class of water rights was not reported was included in "Appropriation and use."

<sup>2</sup> Less than one-tenth of 1 per cent.

#### ACREAGE, BY DRAINAGE BASIN.

The report of a special census taken in 1902 presented all data by drainage basins rather than by counties. The results of the census of 1920 have been tabulated on the same basis, and the data for 1902 are presented for purposes of comparison. For no other census have the results been tabulated in this form. The acreage reported for each drainage basin in 1919 comprises all the irrigated land in that drainage basin, including that watered from springs and wells. In the 1902 results the acreages irrigated from springs and wells were not reported for the smaller tributary streams, but the acreages for the tributaries were included in those reported for the main streams.

# IRRIGATION—NEW MEXICO.

7.

This area is so small, however, that the comparison of the areas reported for the tributary streams is not seriously affected.

TABLE 7.—ACREAGE IRRIGATED, CLASSIFIED BY DRAINAGE BASIN: 1919 AND 1920.

| DRAINAGE BASIN.                          | AREA IRRIGATED (ACRES). |         |                                    | Area included in enterprises, 1920 (acres). | Area enterprises were capable of irrigating in 1920 (acres). |
|--|-------------------------|---------|------------------------------------|---|--|
|  | 1919                    | 1920    | Per cent of increase. <sup>1</sup> |   |  |
| Total.....                               | 538,377                 | 254,945 | 111.2                              | 961,879                                     | 696,119  |
| Canadian River and tributaries.....      | 90,185                  | 56,203  | 60.5                               | 179,402                                     | 136,947  |
| Canadian River direct.....               | 1,680                   | 1,156   | 45.3                               | 1,680                                       | 1,680  |
| Cimarron River.....                      | 31,967                  | 8,122   | 203.6                              | 70,318                                      | 45,628   |
| Vermejo River.....                       | 23,678                  | 4,110   | 476.1                              | 23,978                                      | 23,878   |
| Ocate Creek.....                         | 4,861                   | 1,380   | 252.2                              | 13,908                                      | 13,095   |
| Mora River.....                          | 17,057                  | 32,796  | -48.0                              | 36,670                                      | 29,528   |
| Ute Creek.....                           | 77                      | 4,061   | -98.1                              | 709   | 519  |
| Other tributaries of Canadian River..... | 10,865                  | 24,578  | 137.3                              | 32,199                                      | 22,619   |
| Cimarron River.....                      | 5,757                   | 26,554  | -12.2                              | 14,173                                      | 12,383   |
| Trinchera River.....                     | 389                     | 691     | -43.7                              | 911   | 468  |
| Pecos River and tributaries.....         | 119,040                 | 56,497  | 110.7                              | 225,400                                     | 160,658  |
| Pecos River direct.....                  | 62,430                  | 12,333  | 406.2                              | 102,200                                     | 77,794   |
| Gallinas River.....                      | 4,097                   | 6,281   | -34.8                              | 41,810                                      | 24,201   |
| Hondo River.....                         | 20,561                  | 24,608  | -16.4                              | 33,118                                      | 23,525   |
| Penasco River.....                       | 13,375                  | 5,102   | 162.2                              | 19,889                                      | 13,733   |
| Other tributaries of Pecos River.....    | 18,577                  | 28,173  | 127.3                              | 28,383                                      | 21,405   |
| Rio Grande and tributaries.....          | 250,206                 | 96,836  | 158.4                              | 421,363                                     | 298,663  |
| Rio Grande direct.....                   | 103,844                 | 49,520  | 109.7                              | 172,747                                     | 123,464  |
| Rio Costilla.....                        | 4,417                   | 2,115   | 108.8                              | 7,385                                       | 4,803  |
| Pueblo River.....                        | 11,780                  | 7,075   | 66.5                               | 12,443                                      | 11,791   |
| Rio Chama.....                           | 26,166                  | 8,549   | 206.1                              | 42,235                                      | 30,237   |
| Rio Santa Cruz.....                      | 9,171                   | 3,086   | 197.2                              | 9,863                                       | 9,221  |
| Tesuque Creek.....                       | 3,012                   | 4,744   | -36.5                              | 3,411                                       | 3,183  |
| Rio Puerco.....                          | 14,309                  | 2,927   | 388.9                              | 42,877                                      | 25,991   |
| Other tributaries of Rio Grande.....     | 77,507                  | 218,820 | 311.8                              | 130,402                                     | 89,973   |
| Rio Mimbres.....                         | 12,557                  | 26,546  | 91.8                               | 24,243                                      | 19,554   |
| Gila River and tributaries.....          | 9,983                   | 9,342   | 6.9                                | 14,936                                      | 10,493   |
| Gila River direct.....                   | 6,424                   | 4,647   | 38.2                               | 7,027                                       | 6,587  |
| San Francisco River.....                 | 3,162                   | 4,668   | -32.3                              | 6,986                                       | 3,383  |
| Other tributaries of Gila River.....     | 397                     | 227     | .....                              | 923   | 523  |
| San Juan River and tributaries.....      | 43,825                  | 20,467  | 114.1                              | 71,608                                      | 49,655   |
| San Juan River direct.....               | 12,026                  | 6,285   | 91.3                               | 21,388                                      | 12,651   |
| Los Pinos River.....                     | 1,260                   | 463     | 172.1                              | 2,640                                       | 1,280  |
| Animas River.....                        | 23,355                  | 10,502  | 122.4                              | 35,370                                      | 28,455   |
| La Plata River.....                      | 5,830                   | 3,005   | 94.0                               | 9,445                                       | 5,830  |
| Other tributaries of San Juan River..... | 1,354                   | 2212    | 538.7                              | 2,767                                       | 1,459  |
| Independent streams.....                 | 6,435                   | 1,809   | 255.7                              | 9,783                                       | 7,298  |
| Fresno River.....                        | 1,798                   | 200     | 799.0                              | 3,598                                       | 2,331  |
| Rio Tularosa.....                        | 4,547                   | 1,568   | 190.0                              | 6,095                                       | 4,877  |
| Other independent streams.....           | 90                      | 241     | .....                              | 90  | 90   |

<sup>1</sup> A minus sign (—) denotes decrease. Per cent not shown when base is less than 100.  
<sup>2</sup> Includes springs and wells.

## CAPITAL INVESTED AND COST OF OPERATION AND MAINTENANCE.

TABLE 8.—CAPITAL INVESTED IN IRRIGATION ENTERPRISES: 1890 TO 1920.

| CENSUS YEAR. | Amount.      | Per cent of increase. | AVERAGE PER ACRE. |                                    |
|--------------|--------------|-----------------------|-------------------|------------------------------------|
|              |              |                       | Amount.           | Per cent of increase. <sup>1</sup> |
| 1920.....    | \$18,210,412 | 98.9                  | \$26.16           | 84.4                               |
| 1910.....    | 9,154,897    | 119.8                 | 14.19             | -30.5                              |
| 1900.....    | 4,165,312    | 713.0                 | 20.43             | 266.1                              |
| 1890.....    | 511,937      | .....                 | 5.58              | .....                              |

<sup>1</sup> A minus sign (—) denotes decrease.

TABLE 9.—CAPITAL INVESTED, CLASSIFIED BY DATE OF BEGINNING.

| DATE OF BEGINNING. | Amount.      | Per cent of total. | Average per acre. |
|--------------------|--------------|--------------------|-------------------|
| Total.....         | \$18,210,412 | 100.0              | \$26.16           |
| Before 1890.....   | 268,876      | 1.5                | 6.55              |
| 1890-1899.....     | 384,764      | 2.1                | 13.44             |
| 1870-1879.....     | 482,843      | 2.6                | 12.84             |
| 1880-1889.....     | 2,568,298    | 14.1               | 32.60             |
| 1890-1899.....     | 1,262,916    | 6.9                | 20.72             |
| 1900-1904.....     | 1,122,232    | 6.2                | 31.18             |
| 1905-1909.....     | 4,692,515    | 25.8               | 39.89             |
| 1910-1914.....     | 4,594,735    | 25.2               | 35.66             |
| 1915-1919.....     | 2,021,448    | 11.1               | 25.59             |
| Not reported.....  | 811,795      | 4.5                | 9.27              |

TABLE 10.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY SOURCE OF WATER SUPPLY.

[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                                  | CAPITAL INVESTED, 1920. |                    |                   | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---|-------------------------|--------------------|-------------------|--|-------------------------------------|
|   | Amount.                 | Per cent of total. | Average per acre. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                              | \$18,210,412            | 100.0              | \$26.16           | 336,387                                  | \$2.41                              |
| Stream, gravity.....                    | 13,524,889              | 74.2               | 21.23             | 257,818                                  | 1.65                                |
| Stream, pumped.....                     | 35,520                  | 0.2                | 12.46             | 1,132                                    | 1.30                                |
| Wells, pumped.....                      | 925,003                 | 5.1                | 39.97             | 12,388                                   | 7.51                                |
| Wells, flowing.....                     | 1,220,519               | 6.7                | 36.55             | 14,394                                   | 2.15                                |
| Wells, flowing and pumped.....          | 388,165                 | 2.1                | 52.09             | 4,601                                    | 8.99                                |
| Lake, gravity.....                      | 18,750                  | 0.1                | 1.53              | 1,945                                    | 1.41                                |
| Springs.....                            | 257,179                 | 1.4                | 23.11             | 7,452                                    | 1.92                                |
| Stored storm water.....                 | 686,047                 | 3.8                | 101.28            | 6,207                                    | 1.67                                |
| City water.....                         | 1,000                   | (?)                | 6.67              | 40                                       | 1.25                                |
| Stream, gravity, and pumped wells.....  | 175,000                 | 1.0                | 110.48            | 1,319                                    | 39.77                               |
| Stream, gravity, and flowing wells..... | 14,000                  | 0.1                | 20.44             | 500                                      | 1.00                                |
| Other mixed.....                        | 958,740                 | 5.3                | 25.66             | 28,534                                   | 4.84                                |
| Other and not reported.....             | 4,600                   | (?)                | 4.71              | 57                                       | 4.91                                |

<sup>1</sup> Based on area irrigated in 1919.  
<sup>2</sup> Less than one-tenth of 1 per cent

TABLE 11.—CAPITAL INVESTED, CLASSIFIED BY DRAINAGE BASIN:  
1920 AND 1902.

| DRAINAGE BASIN.                          | 1920         | 1902        | INCREASE. <sup>1</sup> |           |
|--|--------------|-------------|------------------------|-----------|
|  |              |             | Amount.                | Per cent. |
| Total.....                               | \$18,210,412 | \$4,301,915 | \$13,908,497           | 323.3     |
| Canadian River and tributaries.....      | 5,039,780    | 424,442     | 4,615,338              | .....     |
| Canadian River direct.....               | 32,625       | 10,690      | 21,935                 | 205.2     |
| Cimarron River.....                      | 2,188,908    | 130,580     | 2,058,328              | .....     |
| Vermejo River.....                       | 1,248,537    | 131,020     | 1,117,517              | 852.9     |
| Ocate Creek.....                         | 319,529      | 9,400       | 310,129                | .....     |
| Mora River.....                          | 282,575      | 99,475      | 183,100                | 184.0     |
| Ute Creek.....                           | 7,000        | 10,000      | -3,000                 | -30.0     |
| Other tributaries of Canadian River..... | 980,606      | 23,277      | 947,329                | .....     |
| Cimarron River.....                      | 308,147      | 246,200     | 261,947                | 567.0     |
| Trinchera River.....                     | 3,513        | 1,010       | 2,503                  | 247.8     |
| Pecos River and tributaries.....         | 5,263,454    | 2,734,810   | 2,528,644              | 92.5      |
| Pecos River direct.....                  | 3,294,504    | 2,284,176   | 1,010,328              | 44.2      |
| Gallinas River.....                      | 519,566      | 30,931      | 488,635                | .....     |
| Hondo River.....                         | 578,094      | 261,863     | 316,231                | 120.8     |
| Penasco River.....                       | 222,693      | 50,363      | 172,330                | 342.2     |
| Other tributaries of Pecos River.....    | 648,597      | 2107,477    | 541,120                | 503.5     |
| Rio Grande and tributaries.....          | 5,158,057    | 599,836     | 4,558,221              | 759.9     |
| Rio Grande direct.....                   | 3,605,725    | 285,898     | 3,309,827              | .....     |
| Rio Costilla.....                        | 11,471       | 4,697       | 6,774                  | 144.2     |
| Pueblo River.....                        | 19,982       | 11,560      | 8,422                  | 72.9      |
| Rio Chama.....                           | 141,891      | 29,849      | 112,042                | 375.4     |
| Rio Santa Cruz.....                      | 18,281       | 12,862      | 5,419                  | 42.1      |
| Tesque Creek.....                        | 16,864       | 22,680      | -5,816                 | -25.6     |
| Rio Puerco.....                          | 88,109       | 53,523      | 34,586                 | 64.6      |
| Other tributaries of Rio Grande.....     | 1,255,734    | 2168,767    | 1,086,967              | 644.1     |
| Rio Mimbres.....                         | 318,062      | 2112,192    | 205,870                | 183.5     |
| Gila River and tributaries.....          | 70,423       | 73,769      | -3,346                 | -4.5      |
| Gila River direct.....                   | 47,182       | 46,014      | 1,168                  | 2.5       |
| San Francisco River.....                 | 9,809        | 21,455      | -11,646                | -54.3     |
| Other tributaries of Gila River.....     | 13,432       | 26,300      | 7,132                  | 113.2     |
| San Juan River and tributaries.....      | 1,715,867    | 295,298     | 1,420,569              | 481.1     |
| San Juan River direct.....               | 807,700      | 164,994     | 642,706                | 389.5     |
| Los Pinos River.....                     | 3,000        | 4,550       | -1,550                 | -34.1     |
| Animas River.....                        | 824,430      | 101,535     | 722,915                | 712.0     |
| La Plata River.....                      | 47,975       | 23,144      | 24,831                 | 107.3     |
| Other tributaries of San Juan River..... | 32,742       | 21,075      | 31,667                 | .....     |
| Independent streams.....                 | 333,109      | 14,358      | 318,751                | .....     |
| Fresno River.....                        | 297,724      | 2,440       | 295,284                | .....     |
| Rio Tularosa.....                        | 33,900       | 5,868       | 28,032                 | 477.7     |
| Other independent streams.....           | 1,485        | 26,050      | -4,565                 | -75.5     |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000  
<sup>2</sup> Includes springs and wells.

In classifying capital invested by type of enterprise the average capital invested per acre is not presented, for the reason that it is not possible to compute this correctly. The United States Reclamation Service supplies stored water to enterprises controlled by agencies of some of the other classes shown in the table, and a part of its expenditure is properly chargeable to those lands; but it is not possible to tell how much should be so charged or how it should be distributed among the various classes. The Reclamation Service also supplies water to land in Mexico, under treaty with that country.

TABLE 12.—CAPITAL INVESTED, 1920, AND COST OF OPERATION AND MAINTENANCE, 1919, CLASSIFIED BY CHARACTER OF ENTERPRISE  
[When water is pumped, cost of operation and maintenance includes cost of fuel and attendance.]

| CLASS.                          | CAPITAL INVESTED, 1920. |                    | OPERATION AND MAINTENANCE, 1919.         |                                     |
|---------------------------------|-------------------------|--------------------|--|-------------------------------------|
|                                 | Amount.                 | Per cent of total. | Area for which cost is reported (acres). | Average cost per acre. <sup>1</sup> |
| Total.....                      | \$18,210,412            | 100.0              | 336,387                                  | \$2.4                               |
| Individual and partnership..... | 5,589,372               | 30.7               | 97,967                                   | 4.4                                 |
| Cooperative.....                | 3,558,863               | 19.6               | 170,594                                  | 1.2                                 |
| Irrigation district.....        | 914,479                 | 5.0                | 15,000                                   | 3.3                                 |
| Commercial.....                 | 1,877,842               | 10.3               | 17,071                                   | 1.6                                 |
| Carey Act.....                  | 262,713                 | 1.4                | .....                                    | .....                               |
| U. S. Reclamation Service.....  | 5,020,230               | 27.6               | 22,233                                   | 2.7                                 |
| U. S. Indian Service.....       | 691,194                 | 3.8                | 6,922                                    | 0.9                                 |
| State.....                      | 18,544                  | 0.1                | .....                                    | .....                               |
| City.....                       | 276,299                 | 1.5                | 600                                      | 4.1                                 |
| Other.....                      | 876                     | .....              | .....                                    | .....                               |

<sup>1</sup> Based on area irrigated in 1919.

## DRAINAGE OF IRRIGATED LAND.

The acreages reported in Table 13 relate to lands within the boundaries of irrigation projects, and do not include lands within the vicinity of these projects. "Additional acreage needing drainage" includes all lands so reported by the owners of the enterprises, and includes lands producing partial crops as well as those wholly unproductive.

TABLE 13.—ACREAGE WITHIN IRRIGATION ENTERPRISES FOR WHICH DRAINS HAVE BEEN INSTALLED AND ADDITIONAL ACREAGE IN NEED OF DRAINAGE: 1920.

|  |         |
|--|---------|
| Number of enterprises reporting land drained or needing drainage.....  | 203     |
| Acreage included in enterprises reporting land drained or needing drainage.....  | 212,353 |
| Acreage for which drains have been installed.....  | 74,783  |
| Additional acreage needing drainage.....   | 90,277  |
| Per cent that acreage for which drains have been installed is of total acreage included in enterprises reporting drainage.....                                 | 35.2    |
| Per cent that acreage for which drains have been installed is of total acreage included in irrigation enterprises in the state.....                            | 7.8     |
| Per cent that acreage for which drains have been installed plus that needing drainage is of total acreage included in irrigation enterprises in the state..... | 14.0    |

## QUANTITY OF WATER USED.

The quantity of water used in 1919 was reported on only part of the irrigation schedules, and the figures given vary greatly. In order that proper values may be assigned to the figures given, those representing measurements and those representing estimates are reported separately in Table 14. While the data are incomplete, the reports represent sufficient acreages to serve as bases for reliable averages.

TABLE 14.—QUANTITY OF WATER USED IN 1919.

| ITEM.   | Total.    | Measured. | Not measured. |
|---|-----------|-----------|---------------|
| Average volume of water entering canals, second-feet..... | 4,041     | 1,306     | 2,735         |
| Area irrigated in 1919.....acres.....                     | 184,253   | 105,922   | 78,331        |
| Average number of acres per second-foot.....              | 46        | 81        | 29            |
| Total quantity of water entering canal, acre-feet.....    | 1,007,575 | 688,428   | 319,147       |
| Area irrigated in 1919.....acres.....                     | 199,859   | 126,090   | 73,769        |
| Average quantity per acre.....acre-feet.....              | 5.0       | 5.5       | 4.3           |
| Total quantity of water delivered, acre-feet.....         | 274,746   | 212,359   | 62,387        |
| Area irrigated in 1919.....acres.....                     | 160,996   | 119,013   | 41,983        |
| Average quantity per acre.....acre-feet.....              | 1.7       | 1.8       | 1.5           |

## y

TABLE 15.—IRRIGATION WORKS, CLASSIFIED BY DATE OF BEGINNING.

TABLE 16.—IRRIGATION WORKS, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

| CLASS.                          | Number of diverting dams. | Number of storage dams. | MAIN DITCHES. |                         |                 | LATERAL DITCHES. |                 | RESERVOIRS. |                       |
|---------------------------------|---------------------------|-------------------------|---------------|-------------------------|-----------------|------------------|-----------------|-------------|-----------------------|
|                                 |                           |                         | Number.       | Capacity (second-feet). | Length (miles). | Number.          | Length (miles). | Number.     | Capacity (acre-feet). |
| Total .....                     | 1,423                     | 153                     | 2,228         | 23,432                  | 4,469           | 2,154            | 1,463           | 329         | 5,599,578             |
| Individual and partnership..... | 948                       | 102                     | 1,656         | 5,982                   | 2,055           | 1,085            | 506             | 270         | 186,740               |
| Cooperative.....                | 454                       | 36                      | 535           | 13,047                  | 2,064           | 962              | 639             | 39          | 41,199                |
| Irrigation district.....        | 6                         | 2                       | 4             | 388                     | 72              | 8                | 57              | 2           | 12,000                |
| Carey Act.....                  | 2                         | .....                   | 2             | 1,050                   | 30              | .....            | .....           | 3           | 19,390                |
| Commercial.....                 | 5                         | 8                       | 7             | 538                     | 68              | 24               | 66              | 6           | 4,925                 |
| U. S. Reclamation Service.....  | 4                         | 3                       | 9             | 2,192                   | 116             | 53               | 160             | 4           | 5,329,720             |
| U. S. Indian Service.....       | 1                         | 2                       | 12            | 219                     | 54              | 26               | 35              | 2           | 5,600                 |
| State.....                      | .....                     | .....                   | .....         | .....                   | .....           | .....            | .....           | 1           | .....                 |
| City.....                       | 1                         | .....                   | 1             | 6                       | 7               | .....            | .....           | 2           | 3                     |
| Other.....                      | 2                         | .....                   | 2             | 10                      | 3               | .....            | .....           | .....       | .....                 |

| CLASS.                          | Pipe lines, length (miles). | FLOWING WELLS. |                                | PUMPED WELLS. |                                | PUMPING PLANTS. |                                |         |                                |
|---------------------------------|-----------------------------|----------------|--------------------------------|---------------|--------------------------------|-----------------|--------------------------------|---------|--------------------------------|
|                                 |                             | Number.        | Capacity (gallons per minute). | Number.       | Capacity (gallons per minute). | Number.         | Engine capacity (horse-power). | Pumps.  |                                |
|                                 |                             |                |                                |               |                                |                 |                                | Number. | Capacity (gallons per minute). |
| Total .....                     | 60.8                        | 556            | 376,222                        | 461           | 265,618                        | 472             | 8,488                          | 491     | 304,799                        |
| Individual and partnership..... | 39.2                        | 543            | 369,580                        | 457           | 261,843                        | 464             | 8,373                          | 483     | 301,572                        |
| Cooperative.....                | 3.0                         | .....          | .....                          | 1             | 8,300                          | 3               | 25                             | 3       | 2,010                          |
| Irrigation district.....        | 3.3                         | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                          |
| Commercial.....                 | 7.0                         | 8              | 5,842                          | .....         | .....                          | .....           | .....                          | .....   | .....                          |
| U. S. Reclamation Service.....  | .....                       | .....          | .....                          | .....         | .....                          | .....           | .....                          | .....   | .....                          |
| U. S. Indian Service.....       | 0.2                         | 2              | 800                            | .....         | .....                          | 1               | .....                          | 1       | .....                          |
| State.....                      | 2.1                         | .....          | .....                          | .....         | .....                          | 1               | 5                              | .....   | 230                            |
| City.....                       | 6.0                         | .....          | .....                          | 3             | 978                            | 3               | 85                             | 3       | 977                            |

[illegible]

# IRRIGATION—NEW MEXICO.

11

TABLE 17.—IRRIGATION WORKS, CLASSIFIED BY DRAINAGE BASIN: 1920—Continued.

| DRAINAGE BASIN.                          | Pipe lines,<br>length<br>(miles). | FLOWING WELLS. |                                      | PUMPED WELLS. |                                      | PUMPING PLANTS. |  |         |                                      |                         |
|--|-----------------------------------|----------------|--------------------------------------|---------------|--------------------------------------|-----------------|--|---------|--------------------------------------|-------------------------|
|  |                                   | Number.        | Capacity<br>(gallons per<br>minute). | Number.       | Capacity<br>(gallons per<br>minute). | Number.         | Engine<br>capacity<br>(horse-<br>power). | Pumps.  |                                      | Average lift<br>(feet). |
|  |                                   |                |                                      |               |                                      |                 |  | Number. | Capacity<br>(gallons per<br>minute). |                         |
| Total.....                               | 60.8                              | 556            | 376,222                              | 461           | 265,618                              | 472             | 8,488                                    | 491     | 304,789                              | 40                      |
| Canadian River and tributaries.....      | 14.8                              |                |                                      | 5             | 3,311                                | 6               | 66                                       | 7       | 1,522                                | 60                      |
| Cimarron River.....                      | 4.8                               |                |                                      |               |                                      | 1               | 10                                       | 1       | 1,500                                | 22                      |
| Vermejo River.....                       | 1.1                               |                |                                      | 2             |                                      | 1               | 50                                       | 2       |                                      | 100                     |
| Ocate Creek.....                         | 1.5                               |                |                                      |               |                                      |                 |  |         |                                      |                         |
| Mora River.....                          |                                   |                |                                      | 1             | 3,300                                | 2               | 5  | 2       | 10                                   | 35                      |
| Other tributaries of Canadian River..... | 7.4                               |                |                                      | 2             | 11                                   | 2               | 1  | 2       | 12                                   | 72                      |
| Cimarron River.....                      | 0.2                               |                |                                      | 2             | 36                                   | 3               | 32                                       | 4       | 532                                  | 36                      |
| Pecos River and tributaries.....         | 18.2                              | 549            | 375,275                              | 245           | 153,429                              | 243             | 4,455                                    | 256     | 193,036                              | 28                      |
| Pecos River direct.....                  | 5.5                               | 286            | 198,415                              | 96            | 70,598                               | 105             | 2,379                                    | 106     | 96,448                               | 28                      |
| Gallinas River.....                      | 0.5                               |                |                                      | 1             | 3                                    | 1               |  | 1       | 3                                    | 75                      |
| Hondo River.....                         | 11.0                              | 176            | 125,606                              | 79            | 46,585                               | 74              | 1,041                                    | 79      | 57,275                               | 21                      |
| Penasco River.....                       | 0.5                               | 51             | 30,132                               | 10            | 7,210                                | 11              | 216                                      | 11      | 9,000                                | 29                      |
| Other tributaries of Pecos River.....    | 0.7                               | 36             | 21,122                               | 59            | 29,033                               | 52              | 819                                      | 59      | 30,310                               | 36                      |
| Rio Grande and tributaries.....          | 16.3                              | 2              | 27                                   | 121           | 61,898                               | 127             | 1,852                                    | 128     | 62,245                               | 49                      |
| Rio Grande direct.....                   | 2.3                               |                |                                      | 26            | 11,356                               | 29              | 336                                      | 30      | 14,828                               | 33                      |
| Rio Santa Cruz.....                      | 0.1                               |                |                                      |               |                                      |                 |  |         |                                      |                         |
| Rio Puerco.....                          |                                   |                |                                      |               |                                      | 1               |  | 1       |                                      | 96                      |
| Other tributaries of Rio Grande.....     | 13.9                              | 2              | 27                                   | 95            | 50,542                               | 97              | 1,516                                    | 97      | 47,417                               | 53                      |
| Rio Mimbres.....                         | 1.1                               | 1              | 75                                   | 85            | 46,825                               | 86              | 2,065                                    | 90      | 46,660                               | 57                      |
| Gila River and tributaries.....          | 2.5                               |                |                                      |               |                                      | 2               | 4  | 2       | 675                                  | 17                      |
| Gila River direct.....                   | 0.3                               |                |                                      |               |                                      |                 |  |         |                                      |                         |
| San Francisco River.....                 |                                   |                |                                      |               |                                      | 1               |  | 1       | 275                                  | 20                      |
| Other tributaries of Gila River.....     | 2.2                               |                |                                      |               |                                      | 1               | 4  | 1       | 400                                  | 14                      |
| San Juan River and tributaries.....      |                                   | 4              | 845                                  | 1             |                                      | 2               | 5  | 2       |                                      | 170                     |
| Other tributaries of San Juan River..... |                                   | 4              | 845                                  | 1             |                                      | 2               | 5  | 2       |                                      | 170                     |
| Independent streams.....                 | 7.7                               |                |                                      | 2             | 119                                  | 3               | 9  | 2       | 119                                  | 68                      |
| Fresno River.....                        | 7.7                               |                |                                      |               |                                      |                 |  |         |                                      |                         |
| Rio Tularosa.....                        |                                   |                |                                      | 2             | 119                                  | 3               | 9  | 2       | 119                                  | 68                      |



## IRRIGATION—NEW MEXICO.

## CROPS.

TABLE 18.—ACREAGE, YIELD, AND VALUE OF CROPS GROWN ON IRRIGATED LAND, AND COMPARISONS WITH TOTALS FOR THE STATE: 1919 AND 1909.

[Totals for the state, used in making comparisons, are shown in state bulletin on agriculture.]

| CROP. |                                       | AREA HARVESTED. |                              |                  |                              | Per cent of increase. <sup>1</sup> | Unit.      | QUANTITY HARVESTED. |                              |                  |                              |                                    |
|-------|---------------------------------------|-----------------|------------------------------|------------------|------------------------------|------------------------------------|------------|---------------------|------------------------------|------------------|------------------------------|------------------------------------|
|       |                                       | 1919            |                              | 1909             |                              |                                    |            | 1919                |                              | 1909             |                              | Per cent of increase. <sup>1</sup> |
|       |                                       | Acres.          | Per cent of total for state. | Acres.           | Per cent of total for state. |                                    |            | Amount.             | Per cent of total for state. | Amount.          | Per cent of total for state. |                                    |
| 1     | Cereals:                              |                 |                              |                  |                              |                                    |            |                     |                              |                  |                              |                                    |
| 2     | Corn.....                             | 38,954          | 17.1                         | 34,430           | 40.0                         | 13.1                               | Bu.....    | 948,594             | 20.0                         | 714,710          | 61.4                         | 32.7                               |
| 3     | Oats.....                             | 8,880           | 22.2                         | 18,221           | 54.1                         | -51.3                              | Bu.....    | 250,102             | 23.0                         | 440,500          | 61.1                         | -43.2                              |
| 4     | Winter wheat.....                     | 9,059           | 9.8                          |                  |                              |                                    | Bu.....    | 185,479             | 10.6                         |                  |                              |                                    |
| 5     | Spring wheat.....                     | 22,251          | 51.5                         | 25,757           | 79.6                         | 21.6                               | Bu.....    | 395,679             | 57.6                         | 450,531          | 91.3                         | 27.3                               |
| 6     | Barley.....                           | 2,889           | 32.2                         | 1,469            | 68.9                         | 96.7                               | Bu.....    | 62,070              | 32.0                         | 35,391           | 81.4                         | 75.4                               |
| 7     | Hay and forage:                       |                 |                              |                  |                              |                                    |            |                     |                              |                  |                              |                                    |
| 8     | Timothy alone.....                    | 1,766           | 28.0                         | 894              | 37.7                         | 97.5                               | Tons.....  | 2,658               | 34.7                         | 1,505            | 46.6                         | 76.6                               |
| 9     | Timothy and clover mixed.....         | 1,338           | 55.3                         | 115              | 6.1                          |                                    | Tons.....  | 2,074               | 59.6                         | 189              | 7.1                          | 997.4                              |
| 10    | Clover alone.....                     | 821             | 55.9                         | 25               | 12.7                         |                                    | Tons.....  | 1,581               | 69.2                         | 47               | 11.5                         |                                    |
| 11    | Alfalfa.....                          | 87,105          | 74.5                         | 98,963           | 96.4                         | -12.0                              | Tons.....  | 211,351             | 75.9                         | 261,989          | 98.6                         | -19.3                              |
| 12    | Other tame or cultivated grasses..... | 4,015           | 17.1                         | 2,276            | 7.8                          | 76.4                               | Tons.....  | 5,350               | 20.2                         | 2,052            | 13.0                         | 102.0                              |
| 13    | Annual legumes cut for hay.....       | 701             | 20.5                         |                  |                              |                                    | Tons.....  | 1,011               | 27.9                         |                  |                              |                                    |
| 14    | Small grains cut for hay.....         | 6,459           | 24.1                         | 3,353            | 25.5                         | 113.5                              | Tons.....  | 10,287              | 30.0                         | 4,410            | 25.5                         | 155.7                              |
| 15    | Wild, salt, or prairie grasses.....   | 8,513           | 19.9                         | 13,024           | 46.5                         | -34.6                              | Tons.....  | 6,337               | 16.9                         | 14,512           | 65.8                         | -56.3                              |
| 16    | Silage crops.....                     | 1,188           | 33.5                         | ( <sup>2</sup> ) |                              |                                    | Tons.....  | 8,409               | 50.6                         | ( <sup>2</sup> ) |                              |                                    |
| 17    | Corn cut for forage.....              | 3,456           | 10.7                         | ( <sup>2</sup> ) |                              |                                    | Tons.....  | 5,805               | 17.6                         | ( <sup>2</sup> ) |                              |                                    |
| 18    | Kafir, sorghum, etc., for forage..... | 5,748           | 3.3                          | ( <sup>2</sup> ) |                              |                                    | Tons.....  | 10,848              | 4.4                          | ( <sup>2</sup> ) |                              |                                    |
| 19    | Vegetables:                           |                 |                              |                  |                              |                                    |            |                     |                              |                  |                              |                                    |
| 20    | Potatoes.....                         | 504             | 16.4                         | 1,119            | 18.0                         | -55.0                              | Bu.....    | 19,650              | 17.7                         | 83,234           | 28.2                         | -76.4                              |
| 21    | Green peppers.....                    | 400             | 72.6                         | ( <sup>2</sup> ) |                              |                                    |            |                     |                              | ( <sup>2</sup> ) |                              |                                    |
| 22    | Cantaloupes and muskmelons.....       | 421             | 41.2                         | ( <sup>2</sup> ) |                              |                                    |            |                     |                              | ( <sup>2</sup> ) |                              |                                    |
| 23    | Fruits:                               |                 |                              |                  |                              |                                    |            |                     |                              |                  |                              |                                    |
| 24    | Grapes.....                           | 176,520         | 62.9                         | ( <sup>2</sup> ) |                              |                                    | Lbs.....   | 630,440             | 62.8                         | ( <sup>2</sup> ) |                              |                                    |
| 25    | Apples.....                           | 321,233         | 46.7                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 487,878             | 52.0                         | ( <sup>2</sup> ) |                              |                                    |
| 26    | Peaches.....                          | 56,464          | 36.4                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 93,140              | 47.0                         | ( <sup>2</sup> ) |                              |                                    |
| 27    | Pears.....                            | 21,681          | 44.0                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 26,007              | 39.7                         | ( <sup>2</sup> ) |                              |                                    |
| 28    | Plums and prunes.....                 | 9,351           | 21.4                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 11,123              | 37.0                         | ( <sup>2</sup> ) |                              |                                    |
| 29    | Cherries.....                         | 8,204           | 29.1                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 5,876               | 49.0                         | ( <sup>2</sup> ) |                              |                                    |
| 30    | Miscellaneous:                        |                 |                              |                  |                              |                                    |            |                     |                              |                  |                              |                                    |
| 31    | Clover and alfalfa seed.....          | 2,583           | 49.3                         | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 6,354               | 41.2                         | ( <sup>2</sup> ) |                              |                                    |
| 32    | Kafir, milo, etc.....                 | 2,205           | 1.5                          | ( <sup>2</sup> ) |                              |                                    | Bu.....    | 66,683              | 1.8                          | ( <sup>2</sup> ) |                              |                                    |
| 33    | Dry beans, navy, etc.....             | 5,630           | 5.0                          | 2,741            | 13.2                         | 105.4                              | Bu.....    | 63,269              | 7.4                          | 26,288           | 30.6                         | 140.7                              |
| 34    | Dry peas, Canada.....                 | 3,606           | 62.7                         | 1,541            | 62.0                         | 134.0                              | Bu.....    | 51,202              | 73.1                         | 21,839           | 70.8                         | 134.5                              |
| 35    | Cotton.....                           | 7,527           | 70.6                         | ( <sup>2</sup> ) |                              |                                    | Bales..... | 4,077               | 75.5                         | ( <sup>2</sup> ) |                              |                                    |

| CROP. |                                       | AVERAGE YIELD PER ACRE, 1919. |                        |                    |                                |  | Unit.   | VALUE.                       |         |                              |      |                                    |
|-------|---------------------------------------|-------------------------------|------------------------|--------------------|--------------------------------|--|---------|------------------------------|---------|------------------------------|------|------------------------------------|
|       |                                       | For state.                    | On non-irrigated land. | On irrigated land. |                                |  |         | 1919                         |         | 1909                         |      | Per cent of increase. <sup>1</sup> |
|       |                                       |                               |                        | Average            | Per cent of average for state. | Per cent of average on non-irrigated land. | Amount. | Per cent of total for state. | Amount. | Per cent of total for state. |      |                                    |
| 1     | Cereals:                              |                               |                        |                    |                                |  |         |                              |         |                              |      |                                    |
| 2     | Corn.....                             | Bu.....                       | 20.9                   | 20.1               | 24.4                           | 116.7                                      | 121.4   | \$1,422,891                  | 20.0    | \$686,151                    | 64.6 | 123.7                              |
| 3     | Oats.....                             | Bu.....                       | 27.1                   | 26.8               | 28.2                           | 104.1                                      | 105.2   | 262,607                      | 23.0    | 309,911                      | 67.5 | -15.3                              |
| 4     | Winter wheat.....                     | Bu.....                       | 19.0                   | 18.9               | 20.5                           | 107.9                                      | 108.5   | 370,958                      | 10.6    |                              |      |                                    |
| 5     | Spring wheat.....                     | Bu.....                       | 15.9                   | 13.9               | 17.8                           | 111.9                                      | 128.1   | 791,358                      | 57.6    | 447,704                      | 88.0 | 159.6                              |
| 6     | Barley.....                           | Bu.....                       | 21.6                   | 21.7               | 21.5                           | 99.5                                       | 99.1    | 80,691                       | 32.0    | 27,960                       | 78.5 | 188.6                              |
| 7     | Hay and forage:                       |                               |                        |                    |                                |  |         |                              |         |                              |      |                                    |
| 8     | Timothy alone.....                    | Tons.....                     | 1.22                   | 1.10               | 1.51                           | 123.8                                      | 137.3   | 53,160                       | 34.7    | 17,073                       | 46.1 | 211.4                              |
| 9     | Timothy and clover mixed.....         | Tons.....                     | 1.44                   | 1.30               | 1.55                           | 107.6                                      | 109.2   | 37,332                       | 59.6    | 2,214                        | 7.9  |                                    |
| 10    | Clover alone.....                     | Tons.....                     | 1.56                   | 1.09               | 1.93                           | 123.7                                      | 177.1   | 25,296                       | 69.2    |                              |      |                                    |
| 11    | Alfalfa.....                          | Tons.....                     | 2.38                   | 2.25               | 2.43                           | 102.1                                      | 108.0   | 4,861,073                    | 75.9    | 2,795,987                    | 98.2 | 73.9                               |
| 12    | Other tame or cultivated grasses..... | Tons.....                     | 1.13                   | 1.09               | 1.33                           | 117.7                                      | 122.0   | 112,476                      | 20.2    | 27,433                       | 11.7 | 310.0                              |
| 13    | Annual legumes cut for hay.....       | Tons.....                     | 1.06                   | 0.96               | 1.44                           | 135.8                                      | 150.0   | 15,165                       | 27.9    |                              |      |                                    |
| 14    | Small grains cut for hay.....         | Tons.....                     | 1.28                   | 1.18               | 1.59                           | 124.2                                      | 134.7   | 200,597                      | 30.0    | 46,686                       | 24.0 | 362.2                              |
| 15    | Wild, salt, or prairie grasses.....   | Tons.....                     | 0.87                   | 0.91               | 0.74                           | 85.1                                       | 81.3    | 101,392                      | 16.9    | 149,075                      | 62.3 | -32.0                              |
| 16    | Silage crops.....                     | Tons.....                     | 4.69                   | 3.48               | 7.08                           | 151.0                                      | 203.4   | 79,886                       | 50.6    | ( <sup>2</sup> )             |      |                                    |
| 17    | Corn cut for forage.....              | Tons.....                     | 1.02                   | 0.94               | 1.68                           | 164.7                                      | 178.7   | 69,660                       | 17.6    | ( <sup>2</sup> )             |      |                                    |
| 18    | Kafir, sorghum, etc., for forage..... | Tons.....                     | 1.41                   | 1.39               | 1.89                           | 134.0                                      | 136.0   | 162,720                      | 4.4     | ( <sup>2</sup> )             |      |                                    |
| 19    | Vegetables:                           |                               |                        |                    |                                |  |         |                              |         |                              |      |                                    |
| 20    | Potatoes.....                         | Bu.....                       | 36.1                   | 35.5               | 30.0                           | 108.0                                      | 109.9   | 46,178                       | 17.7    | 65,625                       | 28.0 | -20.6                              |
| 21    | Green peppers.....                    |                               |                        |                    |                                |  |         | 58,290                       | 72.3    | ( <sup>2</sup> )             |      |                                    |
| 22    | Cantaloupes and muskmelons.....       |                               |                        |                    |                                |  |         | 54,590                       | 38.3    | ( <sup>2</sup> )             |      |                                    |
| 23    | Fruits:                               |                               |                        |                    |                                |  |         |                              |         |                              |      |                                    |
| 24    | Grapes.....                           | Lbs.....                      | 3.6                    | 3.6                | 3.6                            | 100.0                                      | 100.0   | 50,435                       | 62.8    | ( <sup>2</sup> )             |      |                                    |
| 25    | Apples.....                           | Bu.....                       | 7.4                    | 7.2                | 7.5                            | 107.1                                      | 125.0   | 780,605                      | 52.0    | ( <sup>2</sup> )             |      |                                    |
| 26    | Peaches.....                          | Bu.....                       | 7.1                    | 7.1                | 7.6                            | 123.1                                      | 145.5   | 200,251                      | 47.0    | ( <sup>2</sup> )             |      |                                    |
| 27    | Pears.....                            | Bu.....                       | 7.3                    | 7.4                | 7.2                            | 92.3                                       | 85.7    | 45,512                       | 39.7    | ( <sup>2</sup> )             |      |                                    |
| 28    | Plums and prunes.....                 | Bu.....                       | 7.0                    | 7.0                | 7.2                            | 171.4                                      | 240.0   | 23,914                       | 37.0    | ( <sup>2</sup> )             |      |                                    |
| 29    | Cherries.....                         | Bu.....                       | 7.4                    | 7.3                | 7.7                            | 175.0                                      | 233.3   | 19,978                       | 49.0    | ( <sup>2</sup> )             |      |                                    |
| 30    | Miscellaneous:                        |                               |                        |                    |                                |  |         |                              |         |                              |      |                                    |
| 31    | Clover and alfalfa seed.....          | Bu.....                       | 2.9                    | 3.4                | 2.5                            | 86.2                                       | 73.5    | 127,080                      | 41.2    | ( <sup>2</sup> )             |      |                                    |
| 32    | Kafir, milo, etc.....                 | Bu.....                       | 24.9                   | 24.9               | 30.2                           | 121.3                                      | 121.3   | 83,354                       | 1.8     | ( <sup>2</sup> )             |      |                                    |
| 33    | Dry beans, navy, etc.....             | Bu.....                       | 7.6                    | 7.4                | 11.2                           | 147.4                                      | 151.4   | 221,442                      | 7.4     | 74,551                       | 32.1 | 197.0                              |
| 34    | Dry peas, Canada.....                 | Bu.....                       | 12.2                   | 8.8                | 14.2                           | 116.4                                      | 161.4   | 128,005                      | 73.1    | 23,606                       | 67.3 | 442.3                              |
| 35    | Cotton.....                           | Bales.....                    | 0.51                   | 0.42               | 0.54                           | 105.0                                      | 128.6   | 913,248                      | 75.5    | ( <sup>2</sup> )             |      |                                    |

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when minus.

<sup>2</sup> Not reported separately.

<sup>1</sup> A minus sign (-) denotes decrease. Per cent not shown when more than 1,000.  
<sup>2</sup> Not reported separately in 1910.  
<sup>3</sup> Number of vines of bearing age.  
<sup>4</sup> Number of trees of bearing age.

<sup>5</sup> Not including red clover seed.  
<sup>6</sup> Yield per vine.  
<sup>7</sup> Yield per tree.

# IRRIGATION—NEW MEXICO.

13

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910.

[A minus sign (—) denotes decrease. Per cent not shown when more than 1,000.]

|                          | THE STATE.  | Bernalillo. | Chaves. <sup>1</sup> | Colfax.   | De Baca. <sup>2</sup> | Dona Ana. | Eddy. <sup>3</sup> | Grant. <sup>4</sup> | Guadalupe. <sup>5</sup> |           |
|--------------------------|---|-------------|----------------------|-----------|-----------------------|-----------|--------------------|---------------------|-------------------------|-----------|
| 1                        | Number of all farms in 1920.....  | 29,844      | 1,200                | 744       | 1,052                 | 477       | 1,054              | 785                 | 545                     | 982       |
| 2                        | Number of farms irrigated in 1919.....  | 11,390      | 504                  | 319       | 305                   | 51        | 975                | 555                 | 166                     | 275       |
| 3                        | Per cent of all farms.....  | 38.2        | 42.0                 | 42.9      | 29.0                  | 10.7      | 92.5               | 70.7                | 30.5                    | 28.0      |
| 4                        | Number of farms irrigated in 1909.....  | 12,795      | 700                  | 733       | 270                   | —         | 778                | 605                 | 256                     | 305       |
| 5                        | Per cent of increase, 1909-1919.....  | -11.0       | -28.0                | —         | 13.0                  | —         | 25.3               | —                   | —                       | —         |
| LAND AND FARM AREA.      |   |             |                      |           |                       |           |                    |                     |                         |           |
| 6                        | Approximate land area.....acres.....  | 78,401,920  | 776,960              | 3,866,880 | 2,430,720             | 1,536,000 | 2,445,440          | 2,716,800           | 2,547,840               | 1,939,840 |
| 7                        | All land in farms.....acres.....  | 24,409,633  | 220,708              | 1,924,179 | 1,952,760             | 1,233,305 | 195,316            | 794,543             | 474,169                 | 986,406   |
| 8                        | Improved land in farms.....acres.....   | 1,717,224   | 29,144               | 50,450    | 111,293               | 22,041    | 42,164             | 52,311              | 31,230                  | 31,441    |
| 9                        | Area irrigated in 1919.....acres.....   | 538,377     | 14,536               | 42,259    | 66,187                | 3,035     | 52,265             | 51,353              | 6,987                   | 3,206     |
| 10                       | Per cent of improved land in farms.....   | 31.4        | 49.9                 | 83.8      | 59.5                  | 13.8      | 124.0              | 98.2                | 22.4                    | 10.2      |
| 11                       | Area irrigated in 1909.....acres.....   | 461,718     | 14,832               | 56,064    | 30,756                | —         | 32,232             | 47,141              | 14,834                  | 4,395     |
| 12                       | Per cent of increase, 1909-1919.....  | 16.6        | -2.0                 | —         | 115.2                 | —         | 62.2               | —                   | —                       | —         |
| 13                       | Area enterprises were capable of irrigating in 1920.....acres.....  | 696,119     | 15,218               | 47,433    | 90,881                | 6,928     | 65,057             | 59,784              | 7,243                   | 4,800     |
| 14                       | Area enterprises were capable of irrigating in 1910.....acres.....  | 644,970     | 20,375               | 64,385    | 52,391                | —         | 48,744             | 74,004              | 16,668                  | 13,952    |
| 15                       | Per cent of increase, 1910-1920.....  | 7.9         | -25.3                | —         | 73.5                  | —         | 33.5               | —                   | —                       | —         |
| 16                       | Area included in enterprises in 1920.....acres.....   | 961,879     | 19,056               | 57,785    | 117,715               | 9,128     | 88,023             | 87,661              | 7,781                   | 5,102     |
| 17                       | Area included in enterprises in 1910.....acres.....   | 1,102,297   | 25,510               | 106,948   | 156,503               | —         | 77,590             | 94,680              | 18,821                  | 26,212    |
| 18                       | Per cent of increase, 1910-1920.....  | -12.7       | -25.3                | —         | -24.8                 | —         | 13.5               | —                   | —                       | —         |
| 19                       | Area of irrigated land reported as available for settlement.....acres.....                                    | 66,479      | 650                  | —         | 27,729                | —         | —                  | 2,550               | —                       | —         |
| IRRIGATION WORKS.        |   |             |                      |           |                       |           |                    |                     |                         |           |
| Independent enterprises: |   |             |                      |           |                       |           |                    |                     |                         |           |
| 20                       | Number, 1920.....   | 2,391       | 44                   | 339       | 86                    | 3         | 12                 | 240                 | 70                      | 16        |
| 21                       | Number, 1910.....   | 2,786       | 34                   | 471       | 115                   | —         | 37                 | 270                 | 102                     | 18        |
| Main ditches:            |   |             |                      |           |                       |           |                    |                     |                         |           |
| 22                       | Number, 1920.....   | 2,228       | 35                   | 191       | 150                   | 3         | 7                  | 258                 | 61                      | 16        |
| 23                       | Number, 1910.....   | 2,101       | 22                   | 49        | 166                   | —         | 29                 | 51                  | 75                      | 14        |
| 24                       | Length, 1920.....miles.....   | 4,469       | 172                  | 217       | 374                   | 18        | 53                 | 266                 | 100                     | 66        |
| 25                       | Length, 1910.....miles.....   | 4,664       | 120                  | 174       | 398                   | —         | 139                | 136                 | 154                     | 60        |
| 26                       | Capacity, 1920.....second-feet.....   | 23,432      | 137                  | 836       | 5,839                 | 153       | 1,231              | 1,215               | 331                     | 82        |
| 27                       | Capacity, 1910.....second-feet.....   | 29,646      | 710                  | 801       | 5,448                 | —         | 2,020              | 1,203               | 241                     | 676       |
| Laterals:                |   |             |                      |           |                       |           |                    |                     |                         |           |
| 28                       | Number, 1920.....   | 2,158       | 61                   | 184       | 161                   | 8         | 11                 | 235                 | 39                      | 75        |
| 29                       | Number, 1910.....   | 1,280       | 108                  | 68        | 82                    | —         | 10                 | 54                  | 11                      | 11        |
| 30                       | Length, 1920.....miles.....   | 1,463       | 56                   | 93        | 238                   | 13        | —                  | 323                 | 8                       | 22        |
| 31                       | Length, 1910.....miles.....   | 1,190       | 112                  | 80        | 286                   | —         | 31                 | 39                  | 7                       | 17        |
| Reservoirs:              |   |             |                      |           |                       |           |                    |                     |                         |           |
| 32                       | Number, 1920.....   | 329         | 10                   | 74        | 38                    | —         | 7                  | 27                  | 10                      | —         |
| 33                       | Number, 1910.....   | 522         | 19                   | 54        | 51                    | —         | 4                  | 65                  | 23                      | 7         |
| 34                       | Capacity, 1920.....acre-feet.....   | 5,599,578   | 1,001                | 313       | 65,668                | —         | 2,638,866          | 81,855              | 55                      | —         |
| 35                       | Capacity, 1910.....acre-feet.....   | 454,162     | 5                    | 40,560    | 181,320               | —         | 2                  | 52,008              | 9                       | 162       |
| Flowing wells:           |   |             |                      |           |                       |           |                    |                     |                         |           |
| 36                       | Number, 1920.....   | 556         | —                    | 318       | —                     | —         | —                  | 230                 | —                       | —         |
| 37                       | Number, 1910.....   | 673         | —                    | 404       | —                     | —         | —                  | 267                 | —                       | —         |
| 38                       | Capacity, 1920.....gallons per minute.....  | 376,222     | —                    | 228,385   | —                     | —         | —                  | 146,330             | —                       | —         |
| 39                       | Capacity, 1910.....gallons per minute.....  | 669,268     | —                    | 428,640   | —                     | —         | —                  | 240,549             | —                       | —         |
| Pumped wells:            |   |             |                      |           |                       |           |                    |                     |                         |           |
| 40                       | Number, 1920.....   | 461         | 13                   | 143       | 2                     | 1         | 8                  | 48                  | 4                       | 1         |
| 41                       | Number, 1910.....   | 466         | 12                   | 130       | —                     | —         | 19                 | 25                  | 30                      | 5         |
| 42                       | Capacity, 1920.....gallons per minute.....  | 265,618     | 6,261                | 99,328    | —                     | 1,500     | 1,575              | 27,118              | 400                     | 800       |
| 43                       | Capacity, 1910.....gallons per minute.....  | 190,690     | 3,980                | 50,315    | —                     | —         | 7,938              | 8,450               | 10,652                  | 89        |
| Pumping plants:          |   |             |                      |           |                       |           |                    |                     |                         |           |
| 44                       | Number, 1920.....   | 472         | 12                   | 146       | 2                     | 1         | 8                  | 52                  | 8                       | 1         |
| 45                       | Number, 1910.....   | 413         | 12                   | 131       | 4                     | —         | 22                 | 27                  | 31                      | 6         |
| 46                       | Engine capacity, 1920.....horsepower.....   | 8,488       | 126                  | 2,810     | 60                    | 15        | 109                | 843                 | 32                      | 60        |
| 47                       | Engine capacity, 1910.....horsepower.....   | 14,226      | 105                  | 10,445    | 50                    | —         | 304                | 219                 | 110                     | 71        |
| 48                       | Pump capacity, 1920.....gallons per minute.....   | 304,789     | 6,361                | 135,605   | 1,500                 | 1,500     | 2,277              | 30,633              | 800                     | 800       |
| 49                       | Pump capacity, 1910.....gallons per minute.....   | 216,355     | 3,980                | 58,648    | 1,890                 | —         | 13,638             | 9,144               | 11,002                  | 4,289     |
| 50                       | Average lift, 1920.....feet.....  | 40          | 37                   | 26        | 61                    | 10        | 42                 | 28                  | 35                      | 20        |
| CAPITAL INVESTED.        |   |             |                      |           |                       |           |                    |                     |                         |           |
| 51                       | Capital invested to Jan. 1, 1920.....dollars.....   | 18,210,412  | 165,784              | 1,323,948 | 4,526,888             | 66,512    | 2,485,908          | 2,952,707           | 54,162                  | 87,195    |
| 52                       | Capital invested to July 1, 1910.....dollars.....   | 9,154,897   | 130,450              | 1,757,561 | 1,683,408             | —         | 165,505            | 1,607,244           | 72,242                  | 191,287   |
| 53                       | Per cent of increase, 1910-1920.....  | 98.9        | 27.1                 | —         | 168.9                 | —         | —                  | —                   | —                       | —         |
| 54                       | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars..... | 26.16       | 10.89                | 27.91     | 49.81                 | 9.60      | 38.21              | 49.39               | 7.48                    | 18.17     |
| 55                       | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars..... | 14.19       | 6.40                 | 27.30     | 32.13                 | —         | 3.40               | 21.72               | 4.33                    | 13.71     |
| ESTIMATED FINAL COST.    |   |             |                      |           |                       |           |                    |                     |                         |           |
| 56                       | Estimated final cost of existing enterprises in 1920.....dollars.....   | 20,440,646  | 165,784              | 1,334,688 | 4,626,388             | 92,112    | 2,488,908          | 3,503,207           | 56,967                  | 93,195    |
| 57                       | Estimated final cost of existing enterprises in 1910.....dollars.....   | 11,640,091  | 130,450              | 1,953,424 | 2,512,336             | —         | 165,505            | 1,685,990           | 72,242                  | 226,787   |
| 58                       | Per cent of increase, 1910-1920.....  | 75.6        | 27.1                 | —         | 84.1                  | —         | —                  | —                   | —                       | —         |
| 59                       | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars..... | 21.25       | 8.70                 | 23.10     | 39.30                 | 10.09     | 28.28              | 39.96               | 7.32                    | 18.27     |
| 60                       | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars..... | 10.56       | 5.11                 | 18.27     | 16.05                 | —         | 2.13               | 17.81               | 3.84                    | 8.65      |

<sup>1</sup> Parts taken to form parts of De Baca and Lea Counties, and part annexed to Roosevelt County in 1917.

<sup>2</sup> Organized from parts of Chaves, Guadalupe, and Roosevelt Counties in 1917.

<sup>3</sup> Part taken to form part of Lea County in 1917.

<sup>4</sup> Part taken to form Hidalgo County in 1919.

<sup>5</sup> Part taken to form part of De Baca County in 1917.

<sup>6</sup> Includes \$41,241 for Indian reservations, which was not reported by counties.

## IRRIGATION—NEW MEXICO.

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown where more than 1,000.]

|  | Hidalgo. <sup>1</sup> | Lincoln.  | Luna.     | McKinley. | Mora.     | Otero.    | Rio Arriba. | Sandoval. | San Juan. |
|--|-----------------------|-----------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|
| 1 Number of all farms in 1920.....   | 238                   | 640       | 287       | 668       | 1,911     | 459       | 2,063       | 1,110     | 874       |
| 2 Number of farms irrigated in 1919.....   | 64                    | 194       | 168       | 263       | 437       | 220       | 1,478       | 957       | 584       |
| 3 Per cent of all farms.....   | 26.9                  | 30.3      | 58.5      | 39.4      | 22.9      | 47.9      | 71.6        | 86.2      | 66.8      |
| 4 Number of farms irrigated in 1909.....   |                       | 239       | 116       | 172       | 620       | 241       | 1,487       | 1,038     | 706       |
| 5 Per cent of increase, 1909-1919.....   |                       | -18.8     | 44.8      | 52.9      | -29.5     | -8.7      | -0.6        | -7.8      | -17.3     |
| <b>LAND AND FARM AREA.</b>   |                       |           |           |           |           |           |             |           |           |
| 6 Approximate land area..... acres..   | 2,200,080             | 3,058,560 | 1,904,640 | 3,523,840 | 1,584,000 | 4,280,960 | 3,757,440   | 2,477,440 | 3,504,640 |
| 7 All land in farms..... acres..   | 242,479               | 495,543   | 1,032,827 | 177,952   | 1,013,981 | 251,796   | 304,881     | 135,595   | 78,877    |
| 8 Improved land in farms..... acres..  | 22,644                | 20,425    | 19,533    | 15,538    | 106,995   | 16,869    | 41,625      | 24,258    | 30,231    |
| 9 Area irrigated in 1919..... acres..  | 2,840                 | 6,128     | 11,323    | 6,919     | 17,833    | 7,456     | 40,036      | 23,214    | 42,470    |
| 10 Per cent of improved land in farms.....   | 12.5                  | 30.0      | 58.0      | 44.5      | 16.7      | 47.6      | 110.0       | 95.7      | 140.5     |
| 11 Area irrigated in 1909..... acres..   |                       | 7,355     | 5,347     | 2,564     | 19,083    | 6,378     | 45,673      | 18,259    | 29,520    |
| 12 Per cent of increase, 1909-1919.....  |                       | -16.7     | 111.8     | 169.9     | -6.6      | 18.5      | 0.8         | 27.1      | 43.9      |
| 13 Area enterprises were capable of irrigating in 1920..... acres..  | 2,940                 | 6,341     | 21,143    | 7,229     | 29,749    | 8,565     | 50,247      | 20,659    | 48,195    |
| 14 Area enterprises were capable of irrigating in 1910..... acres..  |                       | 7,907     | 9,763     | 4,200     | 28,137    | 8,359     | 51,635      | 21,701    | 52,656    |
| 15 Per cent of increase, 1910-1920.....  |                       | -19.8     | 116.6     | 72.1      | 5.7       | 2.5       | -2.7        | 22.3      | -8.5      |
| 16 Area included in enterprises in 1920..... acres..   | 3,340                 | 11,899    | 34,786    | 9,057     | 37,673    | 12,117    | 68,691      | 32,988    | 68,515    |
| 17 Area included in enterprises in 1910..... acres..   |                       | 9,678     | 15,291    | 10,200    | 32,668    | 12,173    | 67,384      | 37,136    | 77,169    |
| 18 Per cent of increase, 1910-1920.....  |                       | 22.9      | 127.5     | -11.2     | 15.3      | -0.5      | 1.9         | -11.2     | -11.2     |
| 19 Area of irrigated land reported as available for settlement..... acres..                                    | 500                   |           |           | 360       |           |           |             |           | 3,210     |
| <b>IRRIGATION WORKS.</b>   |                       |           |           |           |           |           |             |           |           |
| Independent enterprises:   |                       |           |           |           |           |           |             |           |           |
| 20 Number, 1920.....   | 5                     | 102       | 153       | 15        | 102       | 96        | 274         | 82        | 54        |
| 21 Number, 1910.....   |                       | 121       | 101       | 3         | 116       | 99        | 338         | 92        | 91        |
| Main ditches:  |                       |           |           |           |           |           |             |           |           |
| 22 Number, 1920.....   | 4                     | 102       | 51        | 19        | 110       | 115       | 273         | 86        | 52        |
| 23 Number, 1910.....   |                       | 117       | 38        | 4         | 117       | 89        | 342         | 100       | 88        |
| 24 Length, 1920..... miles..   | 20                    | 142       | 41        | 35        | 231       | 155       | 454         | 337       | 255       |
| 25 Length, 1910..... miles..   |                       | 161       | 43        | 22        | 254       | 145       | 574         | 299       | 383       |
| 26 Capacity, 1920..... second-feet..   | 47                    | 193       | 3,171     | 126       | 1,081     | 576       | 1,526       | 363       | 1,371     |
| 27 Capacity, 1910..... second-feet..   |                       | 440       | 2,141     | 135       | 1,844     | 454       | 2,195       | 842       | 2,543     |
| Laterals:  |                       |           |           |           |           |           |             |           |           |
| 28 Number, 1920.....   | 11                    | 94        | 37        | 41        | 277       | 75        | 192         | 22        | 106       |
| 29 Number, 1910.....   |                       | 11        | 16        | 11        | 39        | 56        | 83          | 59        | 22        |
| 30 Length, 1920..... miles..   | 8                     | 124       | 7         | 39        | 45        | 77        | 87          | 9         | 85        |
| 31 Length, 1910..... miles..   |                       | 3         | 9         | 10        | 25        | 25        | 64          | 29        | 45        |
| Reservoirs:  |                       |           |           |           |           |           |             |           |           |
| 32 Number, 1920.....   |                       | 3         | 16        | 11        | 16        | 13        | 10          | 5         | 2         |
| 33 Number, 1910.....   |                       |           | 34        | 10        | 12        | 30        | 12          | 22        | 6         |
| 34 Capacity, 1920..... acre-feet..   |                       | 21        | 37        | 6,685     | 672       | 110       | 753         | 44,049    | 150       |
| 35 Capacity, 1910..... acre-feet..   |                       | 21        | 158       | 20,547    | 3,166     | 38        | 1,444       | 241       | 4,820     |
| Flowing wells:   |                       |           |           |           |           |           |             |           |           |
| 36 Number, 1920.....   |                       |           |           | 1         |           |           |             |           |           |
| 37 Number, 1910.....   |                       |           |           | 4         |           |           |             |           |           |
| 38 Capacity, 1920..... gallons per minute..  |                       |           |           |           |           |           |             |           |           |
| 39 Capacity, 1910..... gallons per minute..  |                       |           |           | 75        |           |           |             |           |           |
| Pumped wells:  |                       |           |           |           |           |           |             |           |           |
| 40 Number, 1920.....   |                       |           |           | 75        |           |           |             |           |           |
| 41 Number, 1910.....   |                       |           |           |           |           |           |             |           |           |
| 42 Capacity, 1920..... gallons per minute..  |                       |           |           |           |           |           |             |           |           |
| 43 Capacity, 1910..... gallons per minute..  |                       |           |           |           |           |           |             |           |           |
| Pumping plants:  |                       |           |           |           |           |           |             |           |           |
| 44 Number, 1920.....   |                       | 2         | 156       | 1         | 1         | 4         |             |           |           |
| 45 Number, 1910.....   |                       | 14        | 94        |           | 3         | 18        |             |           |           |
| 46 Engine capacity, 1920..... horsepower..   |                       | 18        | 95,300    |           | 3,300     | 419       |             |           |           |
| 47 Engine capacity, 1910..... horsepower..   |                       | 240       | 32,078    |           | 28        | 3,805     |             |           |           |
| 48 Pump capacity, 1920..... gallons per minute..   |                       | 4         | 153       | 2         | 2         | 4         |             |           |           |
| 49 Pump capacity, 1910..... gallons per minute..   |                       | 14        | 3,471     | 5         | 5         | 15        | 2           |           | 2         |
| 50 Average lift, 1920..... feet..  |                       | 27        | 1,084     |           | 3         | 102       | 41          |           | 10        |
|  |                       | 118       | 91,010    |           | 10        | 419       |             |           |           |
|  |                       | 240       | 32,078    |           | 28        | 3,805     | 3,069       |           | 655       |
|  |                       | 82        | 57        | 170       | 35        | 44        |             |           |           |
| <b>CAPITAL INVESTED.</b>   |                       |           |           |           |           |           |             |           |           |
| 51 Capital invested to Jan. 1, 1920..... dollars..   | 31,935                | 51,939    | 422,450   | 697,280   | 318,067   | 361,284   | 245,425     | 108,410   | 1,660,875 |
| 52 Capital invested to July 1, 1910..... dollars..   |                       | 39,645    | 110,264   | 364,256   | 133,604   | 182,211   | 244,156     | 138,371   | 789,927   |
| 53 Per cent of increase, 1910-1920.....  |                       | 31.0      | 283.1     | 91.4      | 136.6     | 98.3      | 0.5         | -21.6     | 111.0     |
| 54 Average cost per acre based on area enterprises were capable of supplying with water in 1920..... dollars.. | 10.86                 | 8.19      | 19.98     | 96.46     | 10.63     | 42.18     | 4.88        | 4.07      | 34.59     |
| 55 Average cost per acre based on area enterprises were capable of supplying with water in 1910..... dollars.. |                       | 5.01      | 11.29     | 86.73     | 4.75      | 21.80     | 4.73        | 6.35      | 15.00     |
| <b>ESTIMATED FINAL COST.</b>   |                       |           |           |           |           |           |             |           |           |
| 56 Estimated final cost of existing enterprises in 1920..... dollars..   | 46,935                | 52,014    | 430,350   | 702,280   | 327,786   | 364,489   | 259,670     | 124,939   | 2,716,875 |
| 57 Estimated final cost of existing enterprises in 1910..... dollars..   |                       | 39,645    | 110,264   | 515,256   | 133,604   | 182,211   | 244,156     | 138,371   | 800,147   |
| 58 Per cent of increase, 1910-1920.....  |                       | 31.2      | 280.3     | 36.3      | 145.3     | 100.0     | 6.4         | -9.7      | 239.5     |
| 59 Average cost per acre based on estimated final cost and area included in enterprises in 1920..... dollars.. | 14.05                 | 4.37      | 12.37     | 77.54     | 8.70      | 30.08     | 3.78        | 3.79      | 39.65     |
| 60 Average cost per acre based on estimated final cost and area included in enterprises in 1910..... dollars.. |                       | 4.10      | 7.21      | 50.52     | 4.09      | 14.97     | 3.62        | 3.73      | 10.37     |

<sup>1</sup> Organized from part of Grant County in 1919.

# IRRIGATION—NEW MEXICO.

15

COUNTY TABLE.—ACREAGE IRRIGATED, 1919 AND 1909; AND ACREAGE IN ENTERPRISES, IRRIGATION WORKS, AND CAPITAL INVESTED IN IRRIGATION ENTERPRISES, 1920 AND 1910—Continued.

[A minus sign (—) denotes decrease. Per cent not shown when base is less than 100 or when per cent is more than 1,000.]

|                              |  | San Miguel. | Santa Fe. | Sierra.   | Socorro.  | Taos.     | Torrance. <sup>1</sup> | Union.    | Valencia. | All other counties. <sup>2</sup> |
|------------------------------|--|-------------|-----------|-----------|-----------|-----------|------------------------|-----------|-----------|----------------------------------|
| 1                            | Number of all farms in 1920.....   | 1,643       | 896       | 395       | 1,191     | 1,116     | 1,365                  | 2,652     | 1,097     | 4,400                            |
| 2                            | Number of farms irrigated in 1919.....   | 470         | 529       | 240       | 567       | 1,022     | 41                     | 47        | 839       | 120                              |
| 3                            | Per cent of all farms.....   | 28.6        | 59.0      | 60.8      | 47.6      | 91.6      | 3.0                    | 1.8       | 76.5      | 2.7                              |
| 4                            | Number of farms irrigated in 1909.....   | 594         | 844       | 209       | 710       | 949       | -----                  | 94        | 1,093     | 36                               |
| 5                            | Per cent of increase, 1909-1919.....   | -20.9       | -37.3     | 14.8      | -20.1     | 7.7       | -----                  | -----     | -23.2     | -----                            |
| <b>LAND AND FARM AREA.</b>   |  |             |           |           |           |           |                        |           |           |                                  |
| 6                            | Approximate land area.....acres..  | 3,132,160   | 1,262,720 | 1,995,520 | 9,644,800 | 1,441,280 | 2,156,160              | 3,436,800 | 3,621,760 | 7,152,640                        |
| 7                            | All land in farms.....acres..  | 1,452,379   | 522,788   | 330,872   | 1,180,546 | 84,873    | 776,789                | 2,515,522 | 1,000,985 | 4,969,562                        |
| 8                            | Improved land in farms.....acres..   | 68,534      | 49,439    | 7,712     | 32,770    | 23,497    | 88,526                 | 273,748   | 28,818    | 486,988                          |
| 9                            | Area irrigated in 1919.....acres..   | 16,565      | 10,582    | 8,491     | 11,110    | 59,607    | 1,085                  | 6,774     | 19,241    | 775                              |
| 10                           | Per cent of improved land in farms.....  | 28.3        | 21.4      | 110.1     | 33.9      | 253.7     | 1.2                    | 2.5       | 66.8      | 0.2                              |
| 11                           | Area irrigated in 1909.....acres..   | 14,318      | 16,180    | 3,637     | 14,289    | 41,486    | 653                    | 6,315     | 30,302    | 105                              |
| 12                           | Per cent of increase, 1909-1919.....   | 15.7        | -34.6     | 133.5     | -22.2     | 43.7      | 66.2                   | 7.3       | -36.5     | -----                            |
| 13                           | Area enterprises were capable of irrigating in 1920.....acres..  | 43,277      | 10,858    | 9,533     | 13,356    | 67,061    | 1,165                  | 17,986    | 32,666    | 1,805                            |
| 14                           | Area enterprises were capable of irrigating in 1910.....acres..  | 16,902      | 16,707    | 5,959     | 22,532    | 44,395    | 653                    | 8,766     | 51,948    | 2,141                            |
| 15                           | Per cent of increase, 1910-1920.....   | 156.0       | -35.0     | 60.0      | -40.7     | 51.1      | 78.4                   | 105.2     | -37.1     | -----                            |
| 16                           | Area included in enterprises in 1920.....acres..   | 68,806      | 12,244    | 18,432    | 29,780    | 88,265    | 1,550                  | 20,056    | 48,780    | 2,649                            |
| 17                           | Area included in enterprises in 1910.....acres..   | 52,417      | 51,768    | 10,426    | 41,760    | 60,426    | 1,103                  | 30,107    | 74,814    | 11,583                           |
| 18                           | Per cent of increase, 1910-1920.....   | 31.3        | -76.3     | 76.8      | -28.7     | 46.1      | 40.5                   | -33.4     | -34.8     | -----                            |
| 19                           | Area of irrigated land reported as available for settlement.acres..  | 940         | -----     | -----     | 4,640     | 4,400     | -----                  | 1,500     | 20,000    | -----                            |
| <b>IRRIGATION WORKS.</b>     |  |             |           |           |           |           |                        |           |           |                                  |
| Independent enterprises:     |  |             |           |           |           |           |                        |           |           |                                  |
| 20                           | Number, 1920.....  | 101         | 102       | 66        | 95        | 168       | 7                      | 70        | 46        | 43                               |
| 21                           | Number, 1910.....  | 152         | 122       | 63        | 99        | 205       | -----                  | 43        | 62        | 32                               |
| Main ditches:                |  |             |           |           |           |           |                        |           |           |                                  |
| 22                           | Number, 1920.....  | 115         | 103       | 64        | 88        | 163       | 8                      | 84        | 49        | 21                               |
| 23                           | Number, 1910.....  | 153         | 141       | 57        | 89        | 238       | 3                      | 48        | 64        | 7                                |
| 24                           | Length, 1920.....miles..   | 213         | 142       | 119       | 289       | 326       | 30                     | 132       | 278       | 4                                |
| 25                           | Length, 1910.....miles..   | 264         | 229       | 84        | 242       | 343       | 4                      | 95        | 334       | 7                                |
| 26                           | Capacity, 1920.....second-feet..   | 1,459       | 226       | 523       | 814       | 1,268     | 2                      | 407       | 360       | 45                               |
| 27                           | Capacity, 1910.....second-feet..   | 2,378       | 853       | 149       | 991       | 1,513     | 10                     | 452       | 2,105     | 2                                |
| Laterals:                    |  |             |           |           |           |           |                        |           |           |                                  |
| 28                           | Number, 1920.....  | 104         | 17        | 35        | 48        | 57        | 22                     | 178       | 40        | 28                               |
| 29                           | Number, 1910.....  | 43          | 42        | 6         | 69        | 100       | -----                  | 114       | 265       | -----                            |
| 30                           | Length, 1920.....miles..   | 33          | 11        | 15        | 18        | 50        | 10                     | 58        | 30        | 4                                |
| 31                           | Length, 1910.....miles..   | 64          | 28        | 6         | 63        | 105       | -----                  | 31        | 111       | -----                            |
| Reservoirs:                  |  |             |           |           |           |           |                        |           |           |                                  |
| 32                           | Number, 1920.....  | 21          | 8         | 14        | 11        | 3         | 1                      | 11        | 6         | 12                               |
| 33                           | Number, 1910.....  | 32          | 41        | 9         | 12        | 11        | 2                      | 25        | 8         | 12                               |
| 34                           | Capacity, 1920.....acre-feet..   | 38,419      | 160       | 2,638,862 | 80,003    | 1,735     | 75                     | 76        | 14        | 8                                |
| 35                           | Capacity, 1910.....acre-feet..   | 72,335      | 75,451    | 104       | 24        | 327       | 26                     | 1,324     | 14        | 6                                |
| Flowing wells:               |  |             |           |           |           |           |                        |           |           |                                  |
| 36                           | Number, 1920.....  | -----       | -----     | 1         | 1         | -----     | -----                  | -----     | -----     | 1                                |
| 37                           | Number, 1910.....  | -----       | -----     | -----     | -----     | -----     | -----                  | 1         | -----     | -----                            |
| 38                           | Capacity, 1920.....gallons per minute..  | -----       | -----     | 20        | 7         | -----     | -----                  | -----     | -----     | 60                               |
| 39                           | Capacity, 1910.....gallons per minute..  | -----       | -----     | -----     | -----     | -----     | -----                  | 4         | -----     | -----                            |
| Pumped wells:                |  |             |           |           |           |           |                        |           |           |                                  |
| 40                           | Number, 1920.....  | 2           | 2         | 11        | 8         | -----     | -----                  | 4         | -----     | 50                               |
| 41                           | Number, 1910.....  | 2           | 8         | 4         | 3         | -----     | 1                      | 2         | -----     | 94                               |
| 42                           | Capacity, 1920.....gallons per minute..  | 3           | -----     | 1,269     | 3,600     | -----     | -----                  | 47        | -----     | 24,680                           |
| 43                           | Capacity, 1910.....gallons per minute..  | 518         | 1,026     | 140       | 208       | -----     | 6                      | 609       | 50        | 70,558                           |
| Pumping plants:              |  |             |           |           |           |           |                        |           |           |                                  |
| 44                           | Number, 1920.....  | 2           | 1         | 15        | 11        | -----     | -----                  | 5         | 2         | 41                               |
| 45                           | Number, 1910.....  | 2           | 10        | 4         | 4         | -----     | 1                      | 2         | 1         | 26                               |
| 46                           | Engine capacity, 1920.....horsepower..   | -----       | 2         | 59        | 94        | -----     | -----                  | 33        | 20        | 727                              |
| 47                           | Engine capacity, 1910.....horsepower..   | 25          | 107       | 10        | 10        | -----     | 1                      | 8         | 2         | 1,542                            |
| 48                           | Pump capacity, 1920.....gallons per minute..   | 3           | -----     | 2,839     | 3,875     | -----     | -----                  | 544       | 2,000     | 24,495                           |
| 49                           | Pump capacity, 1910.....gallons per minute..   | 518         | 1,710     | 140       | 298       | -----     | 6                      | 609       | 50        | 70,558                           |
| 50                           | Average lift, 1920.....feet..  | 62          | 1         | 81        | 27        | -----     | -----                  | 50        | 52        | 111                              |
| <b>CAPITAL INVESTED.</b>     |  |             |           |           |           |           |                        |           |           |                                  |
| 51                           | Capital invested to Jan. 1, 1920.....dollars..   | 777,482     | 69,975    | 758,484   | 235,051   | 160,886   | 21,100                 | 363,939   | 194,471   | 64,216                           |
| 52                           | Capital invested to July 1, 1910.....dollars..   | 300,708     | 123,834   | 19,089    | 187,682   | 190,940   | 1,010                  | 70,925    | 254,063   | 355,274                          |
| 53                           | Per cent of increase, 1910-1920.....   | 158.6       | -43.5     | -----     | 25.2      | -15.7     | -----                  | 413.1     | -23.5     | -----                            |
| 54                           | Average cost per acre based on area enterprises were capable of supplying with water in 1920.....dollars.. | 17.97       | 6.44      | 79.56     | 17.60     | 2.40      | 18.11                  | 20.23     | 5.95      | 35.38                            |
| 55                           | Average cost per acre based on area enterprises were capable of supplying with water in 1910.....dollars.. | 17.79       | 7.41      | 3.20      | 8.83      | 4.30      | 1.55                   | 8.09      | 4.89      | 165.94                           |
| <b>ESTIMATED FINAL COST.</b> |  |             |           |           |           |           |                        |           |           |                                  |
| 56                           | Estimated final cost of existing enterprises in 1920.....dollars..   | 788,502     | 69,975    | 1,060,459 | 259,351   | 177,176   | 23,600                 | 382,389   | 227,991   | 64,616                           |
| 57                           | Estimated final cost of existing enterprises in 1910.....dollars..   | 1,189,708   | 347,056   | 19,089    | 301,582   | 190,940   | 1,010                  | 70,981    | 254,063   | 355,274                          |
| 58                           | Per cent of increase, 1910-1920.....   | -33.7       | -79.8     | -----     | -14.0     | -7.2      | -----                  | 438.7     | -10.3     | -----                            |
| 59                           | Average cost per acre based on estimated final cost and area included in enterprises in 1920.....dollars.. | 11.46       | 5.72      | 57.53     | 8.71      | 2.01      | 15.23                  | 19.07     | 4.67      | 24.39                            |
| 60                           | Average cost per acre based on estimated final cost and area included in enterprises in 1910.....dollars.. | 22.70       | 6.71      | 1.83      | 7.22      | 3.16      | 0.92                   | 2.36      | 3.40      | 30.67                            |

<sup>1</sup> Included in "All other counties" in 1910.

<sup>2</sup> Includes Curry, Lea, Quay, and Roosevelt Counties. Lea County formed from parts of Chaves and Eddy Counties in 1917.