CHAPTER V

RELATION OF PHYSICAL AND ECONOMIC FACTORS TO THE GEOGRAPHIC DISTRIBUTION OF TYPES OF FARMING IN THE UNITED STATES

In the preceding chapter we were concerned with the regional differentiation of the agriculture of the United States. A type of farming map was presented which showed the country divided into 514 major type-of-farming areas and into an additional number of subareas.

Apart from a brief discussion of the basis used and a short description of the nature of the farming in each area no further explanation was made of the type area differentiation. We need now to turn to a discussion of the physical and economic factors which are related to this geographic distribution of types of farming and seek to explain the causal factors lying back of and responsible for them.

We have already pointed out in the introductory chapter that types of farming result, in the main, from man's efforts to adjust himself and his resources to his environmental conditions. He seeks to administer these resources in a manner which will result in maximum returns. Inasmuch as these resources vary widely in different parts of the country there necessarily result wide differences in the way in which they are utilized. Thus we have a corn belt, a cotton belt, a cash-grain belt, a dairy region, etc. Just what causal factors lie back of this specialization and determine the type localization in particular areas is the problem with which we shall be dealing in this chapter.

Theoretical consideration of the principles involved in the geographic specialization of agricultural production.—Before launching into a detailed discussion of the specific factors operating to determine types of farming in particular areas it may be well to give some attention to the broad general principles involved in the analysis.

An historical study of the agriculture of any area likely will disclose a wide range in the nature of the crop and livestock systems followed in different periods of time. This results, in part, because of changes in technique, changes in prices and cost of goods, and in part because of mistaken judgments of individual producers. When a new community is established, as was manifested so many times in our agricultural history, there results a considerable period of uncertainty on the part of the early settlers as to what are the best things to grow, in what combinations and by what methods and practices. A lot of things have to be learned and these mostly by trial and error, with the result that there is very little unanimity of opinion. Gradually, as experience accumulates, there develops a common judgment more or less shared by all that certain crops and livestock are better adapted to the prevailing conditions than are others.

A study of the way in which man has adjusted himself and resources to his physical environment has led to the formulation of certain generalizations or principles which seem particularly applicable to the problem under consideration.

In considering the problem of selecting the lines of production to be carried on in a given farming region, or in explaining shifts which have occurred, it is sometimes maintained that no satisfactory solution of this problem can be reached until a careful comparison of production costs in competing regions has been made. This, as we shall see, is not the proper approach to the problem because most farm commodities are not always produced where they can be produced at least cost.

For example, some years ago some of the States in the Corn Belt of the Middle West encouraged their farmers to get into the production of sugar beets. This proceeded to the point of offering bounties in certain instances to induce the introduction of the crop. Farmers in this region, however, did not readily respond to this inducement. Their refusal was not due to the circumstance that sugar beets could not be grown successfuly in the Corn Belt. It is probable that the yields of the crop in this area would be as high or higher than are obtained in some of the better sugar beet areas, but they were not grown because they competed with corn for the use of the land and were unable to yield a net return commensurate with what could be obtained from growing corn. The area especially adapted to the production of corn is more limited in extent than is the area adapted to sugar production and, as a consequence, corn gets the first choice of the areas to which it is best adapted.

For many years farmers in the South, similarly, have been encouraged to get into more diversified systems of farming; to cut down the acreage devoted to cotton, replacing it in part or wholly with other crops and livestock. Farmers as a group in this general area, however, have failed to carry the recommendation into effect and have continued to stick to cotton. The problem resolves itself into what direction lies the farmers' best economic interest. Shall he continue to keep the major part of his crop land in cotton, supplementing it with feed crops and livestock to supply home needs, or shall he curtail the acreage in cotton and produce more of the other crops to the extent of depending upon an outside market for the excess? The fact that farmers have continued to direct their energies largely to the production of cotton, exchanging it for other products for which they have need, is sufficient commentary on what they consider is their best economic interest.

Similar illustrations could be cited in other parts of the country. All point to the same generalization that, "The producers of every locality tend to use their resources in the production of those goods in which their costs are comparatively lowest and to buy with the proceeds of this production such of the goods of other producers as they may desire for the satisfaction of their wants."[1]

This generalization has come to be known as the principle of comparative cost or comparative advantage.

From what has already been said it is apparent that in determining comparative advantage the comparison is not made between the cost of producing a particular commodity in one area with that of the same commodity in other areas but rather is made between the cost of producing a given value of a commodity in a given area with the cost of producing an equal value of any other commodity or group of commodities in the same area.

The principle may be stated in another way, resolving itself into a law of maximum utilization of resources as follows: "Each region tends to utilize its productive resources by producing those commodities from which it will realize a maximum of value for the resources used and to exchange these products for those in which its productive advantage is comparatively less, drawing these latter products from regions in which their production means maximum utilization of resources."[2]

This law is universally applicable. It should not be considered, however, as absolute and inflexible but rather as representing a tendency. There is evidence all around us that farmers as well as others are constantly striving to apply this principle in their business and every day affairs. That they are able always to select the several lines of production which enable them to produce a given value at least cost is a perfection to be strived for but doubtless rarely attained. At

[1] Economics of Farm Organization and Management, C. L. Holmes, Ch. IV, p. 47.
[2] Ibid, p. 48.

any particular time in any agricultural area maladjustments are found. These are due to mistaken judgments of farmers as to their best course of action, to external factors over which they have no control, to custom, and countless other forces in operation. Nevertheless, farmers are all working toward the goal of maximum utilization of resources. They are seeking to find that combination of crops and livestock which will yield them maximum returns.

Another law closely related to the foregoing and which bears particularly upon the way in which types of farming are distributed geographically is known as, The Law of Regional Competition of Enterprises. It has been defined as follows: "When two or more farm enterprises compete for land and other resources of a given area, prices will tend to be such that the one with the more limited potential area will have its choice of the territory and its area will expand in the direction of less and less favorable conditions for its production until rising costs and lower prices due to increased production will make it unable to extend farther owing to greater profits secured from the competing enterprises."[3]

The working out of this principle of regional competition involves two sets of factors. On the one hand are included such factors as soil, yields, practices, and the like, which condition the effectiveness with which a single enterprise or combination of enterprises is handled; and on the other hand those ordinarily out of the individual farmers control, such as weather and price.[4] We thus have the influence of both costs and prices determining which enterprise or combination of enterprises will have the choice of the area. If a particular crop can be grown successfully only within a limited range of physical conditions of soil and climate, it means, other things being equal, that the supply of that crop is likely to be limited and as a consequence its price high. This being true, it is obvious that such a crop has an advantage economically, over the other crops or products which are not so limited in the physical range of their production. This crop, therefore, will have the first choice of the limited areas peculiarly adapted for its production.

Many illustrations can be cited as to the way this law has operated in determining the localization of farming types in the United States; also as to the way it has influenced historically our agricultural development. In the discussion to which we now turn of the specific factors responsible for types of farming in particular areas attention will be directed from time to time to these illustrations.

The discussion of the specific factors affecting types of farming will be developed under three main heads—physical, biological, and economic factors. These will now be considered in order.

Relation of Physical Factors to Types of Farming.—Physical factors as herein considered, include climate, topography, and soil. These factors, making up as they do the physical environment, necessarily have a profound influence upon types of farming. They determine, on the one hand, the absolute limits of crop production and on the other, through relative yields, influence in considerable degree the proportion in which the various crops are grown.

Before agriculture can be practiced with assurance of success in the United States, several conditions must be met. The land must not be too hilly or too stony to permit cultivation; the rainfall must be sufficient to grow the crop, the growing season long enough to mature it; and the soil of suitable texture and fertility to produce it at not too great a cost. Each of these factors has had its influence in shaping the agriculture of the United States, although the effect has not been uniform by any means. In certain areas topography is the limiting factor; in others, soils; and in others, moisture and temperature. The importance of each has been so great that more detailed treatment is desirable.

[3] Economics of Farm Organization and Management, C. L. Holmes, Ch. IV, p. 50.

[4] See: The Principle of Comparative Advantage applied to Farm Management Studies of Regional Competition Between Farms—Jesse W. Tapp, Journal of Farm Economics, October, 1926.

The effect of climate.—Climate including rainfall, temperature, and evaporation exercises an important influence in localizing the production of crops. It also has an influence upon livestock, notably in the case of sheep and horses, and to a lesser extent cattle.

Rainfall, both in absolute amount and in seasonal distribution, governs to some extent the choice of a cropping system. The variation from year to year is also important, particularly in semiarid and dry-land farming areas where a two years' moisture supply is oftentimes necessary to produce one crop.

It is not so much the total rainfall (either annual or seasonal), however, which is important, but rather the amount which is effective. That which is effective is determined by the amount of evaporation and run-off. In the western part of the United States, where the atmosphere is dry, the evaporation is high. A given amount of rainfall in northwestern North Dakota is more effective than the same amount in southwestern Kansas and Oklahoma. Wheat, for example, is grown fairly successfully with 15 inches of rainfall in western North Dakota, but in most of Kansas it is grown in areas having 20 inches or more except in the extreme western tier of counties, where the rainfall is around 15 inches.

The run-off is determined, in part, by the nature of the topography, in part by the physical character of the soil and in part by the character of the covering. It is also determined, of course, by the amount of the rainfall and by the way it falls, there being less run-off from a slow gentle rain than from a cloudburst. In areas where the total amount of rainfall verges on the minimum for successful crop production obviously the conserving of the limited amount is important. A number of the States, notably Texas, are conducting terracing experiments with the view of arriving at a practical way of minimizing the enormous run-off and of preventing erosion.

If we examine the climate of the United States geographically we shall find that it is very closely associated with our outstanding systems of relief. These in conjunction with fairly definite high and low pressure areas resulting from the differential heating of the earth's surface probably, in the main, determine our climate. Our main systems of relief are the Pacific Cordillera, the Great Central Lowlands and Plains, and the Appalachian System.[5]

In the Pacific Cordillera from west to east we have, the coast ranges, usually between 1,500 and 2,500 feet in height and east of the coast ranges and running the whole length of the continent, from north to south, is the great Pacific trough or valley including Puget Sound, Cowlitz, and Willamette Valleys in Washington and Oregon, and the Great Valley in California. The whole of this trough or valley receives less precipitation than the western slope of the coast ranges, inasmuch as it is in the "rain shadow" of the mountains. The rainfall is fairly well distributed from north to south to the Oregon-California line, although the Cowlitz and Willamette Valleys have a rather high winter maximum and a summer drought of from one- to two-months duration. In the Great Valley of California the summer drought is longer, extending three to four months.

Adjacent to the Pacific trough on the east extend very high ranges of mountains, usually 5,000 and sometimes over 10,000 feet in height. These are the Cascades of Washington and Oregon, the Sierra Nevada, San Gabriel and San Bernardino ranges of California. These mountains are so high that the moisture laden air from the west spends itself largely on their western slope. Throughout the whole Pacific region the rainfall thus seems to vary with relief, being heaviest on the western slope of the Sierra Nevada Mountains, then next heaviest on the western slope of the coast ranges and least in the valley.

[5] North America—An Historical Economic and Regional Geography—LI. Rodwell Jones and P. W. Bryan—Part II, Chapter X.

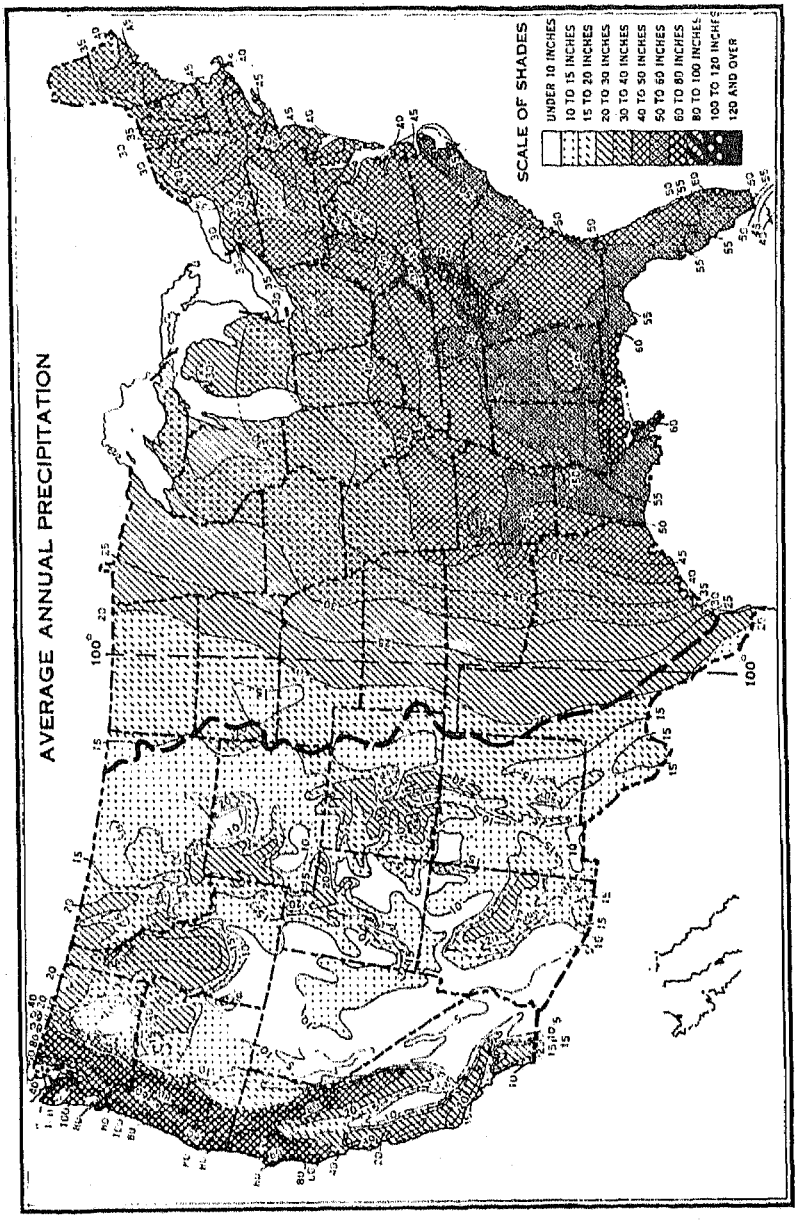


FIGURE 43.—Average Annual Precipitation

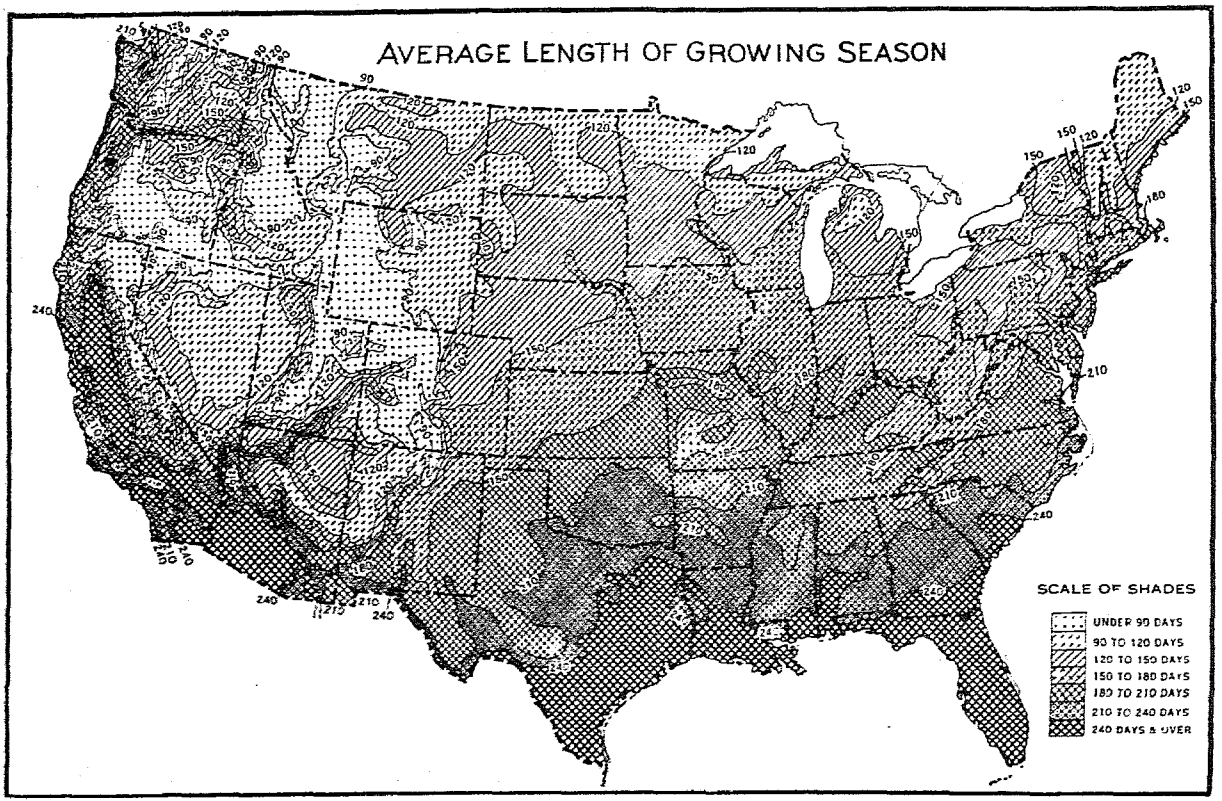


FIGURE 44.—Average length of growing season

Between these high mountain ranges and the Rocky Mountains on the east is a large area of irregular mountain masses and plateaus. In this general area are found the Snake and Columbia River Basin of Washington and Oregon, and the Great Basin of Nevada and Utah. Throughout this region the precipitation is very low. The high mountains to the west and east shut out the influence of both the Pacific and Atlantic Oceans, as well as the Gulf of Mexico. The rainfall, however, is better distributed throughout the year than immediately to the east or west, usually reaching a spring maximum in the north and an early fall maximum in the south.

The Rocky Mountains to the east of the Great Basin are the last member of the Pacific Cordillera. Their extreme height results in their receiving a rather high rainfall, higher than either to the west in the Great Basin, or to the east in the high plains.

The Great Central Lowlands and Plains comprise the second member of our continental relief. They extend between the Rocky Mountains on the west and the Appalachian system on the east. Much of the region can not be characterized either as plain or lowland. The high plains adjacent to the foothills of the Rockies rise to 3,000–5,000 feet. Further east, the Ozark, Ouachita, and Wichita Mountains are found, but, apart from the exceptions noted, the region generally is one presenting but few obstructions to the free movement of air currents from the Arctic to the Gulf of Mexico. In this region are also located the Great Lakes, which have an important influence upon the climate of the region immediately adjacent.

Lastly, there is the Appalachian system in the eastern part of the country. Generally, this mountain chain is not high enough to interfere seriously with the movement of moisture-bearing air currents from the Atlantic Ocean.

Throughout the greater portion of the latter two regions the rainfall is fairly well distributed with a distinct summer maximum. East of the Rocky Mountains the rainfall decreases from east to west, and the summer maximum becomes more pronounced in the same direction.

In Figure 43 are shown the main rainfall belts in the United States in 5, 10, and 20 inch intervals. It will be noted that in general the areas receiving 20 or more inches of rainfall occur in the eastern half of the United States.

This line roughly divides the United States into two agricultural regions—the division, however, is more of a zone than a line. It, in fact, is being pushed further west with the development of new drought resistant strains of crops, and with improved tillage methods of dry land farming. The division, furthermore, is further west in the north than in the south, due to less evaporation and the consequent ability to produce a crop with less total rainfall.

Temperature is another climatic factor of considerable importance in determining what crops are grown in particular areas. This will be discussed under the general heading of length of growing season. Length of growing season is usually measured by the number of days between the last killing frost in the spring and first killing frost in the fall. This, however, may vary greatly from year to year; growing seasons for any particular year may be short at different ends. A late spring may be followed by an early fall or any early spring by an early or late fall. A more useful measure would be one which indicated the probability of a killing frost coming after a certain date in the spring or before a certain date in the fall. This might be expressed as the number of years in 10, 20, or 30 years, in which a killing frost came after or before certain dates in spring or fall. The average length of growing season in different parts of the United States is shown in Figure 44.

Certain of the crops have a much narrower climatic range than do others. Cotton, for example, is largely restricted to the areas "having over 200 days in the

frost-free season, a summer temperature of 77° or more, not less than 20 inches of average annual precipitation and not more than 10 inches of rain in the autumn months."[6] Corn has a somewhat wider climatic range than cotton, but narrower than has wheat. Corn is grown largely east of the line of 8 inches of mean summer rainfall and south of the 66° of mean summer temperature. North of this line barley replaces corn as the principal feed grain. Wheat has a very wide range of adaptation. It, however, does best in regions of moderate rainfall, which comes largely in the winter and spring and but little at harvest time. There is more potential wheat land available than is needed to grow the wheat the world will consume at the present time, as a consequence, wheat is grown in certain areas as a crop secondary to other crops which have a more restricted range of adaptation. This is notably true as between corn and wheat in the Corn Belt of the Middle West.

The narrowing of the spread between corn and wheat prices in the last few decades together with the development of new strains of quicker maturing corn has resulted in a rather pronounced shift in the relation between the corn and wheat acreage in the United States. This is particularly noticeable in the northern and western fringes of the Corn Belt, as will be noted from Figure 45. In the period covered by the chart there has been an increase in corn relative to wheat acreage in the general area noted.

Oats are also quite susceptible to excessive temperatures and to drought, being rather sharply restricted to the northern States. Hay and potatoes also do best in a cool, moist area, as has been pointed out in the previous discussion. Other crops similarly have rather pronounced climatic preferences.

Livestock are not so directly influenced by climate as are the crops, yet indirectly climate, through limitation of pasture and other crops, has a rather pronounced effect upon the geographic distribution of livestock. Horses seem to be directly affected by climate. The draft work in hot countries is done largely by mules, or cattle, or by water buffalo in the extreme areas. The lack of a satisfactory pasture grass in the South has been a factor in restricting the spread of livestock in that general territory. Sheep are very susceptible to disease and are unable to thrive in low, wet lands. Goats, likewise, are unable to withstand extremes in temperature. Both like high, dry altitudes, and climate no doubt has been partly influential in determining their present concentration in the Mountain States.

Effect of topography.—The character of the land surface also has an important influence upon the nature of the farming followed.

We have already discussed the way in which our relief system influences the climate in the United States. The general smoothness of the land surface and the degree of slope also play an important part in determining the kind of farming followed. An uneven or broken surface usually results in a high proportion of nontillable pasture land. Under such conditions, if this pasture is to be utilized, it is necessary that livestock play an important part in the farming system adapted.

Smooth, level land greatly adds to the facility with which labor and machinery may be used. Because of this fact, other things being equal, costs of production on such lands will be less than on more rugged land. The increased mechanization in recent years has added to the advantage which level land has over rough, broken, or hilly land.

The effect of soil.—Soil affects types of farming largely as it influences the physical adaptability of crops. Certain crops are affected by the texture of the soil, others by its chemical content, and still others by its water-holding capacity. The physical structure of soils has an important effect upon the growth of plants.

[6] Agricultural Regions of North American, O. E. Baker, Economic Geography, October, 1926, pp. 459-493.

RATIO OF THE CORN ACREAGE TO THE COMBINED CORN AND WHEAT ACREAGE IN THE NORTH CENTRAL STATES FOR 1889

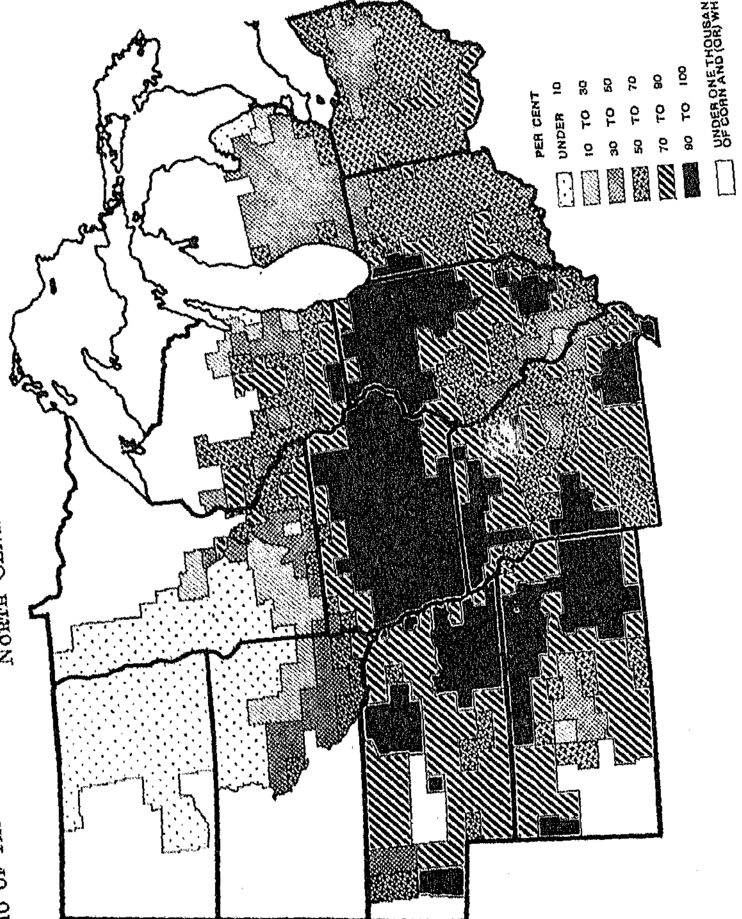


FIGURE 45a

RATIO OF THE CORN ACREAGE TO THE COMBINED CORN AND WHEAT ACREAGE IN THE NORTH CENTRAL STATES FOR 1909

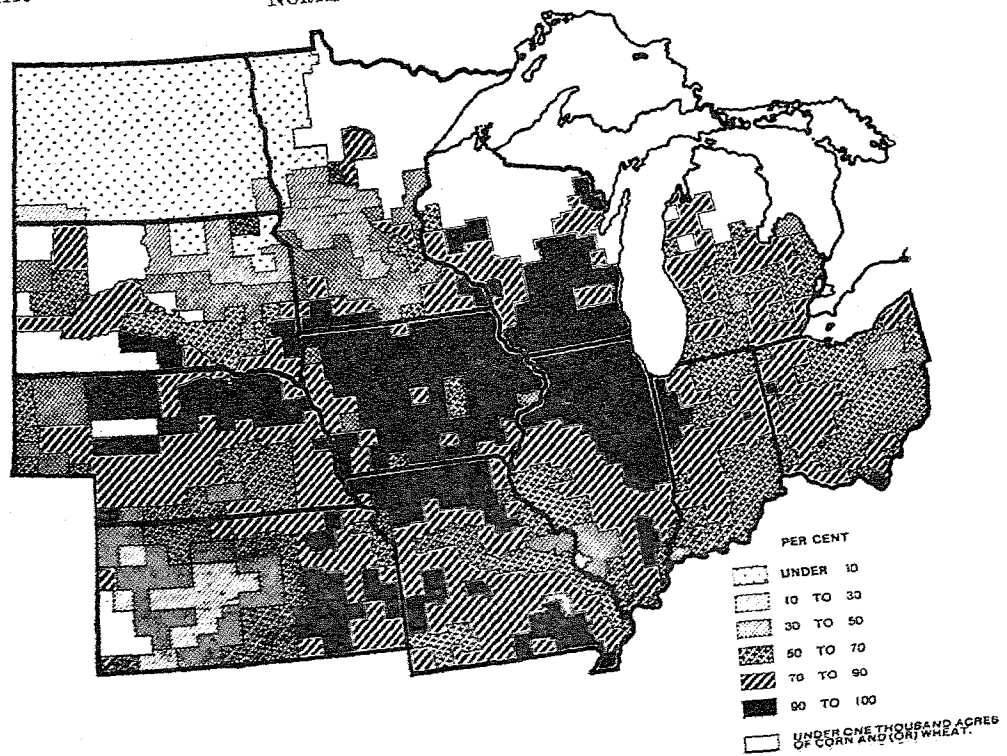
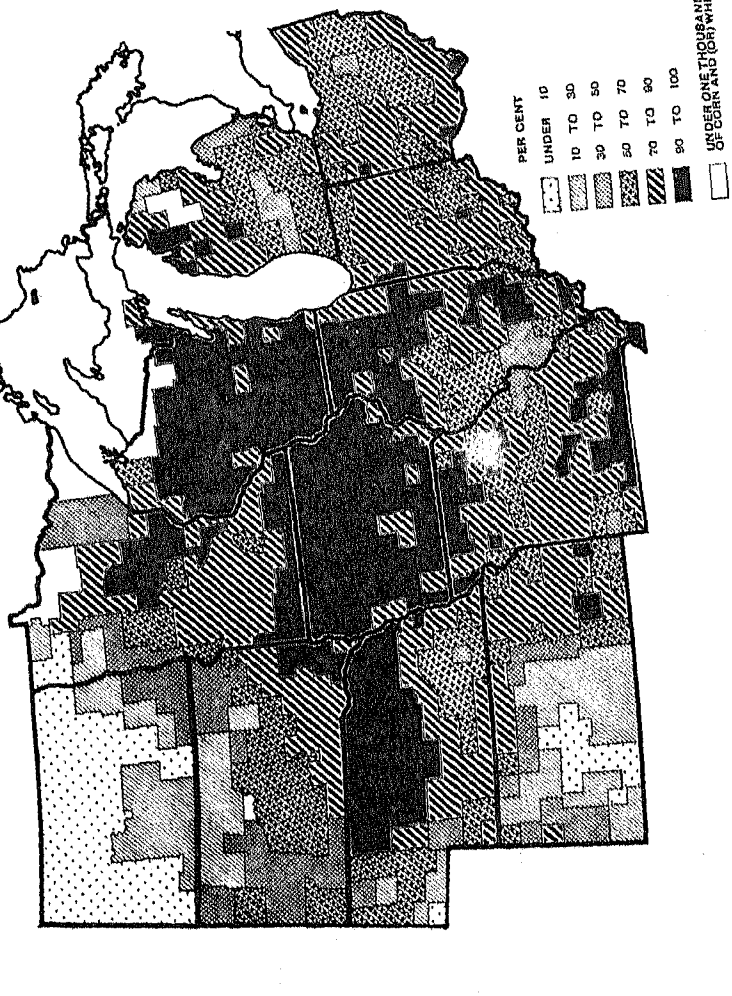


FIGURE 45b



RATIO OF THE CORN ACREAGE TO THE COMBINED CORN AND WHEAT ACREAGE IN THE NORTH CENTRAL STATES FOR 1929

Soils may be loose or compact, hard or friable, granulated or nongranulated. This latter characteristic is particularly important. A well-granulated soil means it is loose and porous, permitting free circulation of air and moisture, thereby aiding capillary action. Soils with generous supplies of organic matter are loose in structure, have great water-holding capacity, and are usually easily worked. Heavy soils have a tendency to be plastic and highly cohesive, rendering them difficult to handle; they become very hard when dry. Timeliness of cultural operations on such soils is very important. If they are plowed too wet they puddle badly. The soil particles of such soils are very small, thus rendering them very retentive of moisture.

At the other extreme are sandy soils with much larger soil particles, acting to moisture much as a sieve. Their absorptive powers are so low that they permit water and water-soluble plant food elements to pass through them freely. Such soils, as a consequence, require constant fertilization to produce satisfactory yields and are usually devoted to the more intensive crops, so that the larger gross acre income will justify the extra outlays necessary.

In between these two extreme soils are the various loam combinations. In these soils there is a mixture of large and small particles, the large ones facilitating drainage and the smaller ones forming nuclei around which the still smaller ones collect, thereby assisting granulation and capillarity.

The chemical content of the soil also profoundly affects plant growth, and in many cases is the element which finally determines what is grown. A soil can not always be made productive, however, by merely supplying the known deficiencies in plant food elements. A soil may show by chemical analysis an abundance of nutrient elements and yet produce poorly because they are in a form unavailable for plants or are locked up through some unknown inhibition.

The effect of soil upon crop distribution is appreciable. It is much more local in its action, however, than is climate. Wheat, for example, rarely does well on sandy soils. It yields poorly on such soils, and the soil, furthermore, does not give it the support it needs. The best wheat soils are those which contain a fairly high clay content. Soil is not so important in limiting wheat production, however, as is climate.

Corn is partial to a deep, fertile, warm soil—one that is rich in lime, nitrogen, and organic matter. It also does well on rich limestone uplands and particularly well on rich river-bottom lands.

Certain crops, notably the legumes, do not thrive well on soils deficient in lime. Potatoes, however, are more acid tolerant and do well on the poor, lime-deficient soils of New England and the Middle Atlantic States. The truck crops do well on sandy soils. These soils warm up quickly in the spring and, furthermore, are easy to work. This latter circumstance is of considerable importance in the production of a crop which requires a great deal of hand labor. Other illustrations might be given of the soil preferences of particular crops, but enough has been said to indicate that soil plays, by no means, an insignificant part in determining the localization of particular crops.

In order that the discussion may be made somewhat more objective we shall consider briefly what we have in the way of soil resources in the United States. The United States Bureau of Soils [7] has divided the United States into 13 soil provinces and regions based largely on geographic features common to each. They include seven soil provinces and six soil regions. The seven soil provinces are located in the eastern part of the country and comprise (1) the Glacial and Loessial, (2) Glacial Lake and River Terraces, (3) Appalachian Mountains and

[7] The discussion of the different soil provinces and soil regions in the United States has been adapted largely from the report, Soils of the United States, Bulletin 90, U. S. Department of Agriculture, by Dr. Marbut and associates in the Bureau of Soils.

Plateaus, (4) Limestone Valleys and Uplands, (5) Piedmont Plateau, (6) Atlantic and Gulf Coastal Plains, and (7) River Flood Plains.

The Glacial and Loessial Province.—Of these soil provinces the Glacial and Loessial province is relatively the most significant from the standpoint of area and also from the standpoint of the importance of the agricultural regions involved. It includes that part of the United States lying east of the Great Plains, the soils of which were derived from the deposits left by the retreat of the ice of the glacial period; by the water-laid material deposited during the advance and retreat of the ice in the form of outwash plains and by silt deposits laid down by water or wind during or subsequent to the retreat of the ice. The province extends on the north from the Maine coast along the Canadian boundary to the middle of Montana. On the west and south it follows roughly the Missouri River to St. Louis, south on the east side of the Mississippi River to Baton Rouge, La., north again to the Tennessee-Kentucky line; northeast through Cincinnati and Chillicothe, Ohio, to New Castle, Pa., and Jamestown, N. Y., southeast again to New York city, and up the Atlantic coast to Maine.

Topographically the whole area may be divided into a western, eastern, and coastal area, known as the interior lowland area, the Appalachian area and the coastal area. The interior lowlands comprise roughly the territory west of the Ohio-Pennsylvania State line. This general region represents, on the whole, the most productive agricultural area in the United States. Three classes of soils, loams, silt loams, and clay loams predominate. Within this region are located the Corn Belt, the major portion of the hard spring wheat area, the soft winter wheat belt of Ohio, Indiana, Illinois, and Missouri, and the dairy belt of the Lake States.

The eastern or Appalachian part of the province comprises that portion lying east of the interior lowland area, except the coastal plain area on Long Island, Cape Cod, and intermediate islands. The soils of this general region are much less productive than those of the interior lowland. They are derived from glacial deposits consisting mainly of sandstone, shales, crystalline gneisses, and schists and limestone. Dairying is the predominant type of farming in the area as a whole, but potatoes, truck, and fruit are also important. In restricted localities considerable specialization is found, as for example, the growing of Sumatra tobacco in the Connecticut Valley.

The Atlantic coastal area is characteristically sandy and is devoted largely to fruit and truck.

Glacial Lake and River Terrace Province.—This soil province is not continuous but represents small strips or patches lying largely in the basin of the Great Lakes. The principal areas are found along Lake Ontario in northern New York, along Lake Erie from Buffalo to Toledo, the Maumee Valley of Ohio, around Chicago, Saginaw, Mich., Green Bay, Wis., and in northwestern Minnesota and eastern North Dakota (the old lake Agassiz area).

The soils of this province are reworked glacial débris deposited either in the basin of lakes formed by the advance and retreat of ice or by the streams that flowed from the ice during the Glacial period. The principal classes of soils are loams, sandy loams, clays, clay loams, and sands. Along Lake Ontario and Lake Erie the dominant type of farming is fruit and truck with dairy. In the Maumee Valley, cash grain (corn) and general farming is practiced; in the Saginaw Valley, sugar beets and beans; in northwestern Minnesota and eastern North Dakota, cash grain (principally wheat), potatoes, and general livestock farming.

Appalachian Mountains and Plateau Province.—This province comprises central and southwestern Pennsylvania, the whole of West Virginia, eastern Ohio and Kentucky, east central Tennessee, western North Carolina, parts of Virginia and Maryland and northeastern Georgia, and portions of northern Alabama. The soils of this region are derived from disintegration of rocks in place, but these rocks were themselves formed of material which had previously been transported

by water. They consist mostly of loams, clay loams, and silt loams. The important Shenandoah-Cumberland fruit area, is located here and dairying is of importance in certain parts, but on the whole the region is relatively unimportant agriculturally. Throughout most of the area self-sufficing and part-time farming are dominant.

Limestone Valleys and Uplands Province.—The Limestone valleys of this soil province are located mainly in the Appalachian Mountain region. They extend in a continuous stretch from northern Alabama to New Jersey. The valleys vary in width from 40 to 60 miles in eastern Tennessee to but a few miles farther north. In Tennessee the formation is known as the Valley of Eastern Tennessee and extends from the Blue Ridge Mountains on the east to the Cumberland-Allegheny Plateau on the west. In Virginia the valley is known as the Shenandoah, narrowing down considerably toward the north to become the Cumberland Valley in Maryland and southern Pennsylvania and the Lebanon Valley in eastern Pennsylvania. Smaller valleys belonging to the same formation are the Sequatchie Valley in Tennessee, Browns Valley in Alabama, and Nittany Valley in Pennsylvania.

Associated with these valleys, but not directly touching them, are probably the two most important areas of the whole province—the bluegrass region of central and northern Kentucky and the central basin in middle Tennessee. These two areas are among the most highly productive in the United States and are of a great deal of importance agriculturally. Both are noted livestock sections; the former particularly has long been the race-horse production center of the United States, as well as a producer of other classes of livestock. Burley tobacco production also is centered here. The soils of the limestone valleys are, as would be deduced from the name, of limestone origin. They are very productive usually being high in phosphorous and lime.

The uplands portion of the province comprises the highland rim section of northern Alabama and central Tennessee, continuing through Kentucky nearly to the Ohio River. Other important areas occur in northern Arkansas, southern Missouri, northeastern Oklahoma, and southeastern Kansas. These latter areas are much less productive than are the valleys. Throughout the province general livestock farming predominates with chief emphasis being placed upon grazing, but in Arkansas and Missouri small general and self-sufficing farms are quite common in the upland phase of this formation.

Piedmont Plateau Province.—This province comprises the rolling to hilly region lying between the Appalachian Mountains and the Atlantic coastal plain. It extends from northeastern New Jersey across southeastern Pennsylvania, through central Maryland, Virginia and North Carolina, western South Carolina, north Georgia, to central Alabama. Starting as a rather narrow strip in New Jersey, Pennsylvania, and Maryland, it widens out until it is on an average of 100 to 125 miles in width in North and South Carolina. The soils of the Piedmont Plateau are residual in origin, being formed by the disintegration of the underlying rock. The most important and widely distributed soils of the region are known as the Cecil series. These soils are characterized by their red clay subsoils and gray to red soils ranging from sand to clay. Deep sandy soils are rarely found in the Piedmont and the surface soils are also much heavier than are those in the coastal plain.

In New Jersey, Pennsylvania, and Maryland dairying is the principal type of farming on the Piedmont soils. Proximity to metropolitan areas probably being the determining factor rather than the physical conditions prevailing. The dominant type of agriculture followed in the Piedmont soils in Virginia and northern North Carolina centers in the production of dark tobacco. From north central North Carolina south to Alabama tobacco is replaced by cotton as the principal enterprise.

Atlantic and Gulf Coastal Plains.—The Coastal Plains comprise one of the most important of the physiographic regions of the United States. They extend from Long Island southward to southern Florida and along the Gulf of Mexico to the mouth of the Rio Grande River in Texas. In North Carolina the province is about 400 miles wide. Toward the Mississippi River it widens and extends northward in a narrow strip to the Kentucky line. West of the Mississippi it covers considerable portions of Arkansas, Louisiana, and Texas.

The more important subdivisions of the region are the Flatwoods, extending along the coast of the Carolinas, Georgia, and over most of the State of Florida, except the northwestern part, and in southern Mississippi. This area is poorly drained and of limited agricultural value.

Further inland and adjacent to the Flatwoods lies the Middle Coastal Plain. It extends across the Carolinas and Georgia into western Florida. Here the elevation is higher (from 100 to 400 feet), the surface is rolling and the soils, mainly grayish sandy loams with yellow friable subsoils, are better adapted to agriculture.

Adjacent to the Middle Coastal Plain lies the Upper Coastal Plain which is similar to it but with a little higher elevation. This region extends from South Carolina, across central Georgia and southern Alabama, to central Mississippi. A fourth subdivision of this province is the clay hills, extending from western Georgia, through Alabama and Mississippi, almost to the Tennessee line. The surface is hilly and some of the land is rough and stony. The soil is relatively unproductive.

Extending along the upper margin of the Coastal Plain from central North Carolina across South Carolina and Georgia into Alabama, is a narrow belt known as the sand hills. The soil is mainly deep loose sand and is utilized largely in the production of cotton, fruit and truck. The Georgia and Carolina peach belts, are located in this area.

In addition to the foregoing, other important subdivisions are the Black Prairies of Alabama and the Black Waxy Prairie of Texas. These latter areas are the most productive soils of the region.

Throughout the Coastal Plains province cotton farming is dominant, except in eastern North and South Carolina and southeastern Georgia, where the production of flue-cured tobacco prevails. In Florida and in localized areas in the other States, both truck and fruit production are important. The sandy type of soil and a favorable climate contribute to their development.

River Flood Plains.—This is the last of the seven major soil provinces in eastern United States. It includes all of the alluvial soil along the rivers east of the Great Plains. The soil is very productive, having been deposited by the adjacent rivers. The area of greatest extent and importance is the Mississippi Delta extending from Cairo, Illinois, to the Gulf of Mexico. The delta, as is well known, is largely devoted to the production of cotton. On the alluvial soils of the northern States corn is the prevailing crop, yielding particularly well on such soils.

Turning now to the western United States we find that there are six well-defined regions which can be differentiated. The Bureau of Soils has divided the western part of the United States into the (1) Great Plains Region, (2) Rocky Mountain Region, (3) Southwest Arid Region, (4) Great Basin Region, (5) Northwest Intermountain Region, and (6) Pacific Coast Region.

Great Plains Region.—This region comprises the nonglaciated part of the western prairies and plains and includes the greater part of eastern Montana, southwestern North Dakota, western South Dakota, Nebraska, and Kansas; eastern Wyoming, Colorado, and New Mexico, western Texas and most of Oklahoma and a part of eastern Kansas and western Missouri. The soils of this

region have been derived from residual, glacial, lake-laid, wind-laid, and alluvial material and there, consequently, is considerable variation in physical conditions within the region. The lighter textured soils of the region are usually wind-blown.

The character of the agriculture varies widely as between the higher, drier portions of the west and the more humid portions of the east. Cash-grain farming predominates in the Panhandle of Texas and Oklahoma, the western two-thirds of Kansas, western Nebraska, and eastern Colorado. This, in fact, is the center of the hard winter wheat belt of the United States and is located on the heavier soils of the region. In southwestern North Dakota and South Dakota, the Sand Hills of Nebraska and in most of Montana, Wyoming, and in large parts of Texas; particularly in the Edwards Plateau and north central Texas, range livestock production is the dominant type of agriculture followed. Cotton farming in central and south western Oklahoma and on the high plains of Texas, around Lubbock and adjacent territory is very important. Specialized irrigation farming also is found in restricted areas throughout the western part of the region, notably along the Yellowstone River in Montana, the Platte River of Colorado, Wyoming, and Nebraska, and the Arkansas River of Colorado and Kansas. Sugar beets, potatoes, and alfalfa hay are the principal irrigated crops. The growing of ripe field beans is also important in this region. They are produced largely on dry land.

Rocky Mountain Region.—The Rocky Mountain region covers the mountain and plateau areas extending from the Dominion of Canada on the north to the southern part of New Mexico and Arizona on the south. They extend from the Great Plains on the east to the desert plains and valleys of the Great Basin and the northwestern intermountain area on the west. The region, thus, includes the northeastern part of Washington, northern and central Idaho, western Montana, Wyoming, and Colorado, eastern Utah, and large portions of New Mexico and Arizona. Agriculture is practically absent in the mountains proper, while in the plateaus range livestock production is of considerable importance. Throughout the region are found localized irrigated areas producing hay, potatoes, sugar beets, fruit, and truck crops.

Southwest arid Region.—The Southwest arid region extends from the southeastern corner of California and Nevada along the Colorado River to southern and southeastern Arizona to southeastern New Mexico, and to most of the region west of the Pecos River in Texas. This region is characterized by an arid climate, with long hot summers, mild winters, low relative humidity. Evaporation is excessive and frost frequently occurs in most of the region during the cooler months. The area, in general, is not adapted to farming except by irrigation. Range livestock production is carried on, the vegetation, however, is sparse and the carrying capacity of the pastures is very low.

Great Basin Region.—The Great Basin region includes the area lying between the Rocky Mountains on the east and the Sierra Nevada Mountains on the west. It includes all of Nevada, with the exception of the extreme southeastern part, the western part of Utah, a portion of southeastern Idaho, the south central part of Oregon, and extends along the eastern border of California widening out toward the south to include a considerable part of the southeastern portion of the State. In the South it merges into the arid regions of the southwest and in the North it merges into the northwest intermountainous region along the northern boundary of Nevada and south central Oregon. The region as a whole is characterized by numerous isolated regions of mountain ranges running generally north and south and rising from an arid, treeless, desert plain. Where favorably situated with respect to topography and water supply, the soils of the Great Basin region are productive. They are adapted to the production of a wide range of staple and

specialized crops. The limited water supply, however, has virtually rendered this region incapable of agriculture other than grazing. There is considerable irrigation development in Utah and in Nevada around Reno.

Northwest Intermountain Region.—This region embraces the Columbia River Basin in Washington, Oregon, and Idaho, and the Snake River Plains in Idaho and southeastern Oregon, and in addition the Klamath Basin country of southeastern Oregon and northern California. From a topographic standpoint the region may be divided into three subdivisions, Plateau plains, uplands and mountains, and the Klamath-Lassen Peak district. The Plateau plains, divided by the Blue Mountains, embrace the Columbia and Snake River plains. The former include the greater part of the province in eastern and central Washington and north central Oregon, and the latter the larger part of the province in eastern Oregon and southern Idaho. The uplands and mountains include the Blue Mountains and associated ranges in southeastern Washington. The Klamath-Lassen Peak district, located in the southwestern part of the region, consists of desert plains broken by rocky regions and volcanic cones, and occasionally broad shallow lake basins.

The rocks of this northwestern region are mainly of basaltic character. In the more important agricultural portions of the region, particularly in the Columbia River Basin, the prevailing soil type is a silt loam. Considerable areas of fine sand and fine sandy loams are also found. These soils, especially the silt loams, are well supplied with mineral plant-food elements. The soils vary greatly in depth. In the "scab lands", where there is an outcropping of the basaltic rock, they are usually shallow and much affected by drought. The soils of the "Big Bend," however, are usually of greater depth, retentive of moisture and are well adapted to dry-land farming.

In this region is centered the important White Wheat Belt of the United States. In eastern Washington, western Idaho, and northern Oregon, cash-grain farming is the dominant type of agriculture followed. The most important irrigation developments occur along the Snake River in Idaho where potatoes, sugar beets, beans, and truck crops are the dominant crops grown and along the Columbia and Yakima Rivers, where fruit production is important. Here is found the Wenatchee and Yakima apple districts.

Pacific Coast Region.—There finally remains the Pacific region which embraces western Washington and Oregon, all of California, excepting a portion of the Great Basin, starting as a fringe along the Nevada border in the north, but gradually widening to include a large portion of the southeastern part of the State. The agricultural portion of this region, with which we are primarily concerned, consists largely of a series of valleys having as their boundary on the west the coast ranges, and on the east the Cascade and Sierra Nevada Mountains.

The principal agricultural areas, beginning at the north and proceeding southward, are the Puget Sound, Lower Columbia Basin, Cowlitz, Willamette, and Rogue River Valleys in Washington and Oregon, and the Sacramento and San Joaquin Valleys in California. The region covered by the coast ranges contain many stream valleys, some of which are highly developed and of considerable agricultural importance. In the mountains and foothills the soils are residual having been formed by the disintegration of the rocks in place. Deposits known as alluvial fan and valley filling material, laid down by intermittent streams emerging from canyons, together with the marine material deposited in the valley depressions, have given rise to the main agricultural soils of the region. No region of the United States has a more varied agriculture than is found in the Pacific region. This has developed largely as a result of the wide range in soil, climatic, and topographic conditions.

Relation Between Soil Regions and Type of Farming Regions.—In order to summarize the foregoing discussion and to enable the reader to visualize more clearly the geographic distribution of our soil resources, we now present a generalized map of the principal soil regions in the United States. (See fig. 46.) That there is a rather high degree of correlation between these principal soil regions and the type of farming regions shown on the generalized type of farming map of the United States referred to in Ch. IV, is disclosed at once by a comparison of the two. Thus, the dairy area of the United States, for example, follows closely the soil regions numbered 1, 2, 3, and 4 on Figure 46. The animal-specialty or livestock-feeding area follows mainly soil regions 18 and 19 and, to a lesser extent, regions 3, 15, and 16; whereas, the range livestock or ranching areas are located mainly in the soil regions lettered D. The cash-grain area (wheat, flax, rye, etc.) is located largely in soil region 24 and to a lesser extent in regions 15 and 16. In the South the cotton area is found in soil regions 9, 10, and 11 east of the Mississippi River and in regions 8, 17, 20, and 24 west of the river. In addition to these soil areas cotton is the dominant type of farming in the black belt of Alabama, the Black Waxy Prairie of Texas (soil regions numbered 21), and on the delta lands of the Mississippi and Arkansas Rivers. The self-sufficing and part-time farming areas are found largely in soil region 8 and to a lesser extent regions 5 and 7; and finally the important truck and fruit areas are found in soil regions lettered S and P.

That soil has played an important part in determining types of farming seems clear. It is easy to go astray, however, and attribute an apparent correlation such as this to the single-factor soil, when as a matter of fact other factors associated with it may also have played an important part. We have already seen that climate and topography influence types of farming and we need now to discuss other factors, before making a final appraisal of the particular one or group, responsible for the localization of a type of farming in a particular area. There are at least two such additional factors which need to be examined. These are biological factors and economic factors to a discussion of which we now turn.

Effect of Biological Factors.—Under this heading will be discussed diseases and pests, weeds, the development of new varieties, and new strains of crops and improved classes of livestock.

Although methods of control are being discovered and improved continuously, diseases and pests are still a constant threat to the growth of certain crops. Only a cursory examination of our agricultural history is necessary to reveal the great influence which they have played in causing shifts in types of farming. Even though the shifts may be temporary, in many cases they result in much maladjustment, uncertainty, and loss until a way to cope with them is developed.

When the San Jose Scale first appeared in the United States it caused losses amounting to millions of dollars to the fruit industry. The peach industry of New Jersey, Delaware, and Maryland was practically destroyed by it, and land values depreciated greatly. As soon as a practical method of control was developed the peach industry came back, as did land values. Other examples of fruit diseases and pests which have caused great losses are blight, the codling moth, and recently the Mediterranean fruit fly. The Hessian fly, black stem, rust, and chinch bugs have preyed upon the wheat plant in a similar way and have forced curtailment of the crop or the adoption of specific measures of control.

Probably the most noted example of the effect which a pest may have upon a crop is that of the Mexican cotton boll weevil. Boll weevils were first found in the United States near Brownsville, Tex., in 1892. They spread over Texas rapidly, reaching Louisiana by 1903, Mississippi by 1907, and Alabama by 1909.

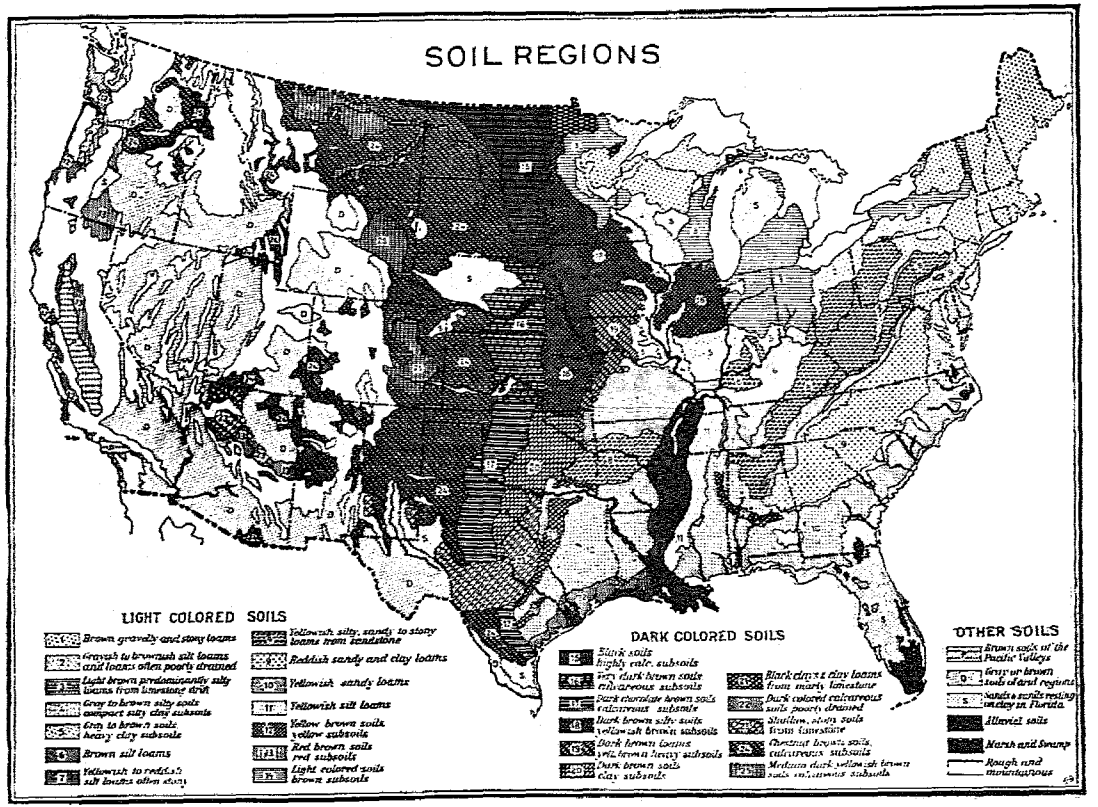


FIGURE 46

[By Courtesy of U. S. D. A.]

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The spread throughout the South Atlantic States, likewise, was rapid reaching Georgia by 1915, South Carolina by 1917, and North Carolina by 1920.[8] This pest has caused enormous losses in the South and has done more to force a diversification of crops in the Cotton Belt than any other single factor. The pink bollworm is another insect which preys upon the cotton plant and is second in importance only to the boll weevil.

The corn plant also is affected by disease and pests, notably the corn ear worm, root rot, and the corn borer. The European corn borer was introduced into the United States only in recent years. Enough is known already of its destructive activities to lead many agricultural authorities to foresee the possibility of a complete change in the cropping system in the Corn Belt unless practical means of control are discovered and put into effect.

Diseases among livestock have also exacted their toll. Notable among these are hog cholera, foot-and-mouth disease, blackleg, and Texas fever. Effective measures of control have been found for some of these but outbreaks occasionally occur which result in enormous losses. Texas fever has been one of the important factors restricting cattle raising along the southern boundary of the United States.

Weeds are another factor which have and continue to have an effect upon farming systems in the United States. Among the more destructive weeds are included the Canadian thistle, "Sow thistle," and quack grass. The wheat lands of the Upper Red River Valley have become so infested with weeds that yields are being curtailed materially due to the continuous growing of small grains. Flax, for example, is particularly susceptible to weedy land and can not be profitably grown on such land. Farmers in this general area may be forced into more intertilled crops in order to control the weed problem.

Still another set of biological factors of a different sort have influenced types of farming in the United States. They, in contradistinction to diseases and pests, are on the constructive side of the ledger. They include the development by agricultural scientists of new varieties and strains of crops and improved classes of livestock. This development has taken place in three major directions: In breeding more early maturing varieties of crops, more drought-resisting varieties, and more hardy and disease resistant strains.

The work in this direction has been really of a phenomenal nature. There probably are no crops of commercial importance in the United States which have not been improved through experimentation in one way or another. The development of marquis wheat, for example, really made the hard spring wheat area of the United States as we know it to-day. The development of drought-resistant strains of wheat also has helped to push the wheat belt farther and farther west into the area of scant rainfall. Likewise, the development of earlier-maturing corn, requiring a shorter growing season, has enabled the Corn Belt to be pushed farther north. The same is true with respect to cotton. Similarly wilt-resistant varieties of flax, cotton of longer staple length, sugarcane and sugar beets with higher sugar content, have been developed.

In livestock breeding, high-producing families of dairy cattle, quicker maturing beef cattle and hogs, and sheep with finer grades of wool have been produced. All of these developments have resulted in a shift in emphasis with respect to particular enterprises, the result of which has been manifested in changes in types of farming in the United States.

[8] See fig. 76, p. 293. (Map showing dispersion of Mexican cotton boll weevil in United States, 1892-1921.) Cotton by Harry B. Brown.

EFFECT OF ECONOMIC FACTORS.—Up to this point the discussion of factors affecting types of farming has centered around the physical and biological factors. These factors are in a sense really passive factors. They, to be sure, determine the conditions of production, yet they in themselves do not determine types of farming. There must be some motivating agency, some guiding hand which determines how these various conditions can best be used or overcome. The agency which does the combining, of course, is the human factor and it is through this agency that these other factors ultimately exert their force.

The guiding motive in adjusting crop and livestock systems to the physical environment is not so much one of personal likes and dislikes, as it is one of profits or net returns. Much has been made of the great influence exerted by the personal factor, but it is probable that this factor really has played only a minor role. If a type of farming pays well it usually is easy to learn to like it.

The question of net returns brings us forward to the last major group of factors affecting types of farming which will be discussed. These are the economic factors. Economic factors exert an influence upon types of farming, mainly as they effect the returns from particular enterprises or combination of enterprises, in relation to the resources used. This manifests itself largely through changes in the prices of products and changes in cost factors. Two enterprises may be equally adapted to the physical conditions within an area, yet not be at all comparable from the standpoint of returns. The price of one may be entirely out of line, due to conditions of production in other parts of the world or due to changing consumption habits or to changes in demand from other causes.

The American market is continually becoming more discriminating. The consumption habits of people change. Research in nutrition, education, advertising, and better marketing methods with respect to packaging and containers, trade brands, etc., are contributing to this end. The substitution of machine for hand labor has eased the burden of physical toil and has affected the consumption habits of laboring men. These various factors have contributed to an enormous increase in the per capita consumption of dairy products, fruits, and vegetables during the past few decades. These changes in consumption are reflected in the relative prices at which the various farm products sell, which in turn cause farmers to increase the production of those products which sell at more favorable prices.

From the standpoint of economy in production one enterprise may require much less labor than another or its labor demands may be supplementary rather than competing with respect to the labor demands of other enterprises adapted to the area. Because of this fact it is advantageous to combine those enterprises which demand attention at different seasons of the year and thereby avoid costly peak loads of labor. Farmers frequently add supplementary enterprises to their business in order to insure more complete utilization of materials and other resources, such as family labor, crop residues, low-grade feeds, and untillable pasture land.

Other factors of an economic nature which affect types of farming are transportation facilities, freight rates, and markets. Inasmuch as their effect is reflected either in the prices at which the products sell or in the expenses at which they are produced their influence is ultimately one of price and is so measured.

The effect of transportation on types of farming comes about through two main characteristics of production, specific value and perishability. The way in which these two factors operate to determine localization was first most clearly stated by the German economist von Thünen. The fundamental principle involved is that goods which are of low specific value or high perishability tend

to be produced adjacent to the marketing or consuming center, while those of higher specific value or with less perishability are produced at greater distances, and those with the maximum specific value and least perishability at maximum distances from market.

There are numerous examples in our agriculture where this principle has operated to determine the localization of types of farming. This is true particularly of the first part of the generalization relating to specific value. The perishability factor is not so important as in former years, because of the rapid advances made in refrigeration and preservation, rapid delivery, etc.

If we were to chart geographically the price per unit of weight of the important products, such as wheat, corn, hay, potatoes, hogs, milk, butterfat, etc., we would find that the prices would be lowest in the areas most remote from market and would gradually increase as the important centers of consumption are approached. We furthermore would find that there would be a rather marked tendency for the products with the highest value per unit of weight to be purduced at greatest distances from the markeeing centers.

An excellent illustration of this tendency is furnished by the localization of the hog industry. It is well known that our greatest center of hog production is found in the Corn Belt States, but it is the localization within these States which is of most interest and to which we wish to call attention. An examination of dot maps 5 and 24, will show that, in general, there is a high correspondence between the distribution of corn and hogs, but the areas of heaviest hog production tend to center in the western part of the Corn Belt. This is where the corn is cheapest in price and consequently the most economic for growing hogs. The tendency would be even more distinct if the weight per hog were taken into account. Since it is more economical to ship 1 pound of hog than it is 5 pounds of grain (roughly the quantity required to produce one pound of live weight), the farmers in the areas remote from market feed hogs out to heavier weights.

The same sort of tendency is to be noted in the dairy industry—butterfat dairying is followed in the more remote areas and whole-milk dairying nearer the consuming centers. Truck and vegetables, likewise are usually produced near consuming centers. The usual order in localization of type is somewhat as follows: Truck comes first around the city, followed by whole-milk dairying and poultry, butterfat dairying, livestock feeding, grain growing, and livestock grazing.

The effect of urban influence or industrial development always has been to cause an increase in the more intensive types of agriculture, particularly vegetable growing and whole-milk dairying. While this general tendency is well understood and accepted it is sometimes difficult to show historically because of the lack of adequate data.

In Figure 47 is shown the influence of Chicago upon the surrounding agriculture as measured by changes in the number of dairy cows per square mile of farm land from 1870 to date by selected census periods. Obviously, this is only one of a number of measures for showing changes in intensity of production which might be used. Changes in the relative acreage or in the value of truck crops is another and probably a better one. Dairy cows were used because data ran back for a longer period than did data for truck crops.

This chart clearly indicates a rather pronounced shift in the number of dairy cows per square mile from 1870 to date. It will be noted that the change has been greater in areas immediately adjacent to the city than it was farther out. In other words, a zonic effect is produced. This is in line with the von Thünen generalization which was discussed above. The decrease in cows per square mile indicated between 1920 and 1930 is, in part, the result of the slaughter of dairy

NUMBER OF DAIRY COWS PER SQUARE MILE OF FARM LAND IN THE CHICAGO DAIRY AREA, BY SELECTED CENSUS PERIODS, 1870-1930

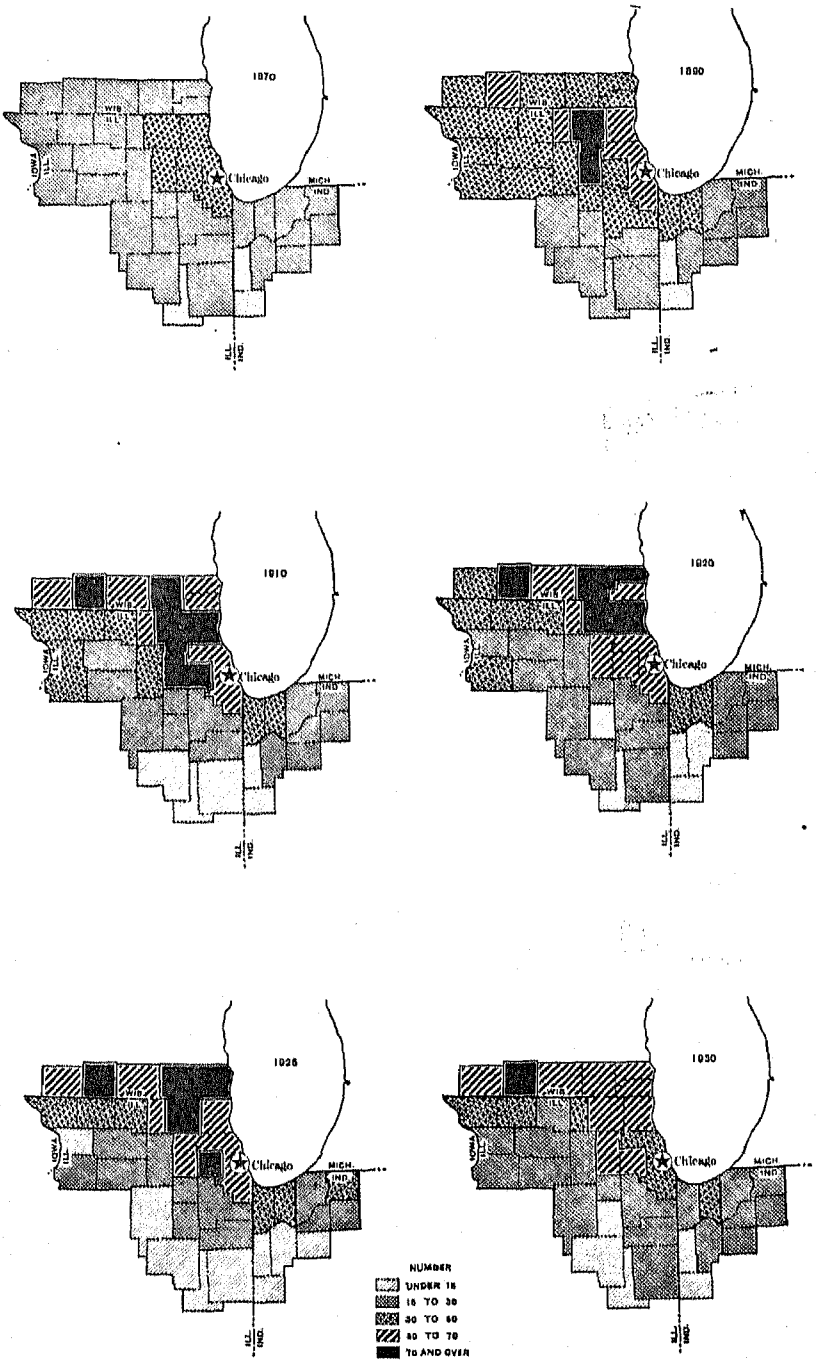

FIGURE 47

NUMBER OF DAIRY COWS PER SQUARE MILE OF FARM LAND AROUND SELECTED CITIES IN THE UNITED STATES AND THE POPULATION OF THESE CITIES, 1870–1930

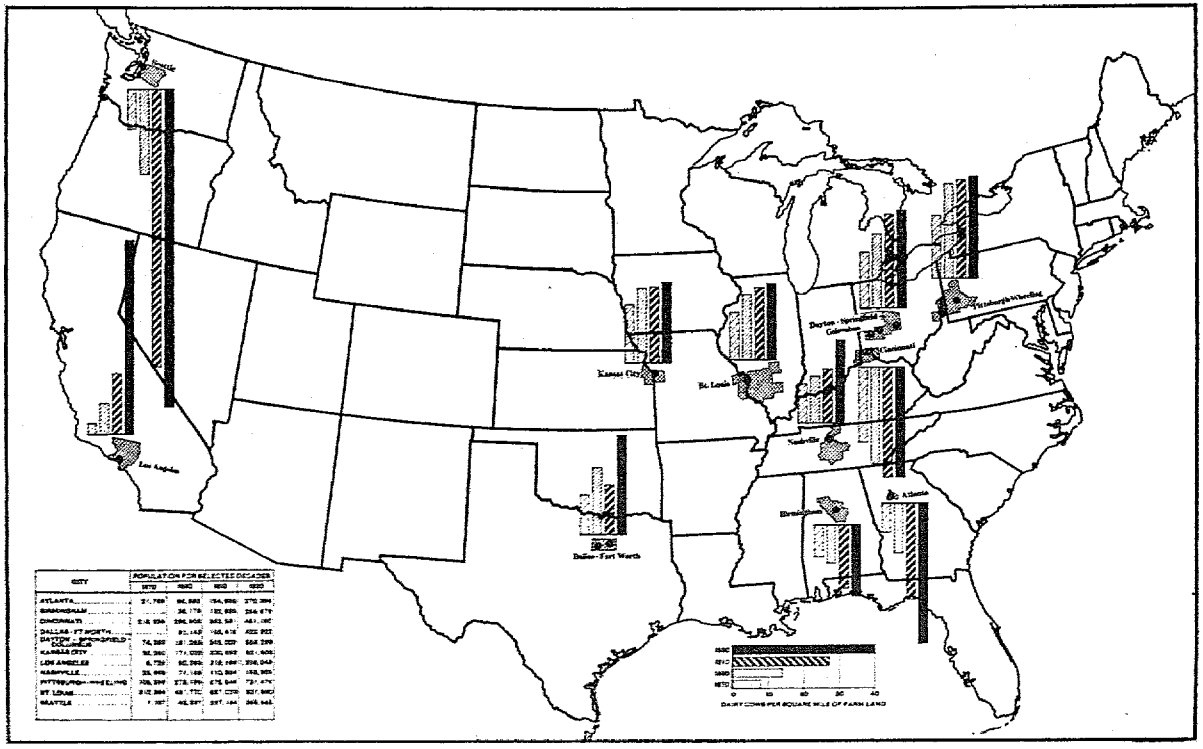

FIGURE 48

animals in the tuberculosis eradication campaigns which were conducted during that time.

The influence which other selected cities have had upon the intensity of production in the territory contiguous to them is shown in Figure 48. There is to be noted a very pronounced change in the number of dairy cows per square mile of farm land around certain of these cities from 1870 to 1930. This is particularly true of Seattle, Los Angeles, and Atlanta, and to a lesser extent of Birmingham, Dallas and Fort Worth, Nashville, and Cincinnati.

Similar developments have taken place around other urban centers. Reference again to the dot maps, showing distribution of truck, dairy, and poultry farms and to the generalized type-of-farming map, will show that these types of farms usually are found concentrated around cities. A few farmers around practically every city will usually find it profitable to get into these more intensive types of farming to supply the local demand. When production is increased beyond the demands of the local market, however, prices are likely to fall rather sharply, with the result that the type of farming may become decidedly unprofitable to most of the producers engaged. Conditions may be such as to justify a few farmers engaging in the business to supply local needs but be decidedly unfavorable if an attempt is made to ship from the region.

Still another group of factors which has an influence upon types of farming and which comes about through its effect upon price and returns, is that of invention and changes in technique. The introduction of a new machine or a new process may so cheapen the cost of production in areas where the machine is adopted that it becomes profitable to grow a crop on grades of land which before were submarginal. The result of such an influence may be to expand the production to the point where price is so lowered that farmers in competing areas are forced out. The returns which can be obtained from the enterprise relative to the returns which can be obtained from alternative enterprises in the area are so low as to make it advantageous to shift out of it completely and to get into another type of farming.

The effect which the development of the grain binder, the roller process in flour production, and the opening up of the Upper Mississippi Valley had upon eastern agriculture is probably the most noted example in the United States of this type of influence. The improvement in the combine harvester, thresher, and tractor in recent years has had somewhat the same effect, although not nearly so pronounced.

The development of new machines, with the resulting economy in man-labor, increases the competition for areas to which the new machine is not adapted and sooner or later will force them into a readjustment of their farming systems.

Then finally there is the effect of changes in fiscal policies, in tariffs, property taxes, etc. A tariff on sugar, for example, may open up an entirely new agricultural development in areas adapted to the production of sugar beets. The higher prices for the product, resulting because of the effectiveness of the tariff, may bring about an entire realignment in the returns from alternative lines of production to the extent that they will be replaced wholly or in part by the beets. Conversely, if the tariff is lowered the opposite effect may result.

Similarly, a bounty or an export debenture may encourage a shift to the production of the product or products affected to the extent that a readjustment in farming systems is brought about. An increase in the levy on real property may produce a like effect. The tax may be so heavy as to force a more intensive system of farming in order that the tax be met.

CAUSAL FACTORS DETERMINING TYPES OF FARMING REGIONALLY CONSIDERED.—We have now considered the general rôle which physical and economic

factors play or have played in shaping the agriculture of the United States. The factors have been discussed largely, however, from the standpoint of their individual effects rather than from the standpoint of their influence as a group or in a combination sense. We need now to consider this latter phase of the problem and seek to explain the way in which they have operated to determine the types of farming in specific regions or areas.

In the large pocket map showing type of farming areas in the United States it will be recalled that the United States has been divided into 514 major type-of-farming areas and into a number of additional subareas; furthermore, that these areas can be grouped into some 15 or 16 major type-of-farming regions. Due to limitations of space it will be impossible to discuss adequately the causal factors responsible for the type of farming in each specific area. We shall have to confine the discussion, therefore, to a brief consideration of the more important conditions and forces shaping the agriculture in the major type-of-farming regions. We shall begin with the dairy region.

DAIRY REGION.—The main dairy region of the United States extends more or less continuously from the New England and Middle Atlantic States in the East, through northeastern Ohio, southeastern Michigan, northern Indiana and Illinois, throughout practically the entire State of Wisconsin, to the western edge of Minnesota. Other regions where dairying is found as the major enterprise are located in the Pacific Coast States and around selected cities outside of the metropolitan areas.

Why, it may be asked, is dairying concentrated in the northeastern quarter of the United States? The answer to this question can not be made in a categorical way, but there are certain clearly defined reasons why it has become established in this general region. In the first place, this region is the most important hay and pasture region of the United States. The soils of the region are not sufficiently productive to grow the cereal crops and compete with the States further west, but the cool climate, with its well distributed rainfall, is very favorable to the production of hay and pasture. Furthermore, the topography is such as not to favor extensive use of machinery. The region, therefore, is at a disadvantage in the production of crops requiring machine methods.

The rough and broken terrain has resulted in small farms and has necessitated keeping a large proportion of the farm area in pasture. To utilize this pasture it is necessary to keep some kind of herbivorous animal. Beef cattle are at a disadvantage because of the comparatively short pasture season and the consequent long winter feeding period. It is not profitable, furthermore, to import concentrated feed to feed them out, since this feed can be utilized more profitably when fed to dairy cattle which produce a higher income. The large amount of hay, silage, and other surplus roughage, supplies the basis for an economical dairy ration. To this, of course, must be added concentrated feed, but such feeds can be imported even at fairly high prices and still be fed with profit in this region.

Furthermore, the proximity of the region to the important population centers insures a steady demand for dairy products and the short freight hauls result in a higher fraction of the consumer's price going to the farmer than would be true for farmers shipping from more remote distances. These, in the main, are probably the more important reasons why dairying has become concentrated in this section of the United States.

The localization of dairying around selected urban centers, we have already seen, has developed to supply the local demand for dairy products. The prices are sufficiently high to attract enough farmers to get into dairying to supply the local need. When production is pushed beyond this amount, however, dairying usually is not able to compete with other types of farming more specifically adapted to the area.

In the Pacific Coast States dairying has developed because of a local urban demand and because physical conditions have been favorable with respect to climate and cropping systems in the form of hay and pasture. The extremely heavy rainfall on the coast is particularly favorable to the grass crops which supply a cheap feed.

The Livestock producing and feeding region.—The animal-specialty or livestock producing and feeding region is located in the Corn Belt States of the Middle West, centering in Illinois, Iowa, eastern Nebraska, northeastern Kansas, southeastern South Dakota, southwestern Minnesota and Wisconsin, Indiana, and Ohio. The explanation of why this is the principal meat-producing region of the United States centers largely in the nature of the cropping systems followed in the region. These, in turn, are due primarily to soil and climatic conditions.

This general territory, as is well known, is the important Corn Belt of the United States and is located on the fertile prairie lands of the Middle West. This prairie land stretches westward from Ohio across the Mississippi River to the edge of the semiarid Great Plains. It is bounded on the north by the less fertile soils of the Great Lakes regions and on the south by the poorer soils of southern Ohio, Indiana, Illinois, and Missouri.

Throughout this region the land is level, with deep, fertile, warm, black soils, rich in lime, nitrogen, and organic material. They are remarkably fertile and particularly adapted to the production of corn.

Although soil and topographic conditions play an important part in determining the corn production they are, on the whole, probably not as important as climate in determining its localization. Corn is affected both by high temperature and rainfall. An average summer temperature of 70° to 80°, an average night temperature of 55° represent the average conditions under which the bulk of the crop is grown in the Corn Belt. Very little corn is grown where the average summer temperature falls below 66° Fahrenheit.

The average growing period in the Corn Belt runs between 130 and 140 days. By using early maturing varieties this growing period can be varied from as low as 80 to 90 days in the North, to 150 days or more in the South. Corn grows most rapidly toward the end of the growing period. At this time high day temperatures and relatively warm nights are of great importance. Heavy rainfall at this time also is quite important. In the main Corn Belt the rainfall may vary annually as much as from 25 to 50 inches. The moisture requirements of the plant steadily increase from planting time until the time when maximum vegetative growth is obtained in midsummer. A mean summer rainfall, of at least 8 inches, for the months of June, July, and August, is generally regarded as the western boundary of the Corn Belt, particularly toward the southwest where the evaporation is higher.

It is only when we consider the conditions in the territory adjacent to the main Corn Belt region and in other parts of the world, and see how they differ from those found within the region that we appreciate most forcibly the reason why the Corn Belt is located where it is. There is no other like area in the world which has such favorable conditions for the production of corn. This relative scarcity of good corn-producing regions means that in such areas corn will have the first choice of the land.

While corn comprises by far the largest proportion of the crop area in the Corn Belt, it is not grown to the exclusion of other crops. Oats are next in relative importance to corn, and hay is third followed by wheat. The growth and cultural habits of the corn crop are such as to require an extremely heavy labor demand during the summer months. If corn is the only crop grown in the cropping system, this means that in other seasons of the year both man and horse labor are not fully occupied. This results in rather an inefficient utilization of the labor supply.

In order to get around this, farmers in the Corn Belt grow oats. The oats crop requires labor mainly in seasons of the year when it is not occupied by the corn crop. Thus, the crop is seeded in the spring before work on the corn crop begins and is cut in the summer when corn cultivation is about over. Furthermore it serves as a good nurse crop for clover. The usual procedure is to let the land remain in corn one or two years, then follow it with oats seeded to clover or clover and timothy, and sometimes the oats crop is followed by wheat which is seeded to the hay crop. Wheat fits in in a similar way; it is seeded in the fall after the corn cultivation is over and before the corn-harvesting period begins. The wheat-harvesting period interferes somewhat with corn cultivation, but the competition is not a serious one.

Such a cropping system as this, obviously produces a large amount of feed grains and roughage. To utilize this feed, means the handling of livestock. Inasmuch as corn is a fat-producing feed the livestock handled must be of the type to utilize this feed; hogs, beef cattle, and sheep are, of course, the primary meat-producing animals and it is these classes of livestock that are found in the Corn Belt, particularly the first two.

Dairying has become of increasing importance on the northern fringe of the Corn Belt, due to the development of Chicago, Milwaukee, and adjacent cities with their large urban demand for dairy products. As we travel north from the center of the Corn Belt, corn loses a part of the comparative advantage it has over other crops in the region and is replaced in part by oats and hay crops. This results in a shift in emphasis from meat production to dairying.

Cash-grain region.—There are a number of distinct cash-grain regions in the United States.

First, we have the corn and oats area of east central Illinois and west north central Iowa. The area in north central Iowa is not as strictly a cash-grain area as the other. In fact, with the exception of two or three counties, most of the counties in the area receive practically as much income from livestock as from grain. These areas, as will be observed from the dot maps showing the distribution of corn and oats acreage in the United States (figs. 5 and 6), are among the heaviest producing areas of these crops. In fact, the corn production per square mile of farm land in certain portions of the two areas ran as high as 11,000 to 12,000 bushels in 1929.

Just what this means in terms of hogs if all the corn were fed to hogs, will be evident from the following figures: If we assume on an average that 20 bushels of corn will produce a 200-pound hog, then 11,000 bushels would produce 550 hogs. Again assuming an average litter of 5 pigs per sow, it would mean 110 sows on every 640 acres of land in the area, or between 27 and 28 sows for every quarter section of 160 acres. This compares with an average of approximately 33 sows per 640 acres, or 8 sows per 160 acres of land in Iowa on April 1, 1930. It is obvious that if all the corn produced in such high producing areas were fed to hogs that the area would virtually be overrun with hogs.

These areas, in fact, feed but little corn to hogs, but sell most of it for cash. The land in these areas has had such high natural fertility that farmers have been able to keep the land in corn and oats year after year, selling them mostly for cash without the bother of keeping livestock. With this type of farming also has developed a cash type of tenure which prefers a quick turnover. The period of occupancy on a particular farm, furthermore, is usually of short duration. Farm facilities for livestock in the form of buildings and fences are limited. The tenant having possession of the farm for only a limited period, does not feel that he can afford to put much money into fences and equipment. With the

cash-grain type of farming also has developed a marketing system with facilities in the form of elevators, shellers, sidings, etc. All of which have operated to perpetuate the cash-grain type of farming. The persistence of the practice year after year in the face of an adjustment which probably would be more profitable is a good example of the force which custom and vested interests still have in our economic life.

In other parts of the Corn Belt are found farmers who feed the major portion of their corn, selling none or but a small fraction of it. Just what they do in a particular year is largely determined by the relationship between corn and hog prices. If corn prices are high relative to hog prices they tend to sell more grain, if the reverse situation obtains they sell less grain.

A second important cash-grain region is located in Nebraska, eastern Colorado, Kansas, Oklahoma, and Texas. This is the hard red winter wheat region of the United States. Probably the most important factors which have operated to localize wheat production in this general region are physical in nature.

In the first place the region as a whole is a level unbroken treeless plain, admirably lending itself to the use of machine methods and large-scale operations. Next the soil is well suited to the production of wheat, being rather heavy in nature with a fairly high percentage of clay. Soil, however, is not nearly so important as is climate. Climate, including both rainfall and temperature, is probably the primary factor which determines the limits of the region.

Wheat has a much wider climatic range than have corn and cotton, but it, nevertheless, is not successfully grown in areas which have an annual rainfall much below 15 inches. In fact, the more important centers of production in this region receive from 20 to 30 inches of rain per annum. When the rainfall is much in excess of 45 inches per annum the plant is quite susceptible to fungous diseases and rust, with resulting declines in yield.[9] These diseases are accentuated when high moisture is accompanied by high temperatures. Probably mainly for these reasons but little wheat is grown south of the line of 68° average temperature for late spring and early summer; this line runs roughly along the northern boundary of the Cotton Belt. Excessive rainfall and temperatures during the growing period also result in an overdevelopment of straw at the expense of grain; the same conditions later in the year are favorable to rust and also cause the grain to lodge.

Optimum conditions for the plant include a long, cool, wet spring followed by a warm, sunny, dry period for fruiting and harvesting. In this region these conditions are commonly found. While occasionally low temperatures result in winter killing by producing an ice sheet at the time of melting snow which smothers the plant, in the main the snow cover is adequate to protect the plant. Furthermore, the period immediately preceding the harvest is usually dry and warm, giving rise to a condition favorable to the production of high protein wheat.

The physical conditions which largely make this a wheat area at the same time limit sharply the production of other crops. The low rainfall accompanied by a relatively high evaporation, for example, precludes the successful growing of corn. Grain sorghums being less susceptible to such conditions, replace corn as the principal feed grain. They also supply much of the hay and forage. Other crops are grown in a limited way, but the cropping system is largely comprised of wheat and grain sorghums. This is particularly true in the western part of the region; further east some corn is grown, also oats and barley, but even here the alternatives to wheat are limited. In fact, in much of the region about the

[9] North America—An Historical Economic and Regional Geography—LI. Rodwell Jones and P. W. Bryan. Ch. III, p. 104.

only alternative use to which the land may be put if grain is not grown is grazing or the production of livestock under range conditions.

Wheat has been given the choice of land in this region over range livestock production because economic conditions have made it a more profitable enterprise. We have here again an example of the operation of the law of comparative costs. Since wheat growing pays better than grazing, it gets the first choice of the land.

A third important cash-grain area is located in western Minnesota, North and South Dakota, and Montana. This is the important spring-wheat region of the United States. This region roughly lies between the Missouri River on the west and a line running east of the first tier of counties in the western edge of Minnesota. Throughout this region the topography is level and admirably suited for large-scale grain farming.

Generally speaking the rainfall declines as we go from east to west, varying from as high as 25 inches in western Minnesota to as low as 15 inches in western North and South Dakota and Montana. The annual rainfall for the region, as a whole, is around 15 to 20 inches, but the distribution is favorable from the standpoint of wheat, approximately 50 per cent of it falling between March and June. This condition followed, by a period of dry weather during fruiting and harvesting, results in the high-protein wheat for which this region is famous.

The soil, likewise, varies in fertility in different parts of the region. Probably the most fertile part of the region is located in the Red River Valley of western Minnesota and eastern North Dakota. This soil is the well-known Fargo clay loam and is one of the most fertile wheat soils in the United States. Most of the soils throughout the region are glacial in origin, in which clay predominates, thus rendering them particularly adapted to the production of wheat.

The average length of the growing season for much of the region is from 90 to 120 days. This permits sufficient time to mature the spring-wheat crop, but is not of sufficient length for successful growing of corn. Furthermore, the low rainfall, cool nights, and high aridity are not conducive to corn culture. The western edge of the region is governed largely by rainfall. The region lying west of the main Wheat Belt has for the most part a soil that is fertile and temperature conditions that are favorable for wheat production, but the rainfall is too uncertain. The improvement in machine design and development of the combined harvester-thresher, the small general tractor, and the duck-foot cultivator in recent years have resulted in pushing the Wheat Belt further west in the arid regions. This has come about through improvements in dry-farming methods and more economic methods of summer fallowing.

Because of these various conditions of production small grain farming, including both wheat and flax, and to a lesser extent oats and barley, has a comparative advantage over other types of farming, and for this reason it has become localized in this region.

For much the same reason wheat is the prevailing type of farming in the Columbia River Basin of western Idaho, eastern Washington, and northern Oregon. This is the fourth important cash-grain region to be discussed and is known as the White Wheat Belt. This is the most noted dry-land farming region in the United States. The rainfall is low, varying from 20 inches in the eastern part of the region known as the "Palouse" to as low as 10 inches in the extreme western portion. Because of low rainfall the prevailing practice in this region is to grow wheat on summer fallow. The common procedure is to alternate wheat and summer fallow. By following this practice it is possible to grow wheat successfully. The climatic conditions are such as to preclude the doing of much else in the western part of this region. In the "Palouse," however, with the higher rainfall there are more alternatives, but even then wheat continues to be the principal crop.

A fifth wheat region in the United States is located in the Corn Belt States of Ohio, Indiana, Illinois, and Missouri. This is the important soft red winter wheat region. Throughout this region the rainfall and temperature conditions are favorable to both corn and wheat production; in fact, corn is the more important crop of the region. Wheat is grown here mainly for the reason that it fits well into the farming system and provides a more even distribution of man and horse labor throughout the year. As was pointed out previously the production of corn alone tends to result in a high peak load of labor during the summer months. In order that both man and horse labor be used more efficiently, farmers in this region supplement their corn acreage with both wheat and oats. One or the other of these crops also is needed as a nurse crop to get the land into a hay crop. In general, temperature conditions in the southern part of the region are not favorable to oats, so wheat is the principal small grain crop.

The other important cash-grain areas are those which produce rice and are located in Arkansas, southwestern Louisiana, along the Gulf coast of Texas, and in the Sacramento Valley of California. One characteristic of all these regions is their extreme level topography. This is necessary for the irrigation of the crop. In the Texas-Louisiana district, which is the most important of the rice areas, the irrigation is done largely by pumping either from bayous or deep wells. Rice growing in this area is done on a large scale similar to wheat growing in the Great Plains. In Arkansas the conditions are about the same. The California district is of more recent origin; the crop is grown chiefly in the Sacramento Valley, on the adobe soils of this district, being irrigated mainly from the Sacramento and Feather Rivers.

Because of its peculiar growing habits, rice seems best adapted to a medium loam or clay loam soil having a highly impervious subsoil. "Extreme heaviness and stiffness of soil are always better than extreme lightness and porosity, partly because of the greater amount of plant-food usually in the former, and particularly because of its ability to retain water." [10] Most of the best rice soils are so stiff and tenacious that they are difficult to plow before flooding. These peculiar physical requirements of the rice plant are the main factors determining the localization of the rice regions.

Ranching or range livestock-producing regions.—The ranching or range livestock region is located mainly in the Western States, centering particularly in the Mountain and Pacific States and in western North and South Dakota, the Sand Hills of Nebraska, the Flint Hills of Kansas and Oklahoma, and in a large part of western Texas. This is a general region of low and uncertain rainfall. Farming throughout the region is practically impossible, except under irrigated conditions. Alternatives to grazing in this region, consequently, are practically nonexistent. If the area is put to agricultural uses at all it must be left in grass. The type of covering varies in different parts of the region. In much of the region is found the native buffalo grass; in other parts of the region mesquite or sage brush are important, and in the poorer sections of the southwest, desert shrubs, creosote bush, and the like are about the only covering found.

In the larger irrigated areas, particularly those along the Snake and Yellowstone Rivers in Idaho and Montana; Cache, Sevier, and Sanpete Valleys of Utah; Platte and Arkansas River Valleys of Colorado; and in other scattered areas, a great deal of winter lamb feeding is done. This is developed around the utilization of alfalfa hay, sugar-beet tops, and other surplus roughage of the area. The livestock enterprise in many of these areas is probably more important than indicated, inasmuch as many of the livestock may have been shipped out of the

[10] The Small Grains. M. A. Carleton, (p. 621).

valleys before April 1, when the census was taken. This is unquestionably true of Idaho, where most of the lambs are usually shipped early.

Scattered throughout this region are small patches of irrigated land devoted largely to the production of hay. This hay is used for wintering the range livestock. The livestock grazed in the mountains in the summer are brought down into the lower areas for wintering or into the semideserts, such as the Red Desert of Wyoming, for winter grazing.

Cotton region.—The cotton region, or Cotton Belt, as it is more commonly known, is confined almost entirely to the southern part of the United States. The factors which have been mainly responsible for its geographic location are physical in nature. Cotton is a subtropical crop and requires fairly high temperatures, increasing during the growing season. The temperature during June, July, and August on the average, should not fall below about 70° Fahrenheit.[11] The northern boundary of the Cotton Belt in the United States is rather sharply limited by temperature. It follows roughly the line of approximately 200 days free from frost. This, of course, is an average figure. Cotton will grow north of this line if it escapes the spring frosts, but the frosts in the fall will usually destroy so many unpicked bolls that the returns from the crop are greatly reduced. The comparative advantage which cotton has over other crops in the region is greatly reduced, therefore, on the fringes of the region and is lost altogether when it is pushed north into the region of less than 200 days of frost-free season.

The western limit of the region (disregarding irrigated cotton) is determined largely by rainfall. It follows roughly the line of 20 to 23 inches of annual rainfall and is located in western Texas. The southern boundary of the cotton region, likewise, is determined in general by rainfall. Very little cotton is grown either along the Atlantic or Gulf coasts. This is in part due to the low, marshy nature of the country and in part to the high rainfall. Along the southern edge, especially in the southeast, the rainfall amounts to 60 inches or more per year and is generally regarded as too heavy for cotton production. Excessive rainfall causes a rank vegetative growth which takes place at the expense of fruiting. It also may mean greater weevil damage.

For the major part of the Cotton Belt the rainfall, broadly speaking, increases from a winter minimum through spring and summer to a maximum in July and August, decreasing rapidly in autumn when the plant is fruiting. For the three spring and three summer months the rainfall over the greater part of the region is 10 inches or more in each period, while during the three autumn months it is lower. Although the total rainfall varies from as high as 60 inches in the southeast to as low as 20 to 23 inches in the west, the rainfall during the growing period does not show such a wide difference.

Soil is probably not as limiting a factor as is climate. Various kinds of soil are found in the Cotton Belt. Cotton will produce a crop on most any of them, provided it is well drained. The yields, however, may vary rather widely. Cotton on the upland sandy soils yields poorly, for the most part, unless considerable fertilizer is used. Rich clay soils commonly produce good vegetative growth, but the plant does not fruit in proportion, particularly if the rainfall is heavy. Some bottom lands, likewise, may produce excessive vegetative growth unless conditions are very favorable. In general, the cotton plant does best on medium grades of loam, provided they are well drained. The wide range in adaptation of the crop from the standpoint of soil indicates that cotton can be

[11] North America—An Historical Economic and Regional Geography—I.I. Rodwell Jones and P. W. Bryan. Chs. 11, 12, pp. 158–189.

grown on most of the soils found in the Cotton Belt. In fact, the area in cotton acreage could be extended a great deal if the demand for cotton would justify it.

Thus we see that the factors which have operated to limit the cotton area to its present location are largely of a physical nature, climate being the most important.

When we come to consider the distribution of cotton within the Cotton Belt, however, and the reasons for its being grown instead of other crops, we have to consider economic factors as well as physical. There are a number of crops which are physically adapted to the region, yet farmers continue to keep the major portion of the farm area in cotton. This is to be explained only on the basis of returns which they can obtain from cotton as compared with returns from other alternative enterprises which might be substituted for cotton. It is again a question of comparative advantage.

As was pointed out earlier in the discussion, farmers have been urged repeatedly to cut down on the cotton acreage and increase feed crops and livestock. This they have done to a certain extent, but not much beyond supplying home needs. The returns which they can obtain from cotton relative to those which can be obtained from alternative enterprises are generally so much more favorable to cotton that it gets the choice of the land.

We have just seen that the Corn Belt of the Middle West has a similar advantage in growing corn and oats, and the cash-grain regions in growing small grain. This advantage means that these areas generally produce these products more economically than can other regions. It is advantageous for them, as well as for society as a whole, that they continue to produce the products for which they hold a production advantage and exchange them for the products of other regions which in turn have an advantage in their production.

This advantage which cotton has over other crops in the South is due in part to the rather restricted range of adaptability of the cotton crop and to the limited regions in the world where optimum conditions for growing the crop are found and in part to a peculiar labor condition which is found in the Cotton Belt. Cotton is a crop which requires a good deal of hand labor. The more cheaply this labor can be obtained, other things being equal, the more economical it will be possible to produce the crop and thereby the greater the opportunity of making it a profitable undertaking.

In the South there is a very dense Negro population. This population from colonial times has been engaged in the production of cotton, knows the crop, its growing habits, and methods of culture. Local landowners have found it profitable to develop a system of cotton farming which utilizes this cheap labor supply. This is the well-known cropper system of farming which is so closely related to the old plantation system. That this cheap labor supply has been a factor in adding to the advantage of cotton in the South can hardly be doubted.

Cotton does not get first choice of the land, however, in all areas in the South. In eastern North and South Carolina and in southeastern Georgia, it is replaced in part by flue-cured tobacco. This flue-cured tobacco seems to be of best texture and quality when grown on the light sandy soils of the region. On such soils, through proper fertilization, it is possible to control the quality of the crop to a considerable extent.

The rapid expansion in the consumption of cigarettes in recent years has resulted in an increased demand for flue-cured tobacco which is used largely in their manufacture with the result that its price, usually has been favorable relative to the prices of alternative crops in the region. This has stimulated the production of the crop.

The question as to whether tobacco or cotton gets the first choice of the land is determined by the relative returns from the two crops. These fluctuate from year to year. Since this type of tobacco is grown successfully only on the sandy soils and cotton can be grown on either the sandy or clay soils, the tobacco, probably in most years, gets first choice of the sandy soils particularly adapted to its production.

In southwestern Louisiana and along the Gulf coast in Texas and in Arkansa rice gets the first choice of the land. This is to be accounted for mainly because of soil adaptation. Rice likes a heavy stiff soil with a highly impervious subsoil and one with a water table fairly close to the surface. Cotton, on the other hand, has a decided preference for a lighter soil which is well drained. The moisture requirements of the two crops are also different.

Other crops which come into competition with cotton in the South are peanuts, fruits, and vegetables. The main fruit and vegetable areas are located on the more sandy soils of the region. The Sand Hills between the Piedmont Plateau and the upper coastal plains are particularly adapted both to fruit and truck. Peanuts are usually found on the sandy soils.

Crop-specialty regions.—The crop-specialty regions are scattered throughout the United States. This arises from the fact that the type of farming designated "crop-specialty" is comprised of a large number of crops. The more important of these are tobacco, hay, sugar beets, sugarcane, potatoes, and navy and ripe field beans. The discussion will be confined to the conditions which have been responsible for the localization of these more important crops.

On the pocket map showing type of farming areas in the United States, two codes or cross-hatchings have been used for crop-specialty farms, one for tobacco alone, and the other for crop specialities other than tobacco. We shall first consider the tobacco regions. These, it will be noted, are located in central and western Kentucky, northern Tennessee, around Clarksville, in eastern North and South Carolina, and southeastern Georgia, northern Florida, in southern Ohio and Indiana, in Wisconsin, in southeastern Pennsylvania, and in the Connecticut Valley.

Tobacco exhibits marked preferences for particular physical conditions, as much or more than any of the important crops in the United States. Certain soil conditions particularly seem best adapted to the production of the crop. Thus flue-cured tobacco is grown almost entirely on the light sandy soils of eastern North and South Carolina and southeastern Georgia. The bright color of the leaf is due, mainly, to the character of the soil upon which it is grown and to the method of curing. This bright yellow color is one of the most valued characteristics of the crop and is best produced on soils which are by nature infertile. By confining the crop to such soils its quality as previously mentioned can be determined within reasonable limits by the kind and amount of fertilizer used.

These light sandy soils are found principally in the Coastal Plains province in the southern States. They, together with the favorable climate, probably are primarily responsible for this type of tobacco becoming localized in this region. It comes into competition with cotton, however, and whether or not it is grown is determined by the relative returns which can be obtained from the two crops.

Burley tobacco is grown principally on the limestone soils of Kentucky. It has reached its highest development in the central Blue Grass region in the north central part of that State. Here, again, soil apparently has influenced the localization of the crop. This general region not only produces a tobacco light in color and body and of good quality, but it also produces good yields of the crop, so that with prices at all favorable the returns from the crop will be

as high or higher than the returns from alternative enterprises which may be grown in the region.

The culture of the crop is such that it is usually handled in small areas by cropper farmers on the large livestock farms devoted to the production of livestock and the staple crops. Because of the heavy draft of this crop upon soil fertility, also because of the susceptibility to disease it is necessary to rotate it with other crops. It usually occupies the best land on the farm, being shifted about from year to year. If it is grown continuously, yields decrease rapidly and it soon becomes unprofitable.

Still another type of tobacco is grown in western Kentucky, northern Tennessee, and in central and southern Virginia, known as fire-cured tobacco. Its principal characteristics are its dark color, heavy body, and distinctive flavor, imparted to it by the smoke of the open fire used in its curing. The soils upon which this type of tobacco is produced are heavy by nature, containing a high percentage of clay or silt. They are not very well adapted to production of the other types. In recent years, however, with the marked falling off of export demand for this type of tobacco, farmers are wondering to what extent the culture of the crop should be continued, and if other types of tobacco can be substituted for it. While the heavy soils in the areas where grown have contributed to its localization, unless the crop can compete with other crops adapted to the same region at price levels which are likely to prevail, it will be replaced, in part or wholly, by these crops.

Similar or analogous conditions have given rise to the localization of tobacco culture in other parts of the country.

Of the other crop specialties, potatoes, sugar beets, and hay are probably the most important. Potatoes are much like oats in their climatic adaptation. They do best on rather light deep soils and in a cool moist climate. Reference again to dot map (see fig. 16), showing the distribution of the potato acreage in the United States, will reveal that the more important potato areas of the country are found north of the Corn Belt in what we have termed the dairy region and in the irrigated States of the West. Potatoes do well on the poorer soils of the New England and the Middle Atlantic States, and in the States adjacent to the Great Lakes. The nature of the soils together with the climate probably govern, in a large measure, their distribution. Potatoes also do well in the irrigated areas of the West, the most notable of which are in Idaho, Colorado, and Nebraska, and the Yakima district of Washington. Moisture, of course, is supplied by irrigation and the high altitude insures a relatively low temperature during the growing season. In these more arid areas disease control is also a more simple problem.

Sugar beets also like a cool moist climate, differing but slightly from potatoes in this respect. They are located, in fact, in the same general areas. Hay, also, does best in a cool moist climate and is largely confined to the northeastern quarter of the United States and to the irrigated areas of the west.

Sugarcane, on the other hand, grows best in a warm climate with a high rainfall. Sugarcane for sugar is confined largely to a small group of counties in Louisiana. In this area the soils are heavy and poorly drained and thus well adapted to the production of sugarcane, but not adapted to the production of cotton, which likes a well-drained soil. The peculiar physical requirements of the crop probably explain why it is grown in this restricted area.

Ripe field beans are produced largely under dry-land farming conditions in Colorado, New Mexico, southern Idaho, along the Yellowstone River in Montana, the Big Horn basin in Wyoming, and in California. Important areas of navy-bean production are found in western New York and in the

Saginaw Valley in Michigan. In the latter region, beans are grown on the fertile loam, silt loam, and clay loam soils which are well drained and well supplied with the mineral elements of fertility, particularly calcium. They seem to like a uniform growing season which has cool nights and ample rainfall. In this area they are grown in competition with sugar beets.

In the western States they are grown in part under irrigation and in part on dry land. In New Mexico and Colorado, particularly, dry land beans are commonly found. While the yields in the dry land areas are not high the beans can be grown at fairly low cost, thus enabling them to compete on favorable terms with range livestock production which is about the only alternative available in certain areas.

Fruit and vegetable regions.—Figures 29 and 30 will show that fruit and vegetable farming is extremely localized. The latter is found chiefly around urban centers and in Florida and California. The localization around cities is to be explained largely by the von Thünen principle of specific value and perishability Around practically every city there is always opportunity for certain producers to engage in truck growing to supply the local demand. The production of vegetables for shipping is confined largely to favored areas in California, Florida, and other southern areas to supply the demand for early vegetables. The higher prices received for vegetables produced for the early season market enables them to be shipped great distances.

In the areas producing canning crops the truck crops are likely to be grown as supplementary enterprises fitting into the systems of farming which are built around other major enterprises. Inasmuch as truck crops require a great deal of hand labor they are best adapted to muck, peat, or light sandy soils which are easily worked. Sandy soils warm up quickly in the spring, thereby permitting quicker maturity and increasing the probability of the crop reaching the early market. Certain of the truck crops have decided preference for particular kinds of soils—celery and onions, for example, prefer muck soils. Also certain of them have decided seasonal requirements and temperature preferences.

The location of the important fruit areas in the United States is probably determined more by physical conditions, particularly climate, than any other single factor. The main fruit areas, other than those in Florida, Texas, and the Pacific States, are found in the territory adjacent to the Great Lakes, in the Cumberland-Shenandoah region of West Virginia, Maryland, and Pennsylvania, New Jersey, the Ozark region of Arkansas and Missouri, in the Sand Hills of Georgia, and the Carolinas, and in selected areas in the Mountain States. Both climate and soils in these regions are particularly adapted to fruit growing.

In the eastern part of the United States the tree fruits, in general, are located in the regions which were originally timbered. They do not require an extra fertile soil. It is necessary, however, that the soil be well drained. The climatic requirements are more exacting. Extremes in temperature are likely to result in serious damage. Regions are best adapted to fruit production where late spring and early fall frosts are not prevalent. This probably accounts for the localization of fruit areas adjacent to large bodies of water such as those around Lake Michigan, Lake Erie, and Lake Ontario.

Topography also is quite important because of air drainage. This has had an influence in localizing the fruit areas in mountain and hill districts.

In the specialized fruit areas of Florida and California, climate has been of primary importance. The citrus fruits, being subtropical, are confined to very limited districts because of temperature restrictions. The dry atmosphere and large amount of sunshine in California permit inexpensive drying of fruits, thereby enabling the fruits to be preserved and shipped economically for long distances.

The perishable fruits marketed in fresh state are grown in areas which are either adjacent to market centers or have shipping facilities which permit quick delivery. Such fruit can be grown in regions remote considerable distances from market due to their meeting a market demand which is not supplied by local growers. This factor seems to be equally as influential, as physical conditions, in determining such regions.

General farming regions.—The principal general farming regions are found largely in the territory between the Corn and Dairy regions in the north and the Cotton region in the south—centering in Pennsylvania, Ohio and Michigan, southern Indiana, Illinois, and Missouri. In this general region the conditions of climate and soil are such as to favor the production of a large number of enterprises none of which has a particular advantage over others. Corn, wheat, and hay, and to a lesser extent oats, are grown. Much of the land is by necessity kept in pasture. This means adherence to livestock for utilization of the pasture and roughage, and for fertility maintenance. Hogs, beef cattle, and farm flocks of sheep are found on the majority of the farms and a few cows are kept to utilize family labor and for the production of butterfat. Poultry and poultry products are also an important source of income, particularly in southern Illinois and Missouri.

General farms are always likely to be found in the transition areas between regions of dominant types of farming. The dominant enterprise in a region usually begins to lose its advantage over other enterprises as the fringe of the region is approached. As its advantage decreases the advantage of competing enterprises increase, with the result that a point is reached where a type of farming becomes established which partakes of the characteristics of both regions.

Thus we come to the self-sufficing and part-time farming regions, which are the last of the major regions to be discussed.

Self-sufficing and part-time farming regions.—The self-sufficing and part-time farming regions are located, mainly, in the Appalachian Mountain States, centering in West Virginia, eastern Kentucky and Tennessee, northwestern North Carolina, northeastern Georgia, and in selected areas of Virginia and Pennsylvania. Other areas are found in the Ozark and Ouachita Mountain regions of Missouri and Arkansas, in east Texas, and in other isolated areas. In general, the conditions throughout these regions are such as to preclude much agricultural development. Most of them are mountainous or semimountainous in character or devoted largely to mining or timber production. Such farming, as is possible, is done on the more level land. The farms are small and not adapted to the use of machinery. The soils also are relatively unproductive. Under such conditions it is obvious that it is impossible to develop agriculture to any great extent.

The first of these two types of farming, we have designated in our classification as "self-sufficing." It was so-called because the value of the products furnished the family by the farm represented the major proportion (50 per cent or more) of the total value of all products of the farm. These farms are not self-sufficing in the sense that they supply the entire needs of the family in terms of clothing or even of food. There is so little sold on them, however, and the operator and his family depend so much upon them for direct family needs that the term self-sufficing seems to fit them better than any other.

Part-time farms are found in the same general regions as are the self-sufficing farms and also around urban centers. In both cases they reflect an attempt to increase the income by adding another line of activity. In the rural areas the outside activities usually take the form of mine, timber, oil field, or road work; and around cities factory, clerical, professional or other kind of activity.

Part-time farming around urban centers has been increasing rapidly during the past two decades. Improved transportation facilities in the form of better roads, automobiles, and busses, have greatly contributed to this development.

Thus, we conclude our discussion of the physical and economic factors which have determined the localization of the important type of farming regions in the United States. The discussion throughout has been concerned with the explanation of the types of farming which are outstanding or dominant in each region. But little attention has been given as yet to the dispersion in type within each region or more particularly to the variation in crop and livestock enterprises found on a particular type of farm. This is the problem with which we shall be concerned in the next chapter.