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GEOGRAPHY

OF THE

WORLD'S AGRICULTURE

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LAND RELIEF

Fig A.—Land relief, adapted from Physical Maps of the Continents, by J. Paul Goode, Chicago, 1913-1915. Most of the important agricultural regions of the world lie below 2,000 feet elevation, and practically all below 5,000 feet. The lands lying above 5,000 feet are mostly too arid and frosty for extensive agricultural development, hence are used principally for grazing live stock. The Mercator projection used for this map seriously exaggerates the areas toward the poles. The extent of this exaggeration is indicated by the figures along the right hand margin of the map, which give the area in square miles in each 15° quadrilateral of latitude and longitude. A square mile at the latitude of Petrograd, Russia, 60° N., for instance, covers four times as much space on the map as a square mile at the equator.

A Hoen & Co lith. Baltimore

MEAN ANNUAL PRECIPITATION

Fig. B.—Mean Annual Precipitation, adapted from Oxford Wall Maps of the Continents, by A. J. Herbertson, 1908-1911, except the United States, which is based on data supplied by U. S. Weather Bureau. Outside the tropics there are only four extensive areas receiving sufficient rainfall to support a large population—Southeastern Asia, Europe, Southeastern North America, and Southeastern South America. The Asiatic and European areas have attained a density of population several fold greater than the American areas, which afford practically the sole outlet for the increasing population of the Old World, except for the small areas of agricultural land in South Africa and Australia. The tropics are the most abundantly watered regions of the world, but their adaptability to settlement by the white race is uncertain.

Alleen & Co. Lith. Baltimore.

THE purpose of this study is to show the geographic origin of the world's supply of food and of other important agricultural products and to indicate briefly the climatic, soil, and economic conditions that account for the distribution of the crops and live stock of the world. It is impossible within the narrow limits of space available to do more than describe in the most elementary manner where the crops and live stock are produced, and mention a few of the factors which have determined the development of the world's agriculture. It is hoped the material presented will help the reader to make a study of the competition that America has to meet in the world's markets and will show for what crops it depends on foreign countries.

Explanation of maps and graphs.—The maps afford a convenient means of comparing the geographic distribution and density of production of the crops and live stock in the United States with the distribution and density in other countries, while the graphs at the bottom or sides of the maps visualize the relative importance of the various countries in the world's production and markets. The system of uniform dots employed to show distribution does not permit of an easy computation of totals, but the value of the dot is shown for each map, and from the graphs the acreage, production, or number in the important countries can be approximately determined. Since acreage is less subject to fluctuation than crop production, and since it affords better comparison of the importance of one crop with another, statistics of area have been mapped so far as figures were available. In the world maps of rice, cotton, tobacco, sugar, and coffee, however, it was found necessary to use statistics of production. Most of the maps represent an average of the years 1911, 1912, and 1913, compiled from official reports, except in the case of the United States, for which the statistics collected in the census of 1910 were used, and those for Russian Asia, which refer to the two years 1912 and 1914. A list of the more important statistical publications used may be found in the references (see pages 148–150). Two colored maps (figs. A and B), showing respectively land relief and mean annual precipitation for the different parts of the world, provide a picture of the physical and climatic background of the agriculture of the world.

Because of the distortion resulting from any attempt to represent the curved surface of the entire earth on a conventional flat map, the ratio of dot area to land area is not the same in all portions of the world maps, which are on a Mercator projection. Thus a square mile at the latitude of Petrograd, 60° north, covers four times as much space on the map as a square mile at the equator. The density of dots in any section of these maps, therefore, is strictly comparable only with that of other places in the same latitude. All maps other than the world maps have been prepared on a polyconic equal area projection, which permits accurate comparison of density between different portions of the same map.

Data are lacking for some countries or provinces, particularly for China and several of the native states of India, and in such cases line shading has been employed to show the probable distribution and density.

The world dot maps are intended primarily to show the relative importance of different countries in connection with each product, and the maps of individual countries, the relative importance of the different sections within one country or group of countries. The scale for individual maps in many cases has been selected independently of other maps, in order to bring out most effectively the subject matter in the map. The unavoidable result of this method is that comparisons of individual maps with each other may be misleading if the method is not clearly understood. The world maps, however, by bringing together all countries on the same scale, within the limits of the Mercator projection, should prevent misunderstanding.

In showing distribution, use is made of the smallest political or statistical divisions for which figures are available, or which are feasible on the scale of the map. The boundaries of these small divisions, because of their number or the irregularity of their outline, seriously interfere with visualization in some countries and are, therefore, omitted. Such is the case in India, Australia, New Zealand, Argentina, Chile, and Uruguay. Discrepancies in the location of national or provincial boundaries appear between some of the maps as a result of recent territorial changes.

Text.—The brief texts accompanying the maps are intended to emphasize particularly the geographic factors which underlie the distribution of agricultural and pastoral industries. Economic, historical, and other factors are also mentioned, but it is not to be understood that these texts afford a complete explanation of the features of distribution shown in the maps. They may, however, serve as an aid in singling out some of the interesting relationships between the distribution of the various crops in the different countries.

Acknowledgments.—The authors wish to acknowledge their indebtedness to the following persons: In the Bureau of Plant Industry, to M. A. Carleton, Cerealist, who prepared the maps showing the wheat regions and the barley regions of North America (figs. 13 and 45); to W. W. Garner, Physiologist, for the text relating to tobacco; to H. P. Gould, D. N. Shoemaker, and William Stuart, Horticulturists, for assistance in the preparation of the text relating to the fruits, beans, and potatoes, respectively; and to other specialists in the Bureau for valuable criticisms and suggestions, particularly to C. R. Ball, C. E. Chambliss, H. B. Harlan, C. E. Leighty, and C. W. Warburton, Agronomists; C. P. Hartley, Physiologist, and H. S. Garrison, Assistant; C. O. Townsend, Pathologist, and P. A. Yoder, Technologist; H. C. Thompson, Horticulturist; O. F. Cook, Biochemist, and H. D. Smith, Assistant; L. H. Dewey, Botanist, and C. V. Piper, Agrostologist. In the Bureau of Animal Industry, to George M. Rommel, Chief, Animal Husbandry Division; F. R. Marshall, in charge Sheep and Goat Investigations; and to B. H. Rawl, Chief, Dairy Division, for valuable criticism of the text. In the States Relation Service, to C. F. Langworthy, Chief, Office of Home Economics, and W. P. Garrety, Assistant, for computation of the calories in the food crops of the various countries. In the Office of Farm Management the authors are indebted to C. L. Holmes, Collaborator, who contributed the text relating to horses and mules in the United States, and to O. C. Stine, Assistant in Farm Economics, who prepared the maps of cotton acreage in India, tobacco in Cuba, and portions of several other maps; to E. A. Goldenweiser, Statistician, for the preparation of much of the introductory statement entitled "The Food Supply of the United States" and for valuable advice and assistance throughout the preparation of the volume; to L. G. Connor, Assistant Agriculturist, for assistance in preparing the text relating to sheep; to A. H. Cromwell, Statistical Clerk, who collected much of the foreign statistical data; to G. L. Schultze, Cartographer, who compiled the base maps for foreign countries except that of Europe, which was prepared by Mr. Finch; to F. J. Marschner, Cartographer, assisted by M. P. Tucker, Draftsman, who drew the colored maps of Land Relief and of Mean Annual Precipitation; and to R. G. Hainsworth, Head Draftsman, who supervised the preparation of the United States base maps, the drafting of the graphs, the dot maps of the United States, and the lithographing and printing.

The map showing the Land Relief of the World was adapted from J. Paul Goode's Physical Wall Maps of the Continents, Chicago, 1914; and the map of Mean Annual Precipitation of the World from a series of Wall Maps of the Continents, A. J. Herbertson, Oxford, 1911, excepting the section covering the United States, which was compiled from data supplied by the U. S. Weather Bureau.

The sections of this study relating to foreign countries were prepared by Mr. Finch, and the sections relating to the United States by Mr. Baker.

AS an introduction to the study of geographic distribution of agricultural products this section presents a brief discussion of the available food supply of the United States, of the historical trend in per capita production, and of the extent to which the United States is dependent on other nations for food products.

Density of population and of production.—The United States is the least densely populated of the great nations of the world. The population of oriental countries, which has been dense for centuries, has increased but slowly and has now been surpassed in density by western European countries. According to the latest statistics, Belgium has a density of population of about 670 persons per square mile, United Kingdom 380, Japan 370, Italy 330, Germany 320, British India 220, Austria-Hungary and China proper 200, and the United States 34.

In spite of the comparative sparsity of population, the United States has a greater acreage of cultivated land than any other country in the world, with the possible exception of China, for which no statistics are available. The cultivated land in the United States amounts to 319 million acres as against 280 million for the Russian Empire and 265 million for India. The great European countries combined, excluding Russia, do not have a crop acreage equal to that of the United States.

Estimated acreage of cultivated land and food production of the principal countries.

Country.	Estimated acreage of cultivated land.[a]	Population.[b]	Acreage of cultivated land per capita.	Estimated average production, 1911–1913, of important food crops expressed in—		
				Tons.[c]	Calories (in millions).[d] Total.	Per capita.
United States	[e]318,526,000	91,972,000	3.5	733,411,363	425,442,000	4.63
Russian Empire	278,615,000	163,779,000	1.7	121,600,344	300,511,000	1.83
India (British)	264,858,000	244,268,000	1.1	59,637,968	198,133,000	0.81
German Empire	[f] 65,445,000	67,812,000	1.0	84,331,901	143,440,000	2.12
Austria-Hungary	61,450,000	49,458,000	1.2	46,458,352	103,241,000	2.09
France	59,124,000	39,602,000	1.5	90,650,470	70,829,000	1.79
Argentina	44,446,000	7,092,000	6.3	[g]14,479,614	45,767,000	6.45
Italy	33,815,000	34,687,000	1.0	11,959,546	34,334,000	1.00
Canada	[f] 37,063,000	8,075,000	4.6	17,107,305	50,635,000	6.30
United Kingdom	17,862,000	45,366,000	0.4	14,040,491	25,730,000	0.56
Japan	17,639,000	51,646,000	0.3	11,924,729	37,351,000	0.72
Australia	14,987,000	4,455,000	3.4	3,956,776	11,994,000	2.69

[a] As reported by the International Institute of Agriculture and published in the Yearbook of the Department of Agriculture in 1915. Figures are for 1910 or 1911, except for countries referred to in footnote *f*.

[b] Figures are from Statesman's Yearbook and refer as nearly as possible to the same years as those for cultivated land.

[c] Includes corn (maize), wheat, oats, rye, barley, rice, millet (proso), jawar, bajra, gram, potatoes, and sugar.

[d] A million calories is approximately the fuel value of 10 bushels of wheat.

[e] United States Census figure for crops with acreage reports plus estimates for acreage of fruit crops.

[f] Statesman's Yearbook, 1916. Figures are for German Empire, 1913; Canada, 1915.

[g] Average for 1912–1914.

Even more significant is the acreage of cultivated land per capita of the population (see table below). In the United States there are 3.5 acres per person, while in most of the European countries the corresponding figure is between 1 and 1.5 and in the United Kingdom it is only 0.4 acre. The only nations that have a larger number of acres of cultivated land per capita than the United States are the sparsely populated countries of Argentina and Canada.

A more specific measure of the adequacy of the food supply is the quantity of important crops per capita. When the total quantity of these leading food crops is expressed in terms of millions of calories (which is approximately the fuel value of 10 bushels of wheat) the United States has an average of 4.63 per capita as compared with 2.12 for the German Empire, 1.79 for France, 2.09 for Austria-Hungary, 1.00 for Italy, and 0.56 for the United Kingdom. The average is 6.30 for Canada and 6.45 for Argentina, these being the only two important countries that exceed the United States; so that among the countries with large populations the United States is far in the lead in the production of food crops per capita. It is this preeminence of the United States in the food production per capita that constitutes the basic cause of the difference in economic well-being between the Old World and the New and of the current of westward migration. The following table shows the production of the principal food crops in the leading countries of the world:

FIG. 1

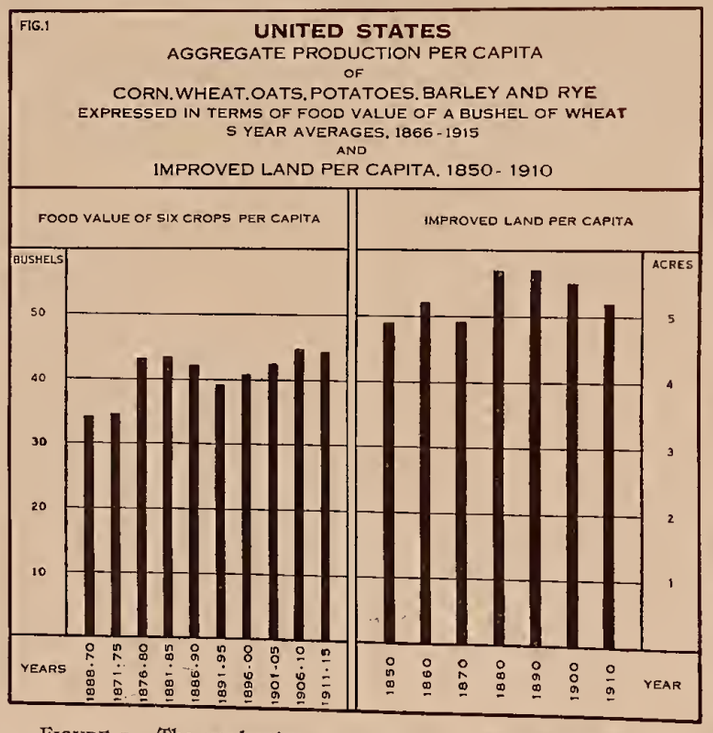

FIGURE 1.—The production per capita of the six important crops, corn, wheat, oats, barley, rye, and potatoes, was low for some years after the Civil War, rising rapidly in the later 70's, after which it remained stationary for about fifteen years. The financial depression of the early 90's apparently also depressed crop production, but with the return of prosperity the production per capita rose to a maximum during the 5-year period 1906–1910. The acreage of improved land per capita, on the other hand, reached its summit during the census years 1880 and 1890, and has since gradually declined.

Production of principal crops in the world and in principal countries, average for 1911–1913.

Country.	Corn (bushels).	Wheat (bushels).	Oats (bushels).	Rye (bushels).
United States	2,701,074,000	704,995,000	1,154,134,300	36,721,300
Russian Empire	78,110,000	727,133,300	1,050,574,700	935,010,300
India (British)	87,526,700	369,612,300	.....	.....
German Empire	.....	160,236,700	595,660,700	455,181,300
France	20,557,000	324,136,700	309,380,300	48,078,700
Austria-Hungary	210,855,300	247,141,000	245,937,700	163,620,000
Italy	100,245,300	190,840,000	37,582,700	5,399,300
United Kingdom	.....	61,297,300	179,359,000	1,666,700
Argentina[a]	251,875,300	155,828,300	65,311,000	1,748,300
Canada	17,636,000	228,933,300	387,159,000	2,496,700
Australia	10,432,000	88,961,000	14,134,000	95,700
Japan	3,637,000	26,305,300	.....	.....
Other countries	468,426,000	527,589,700	336,493,700	131,454,700
Total	3,950,374,600	3,813,009,900	4,375,727,100	1,781,394,400

Country.	Barley (bushels).	Potatoes (bushels).	Rice (bushels—60 lbs. clean rice.)	Sugar (long tons).
United States	187,417,700	348,303,000	11,808,700	1,639,000
Russian Empire	484,848,000	1,287,880,700	6,151,900	1,630,300
India (British)	38,097,700	.....	1,087,002,300	2,407,000
German Empire	157,921,700	1,698,826,000	.....	2,227,000
France	47,608,700	506,884,700	39,100	643,000
Austria-Hungary	153,437,000	642,149,000	.....	1,496,300
Italy	10,029,300	61,410,300	11,052,600	186,300
United Kingdom	62,528,300	259,482,700	.....	.....
Argentina[a]	5,096,700	38,029,000	410,300	242,900
Canada	47,370,700	78,222,300	.....	.....
Australia	2,816,700	13,842,700	.....	253,700
Japan	92,834,700	25,508,700	265,588,200	65,000
Other countries	233,954,700	516,735,000	[b] 1,551,132,600	6,015,000
Total	1,523,961,900	5,477,274,100	2,933,185,700	16,850,300

[a] Average for 1912–1914.

[b] Including incomplete estimates for China.

Historical trend.—The problem before the American people to-day is largely whether this preeminence can be maintained in the face of the increasing pressure of population. The graph in figure 1 on this page shows that the amount of improved land per capita was highest at the census enumerations of 1880 and 1890, when it amounted to 5.7 acres; by 1900 it had dropped to 5.5 and by 1910 to 5.2 acres. This decrease in per capita acreage of improved land, however,

has not so far resulted in a material decrease of food production per capita. The left side of the diagram in figure 1 indicates that in so far as the per capita amount of leading food crops is concerned the United States has not as yet experienced an appreciable decrease, the last two 5-year averages being 44.9 and 44.3 which is higher than those reached at any previous time in the history of the country. This increase in per capita production in the face of a decreasing amount of improved land per inhabitant indicates higher yields per acre due to improvement in agricultural methods and the trend toward more intensive systems of farming. The following table shows the yield per acre of the six more important food crops for each 5-year period from 1866 to 1915. It will be noted that in the case of every crop, with the possible exception of corn, the yields per acre have shown a general tendency upward.

Yield per acre of six leading food crops, 5-year averages for 1866–1870 to 1911–1915.

Years.	Corn.	Wheat.	Oats.	Barley.	Potatoes.	Rye.
1866 to 1870	25.4	11.9	28.6	24.3	94.4	13.5
1871 to 1875	26.8	11.9	28.1	21.5	91.5	13.6
1876 to 1880	27.1	12.9	27.6	22.7	85.3	13.9
1881 to 1885	23.6	11.8	26.8	21.7	77.2	11.9
1886 to 1890	23.7	12.1	25.2	21.8	68.7	11.7
1891 to 1895	23.6	13.4	26.2	23.4	77.7	13.7
1896 to 1900	26.0	13.2	28.6	23.4	81.0	14.5
1901 to 1905	24.9	13.9	31.0	27.0	88.7	15.9
1906 to 1910	27.2	14.6	28.0	24.4	96.6	15.8
1911 to 1915	26.0	15.4	31.7	26.5	98.1	16.5

Improved methods and increasing intensity of culture mean greater capital outlay and greater expenditure of labor per acre and result in higher prices of agricultural products, which in turn make it possible to cultivate less desirable lands. The alternative before the people of the United States to-day is either to maintain this high average at constantly increasing cost in money and effort or to permit the Nation's standard of well-being to decline.

Is the United States self-supporting?—Not only is the United States maintaining its per capita food production, but it is practically self-supporting in the matter of food. The diagram in figure 2 shows that, so far as all the principal crops are concerned, the United States produces all that it consumes and in the case of some crops, notably wheat, it produces a sufficient margin for considerable exports.

Exports.—The most important fact brought out by figure 2, and confirmed by a study of export statistics, is that the entire commerce of the United States with the outside world, in so far as the important food crops are concerned, is of minor importance in comparison with production. Thus only about 41 million bushels of corn were exported out of 2,700 million that were produced annually on the average during the years 1910–1914, and only about 10 million bushels of oats were exported out of 1,100 million bushels produced. It should be added, however, that corn and oats are largely fed to live stock and that considerable quantities, especially of corn, are exported in the form of meat. Foreign commerce is more important for the United States in connection with wheat than with any other agricultural food product. Of an annual average production of 687 million bushels of wheat during the 5-year period mentioned, 105 million, or about 15 per cent, were exported. The United States is one of the six countries having a large surplus of wheat, the other countries being Russia, Canada, Argentina, Australia, and India. The large exports from Russia are made possible by a low per capita consumption, and the same is true of India. The important wheat importing countries are the United Kingdom, Germany, Belgium, Italy, France, and the Netherlands. Of the wheat exported from the United States about one-third goes to the United Kingdom and over one-tenth to the Netherlands. Belgium received 6.9 per cent and the German Empire 6.7 per cent, while the remaining exports are scattered through a large number of countries on both hemispheres. The United Kingdom leads in the proportion of exports of all the leading American food crops with the sole exception of potatoes, the bulk of which go to Cuba. According to the figures, the Netherlands is the second most important customer of the United States, but it is doubtless true that large portions of the crops shipped to the Netherlands are reexported to other continental countries.

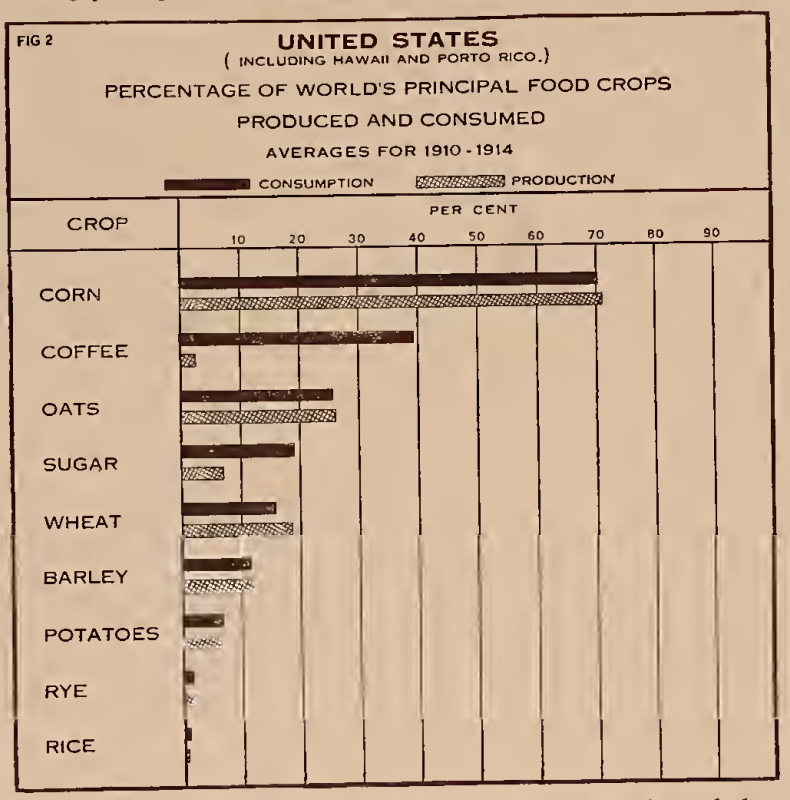

FIGURE 2.—The United States is practically independent of the remainder of the world in its food supply, except for coffee, tea, sugar, cocoa, bananas, and olive oil; and the principal source of supply of these food products, except tea and olive oil, is found in the Western Hemisphere. Of all the cereals, except rice, the United States produces more than it consumes. The United States produces and consumes about 70 per cent of the world's corn, over 25 per cent of the world's oats, between 15 and 20 per cent of the world's wheat, and about 12 per cent of the world's barley. Of the world's rye, the United States produces only about 2 per cent, and of the world's rice less than 1 per cent.

Imports.—The articles of food for which the United States depends on foreign countries are coffee, tea, olive oil, rice, sugar, cocoa, and bananas. With the exception of rice, sugar, and olive oil, these crops are not adapted to the climatic or economic conditions of the United States and will probably continue to be imported. The United States produces only a small amount of coffee, and that in Porto Rico and Hawaii, but it consumes 9.4 pounds per capita, so that large imports are required to satisfy the needs of the American people. About three-fourths of our coffee comes from Brazil, and most of the rest from other South American and Central American countries and the adjoining islands. There is no commercial production of tea in the United States, and an average consumption of 1 pound per capita. The bulk of the tea in this country comes from Japan and China, although considerable quantities are reexported from the United Kingdom or directly imported from the British East Indies. Italy and France supply most of the olive oil imported into the United States. The United States produces 7.4 pounds of rice per capita, but consumes 9.6 pounds, necessitating a large import amounting to 227 million pounds. Most of the rice has been imported via Germany and the Netherlands, but much of it comes direct from Japan and China. The United States has a very large per capita consumption of sugar, and in spite of the large production, both on the Continent and in Hawaii and Porto Rico, large quantities of sugar are imported, mostly from Cuba. The bulk of the cocoa consumed in the United States is imported from the West Indies and from South American countries, while the bananas come from Central American states and from the British West Indies.

On the whole, the figures indicate that the United States is dependent on the outside world for very few articles of fundamental importance and that the majority of these are supplied by countries in the Western Hemisphere.

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IDENTIFICATION MAP

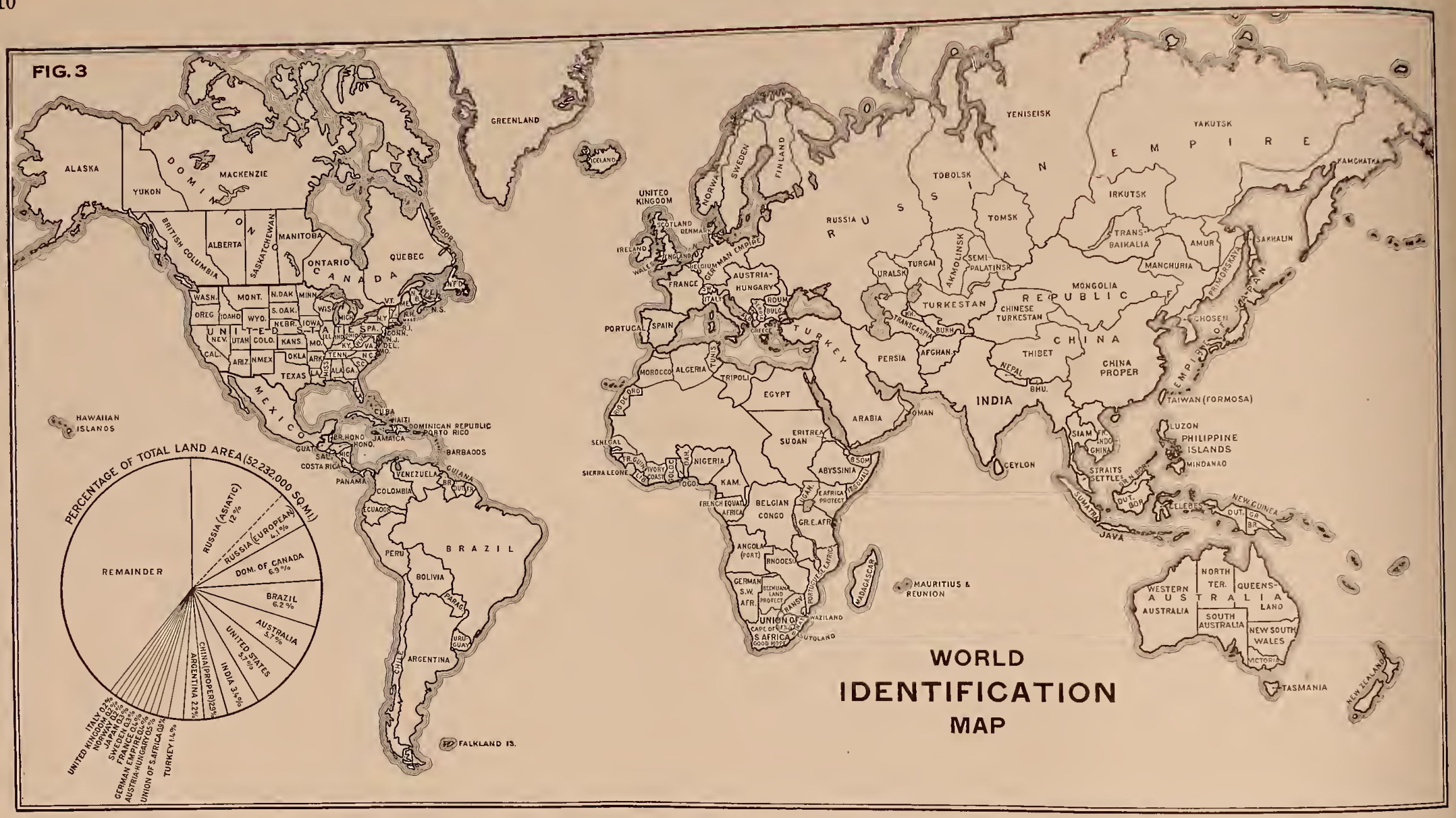
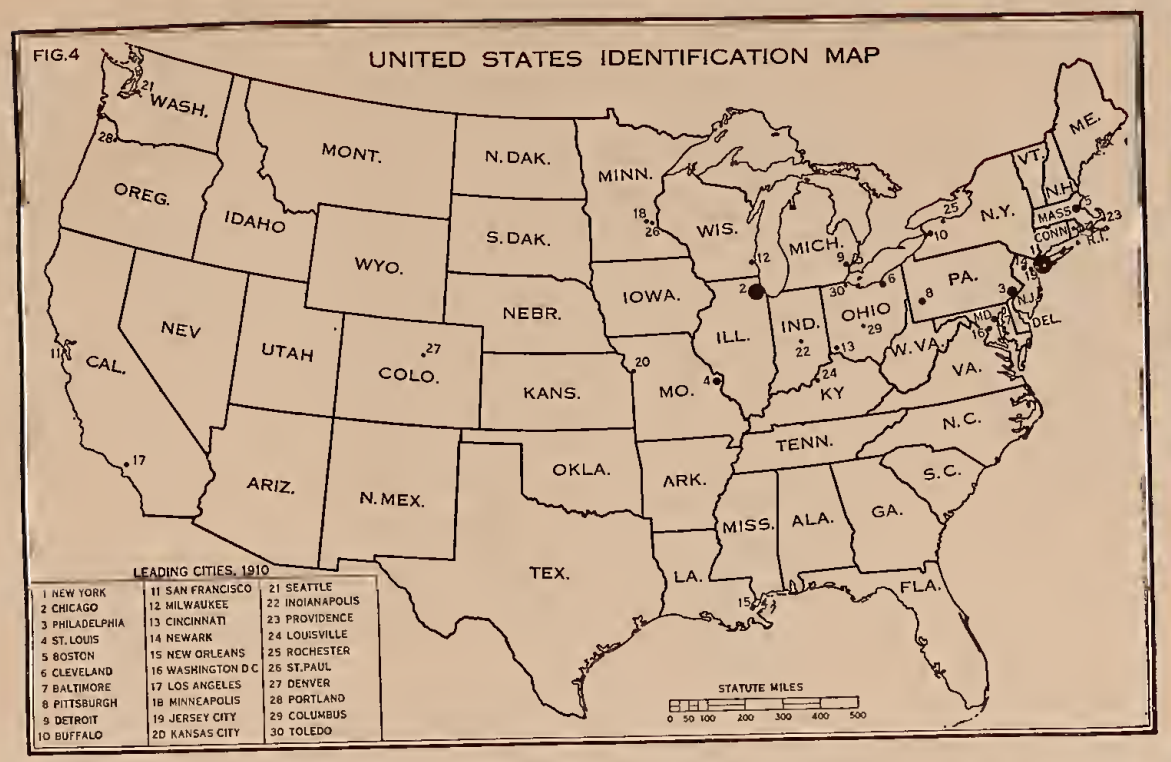
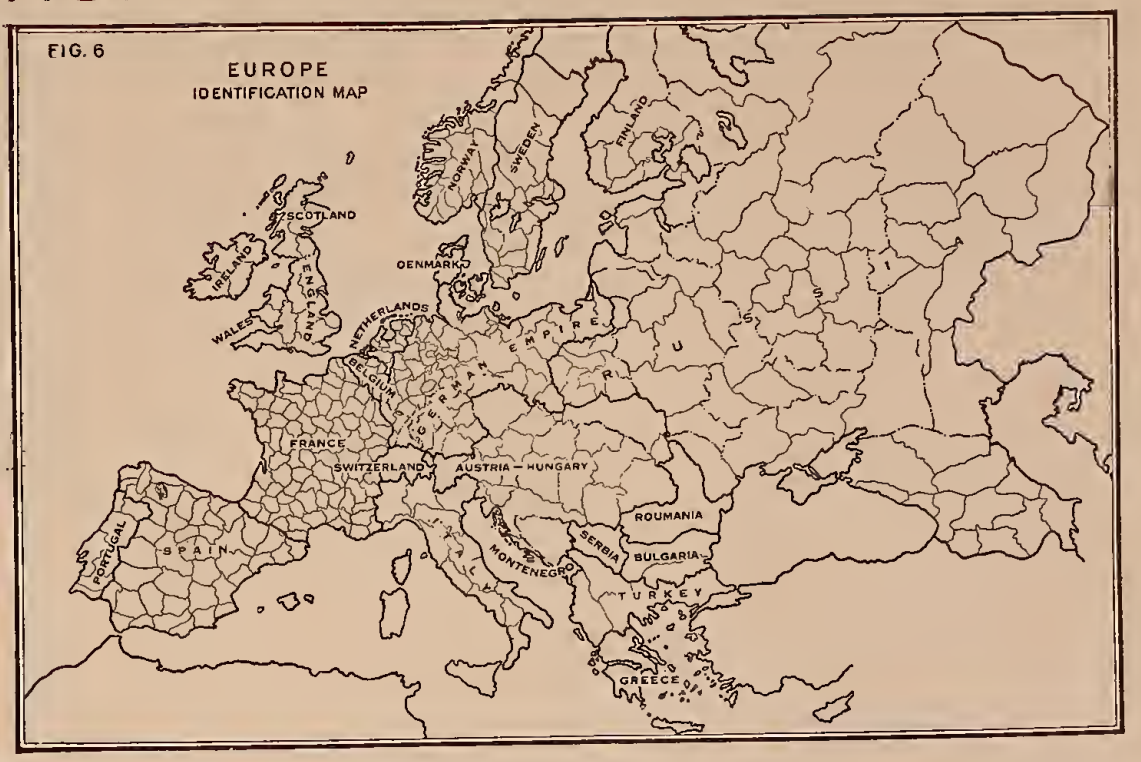


FIGURE 3.—Identification map of the world. The maps of the world showing the geographic distribution of the crops and live stock should be compared with this map to ascertain the name of a country. In Europe the boundaries shown are those existing in 1913, after the Balkan Wars. The Japanese name Chosen is recognized for the peninsula formerly known as Korea, and Taiwan for the island formerly known as Formosa. The Republic of China is considered as including not only China proper but also Manchuria, Mongolia, Chinese Turkestan, and Thibet, a situation more nominal than real. India is recognized as including Burma and Baluchistan. There is serious exaggeration in area in the northern and southern portions of the map, due to the Mercator projection. Thus a square mile at the latitude of Petrograd, Russia, 60° north, covers four times as much space on the map as a square mile at the equator. The circle divided into segments in the corner of the map indicates graphically the percentage which the various countries constitute of the total land area of the world. Asiatic Russia, for instance, constitutes 12 per cent of the land area of the earth or twice that of the United States.

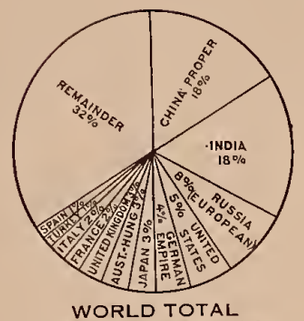




FIGURES 4–8.—Identification maps. The maps of the several countries showing the geographic distribution of the crops and live stock should be compared with these maps to ascertain the names of the states or provinces. The boundaries and names of the minor civil divisions, such as counties in the United States, are not shown on these identification maps, owing to lack of space, but the dots on the crop and live-stock maps have been located, wherever possible, according to these smallest statistical divisions.

POPULATION

FIG. 9



WORLD TOTAL
1,792,000,000 PERSONS

WORLD
POPULATION
EACH DOT REPRESENTS 500,000 PERSONS

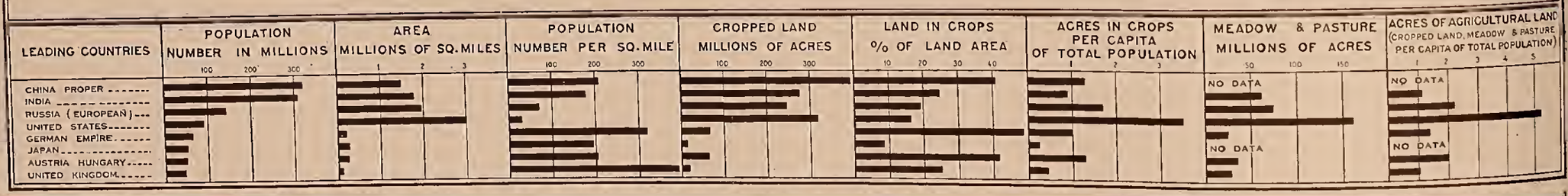


FIGURE 9.—Distribution of the world's population. Seven centers of dense population may be noted on the map—Japan, China, Java, India, Italy, northwestern Europe, and the coast of the United States from Boston to Baltimore. Among the nations of the world the greatest density is in Belgium, where there were at the last census nearly 700 people per square mile. The density in Massachusetts is about 420, in the United Kingdom about 380, in Germany and in Italy over 300, in China about 200, in India 175, in Pennsylvania 170, while the average for the United States is 34. Of more significance, however, is the acreage of crops per person, which ranges from about $\frac{1}{5}$ acre in Japan, nearly $\frac{1}{2}$ acre in the United Kingdom, about 1 acre in India, Germany, and China, $1\frac{2}{3}$ acres in Russia, $3\frac{1}{2}$ acres in the United States, $4\frac{2}{3}$ acres in Canada to $6\frac{1}{3}$ acres in Argentina. The high standard of living in the United States is due largely to the fact that there are 5 acres of improved land (crop, fallow, and improved pasture) per capita of the population as compared with $2\frac{1}{2}$ acres or less in the other populous countries of the world (see last graph of series above).

WHEAT is the bread cereal of the moderately dry temperate climates. So many factors other than geographical enter into the location of wheat-producing areas that the precise nature of the most favorable wheat climate is not easily determined. At present this crop is not grown in regions of warm, humid climate, principally because of wheat diseases which thrive under those conditions. It is not extensively cultivated in regions having a growing season of less than 90 days, nor in regions having less than 9 inches of annual rainfall, except under irrigation; but, on the other hand, most of the important wheat regions of the world have an average annual precipitation of less than 30 inches. The seasonal distribution of the rainfall is as important as the yearly amount, the most favorable conditions being found where a cool, moderately moist season, during which the basal leaves become well developed and tillering proceeds freely, merges gradually into a warm, bright and prefcrably dry harvest period, which favors the formation of a hard wheat, high in nitrogen, and retards the growth of fungous diseases. These conditions are found in coastal regions possessing the Mediterranean type of climate and also in the interior of continents, so that, unlike the geographic conditions required by corn, those adapted to wheat extend over large areas in various portions of the earth.

There are many varieties of wheat, some being winter annuals, sown in the fall and harvested in the early summer, while others are sown in the spring and harvested usually 10 to 20 days later than the winter varieties. Spring wheat is sown where the winters are dry and cold with little or no snow. The wheats of the more humid producing areas of the world are generally soft and starchy, while those of less humid areas usually are hard. Because of the varying seasons at which wheat is sown and the varying altitudes and latitudes of the wheat belt, together with the alternation of seasons in the northern and southern hemispheres, wheat harvest is in progress each month of the year in some part of the world.

Wheat is successfully grown on a wide range of soils. Most of the famous wheat soils of the world, however, are of high fertility and of fine texture, such as silts, silt loams, and clay loams, usually with a large humus content. The quality of wheat is less dependent upon soil than upon climate, but black soils rich in nitrates, such as the chernoziom of Russia and the dark-colored soils of the northwestern prairies of the United States and Canada, generally produce a wheat of higher gluten content.

The world's great wheat fields, except those of Italy, are generally sufficiently level to allow the use of machinery in tillage and harvest.

The world map (fig. 14) shows eight important and distinct wheat regions: (1) The plains of southern Russia and the Danube Valley; (2) the countries bordering the Mediterranean; (3) northwestern Europe; (4) the central plains of the United States and Canada; (5) the Columbia Basin of the United States; (6) northwestern India; (7) Argentina; and (8) southern Australia. The Mediterranean and northwestern Europe regions export practically no wheat because

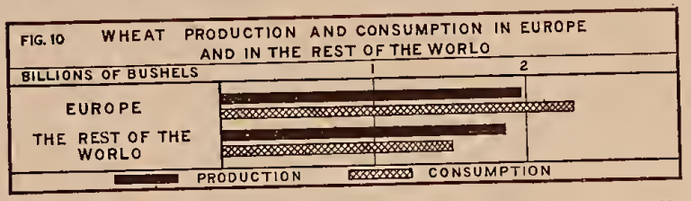


FIGURE 10.—Europe produces about 50 per cent of the world's wheat, and consumes about 60 per cent.

Statistics of wheat, averages of 1911–1913.

Country.	Production (bushels). Total.	Production (bushels). Per cent of total of the world.	Acres.	Yield per acre (bu.).	Wheat and flour. Net imports (bushels).	Wheat and flour. Net exports (bushels).
Russian Empire	727,133,000	19.1	72,800,000	10.0	.....	127,889,000
United States	704,995,000	18.5	48,514,000	14.5	.....	115,847,000
India	369,612,000	9.7	30,410,000	12.2	.....	59,565,000
France	324,137,000	8.5	16,347,000	19.8	54,687,000	.....
Austria-Hungary	247,141,000	6.5	12,393,000	19.9	.....	1,034,000
Canada	228,933,000	6.0	11,038,000	20.7	.....	110,903,000
Italy	190,840,000	5.0	11,778,000	16.3	58,644,000	.....
Argentina [a]	155,828,000	4.1	16,793,000	9.3	.....	95,027,000
German Empire	160,237,000	4.2	4,835,000	33.1	90,624,000	23,243,000
Spain	123,560,000	3.2	9,658,000	12.8	4,295,000	.....
Australia	88,961,000	2.3	7,380,000	12.1	.....	52,318,000
Roumania	88,628,000	2.3	4,631,000	19.1	.....	55,093,000
United Kingdom	61,297,000	1.6	1,904,000	32.2	221,352,000	.....
Bulgaria	44,350,000	1.2	2,853,000	15.5	.....	12,479,000
Algeria	33,177,000	0.8	3,539,000	9.4	.....	.....
Egypt	35,792,000	0.9	1,324,000	27.0	.....	.....
Japan	26,305,000	0.7	1,208,000	21.8	4,396,000	.....
Chile	21,409,000	0.6	1,055,000	20.3	.....	1,933,000
All other	180,675,000	4.8	.....	.....	295,571,000	9,636,000
The world	3,813,010,000	100.0	.....	.....	.....	.....

[a] Average for 1912–1914.

of dense population and large local demand. In five of the six regions of surplus production the population is sparse (see fig. 9), the type of agriculture extensive, the land relatively cheap, and wheat is free in large measure from the competition of more productive crops.

EUROPE (figs. 18–21) produces over one-half of the world's wheat. It is the most important cereal in Europe, occupying more than 30 per cent of the total cereal-producing area of the continent. Some wheat is grown in Finland as far as 65° north, but most of the crop is raised south of the 54th parallel.

The Russian Empire leads the world in both acreage and production of wheat, but owing to low yield per acre her lead in production is slight. Of the total wheat acreage of the empire only one-seventh is in Asiatic Russia. Three prime factors unite to enforce the location of the Russian wheat belt in the south and southeast. They are climate, soil, and location with respect to shipping ports.

As a result of climatic conditions, the Russian wheat belt is divided into winter-wheat and spring-wheat sections (figs. 20 and 21). The severe winter temperatures of northern and central Russia make winter-wheat production hazardous. There is a summer maximum of rainfall, but in the northern sections the maximum comes in the late summer (August). Only in the southern provinces does the maximum come in June and July, when the wheat can best utilize it. The rainfall is heavier in the west than in the east. In the spring-wheat section the winter conditions are not unlike those of North Dakota. The prevailing easterly winds of winter bring low temperatures and little moisture. The summers are short and warm. In the valleys of the Caucasus the protection from extreme winter temperatures afforded by the topography, as well as the early occurrence of the rains, permits the raising of winter as well as spring wheat. Outside of Russia spring wheat is little grown in Europe. Most of the Russian wheats are hard.

The predominant soil of the Russian wheat belt is the famed chernoziom, or "black earth," which overlies various geological formations, chiefly loess. The characteristics of this soil are its silty texture, its dark color, due to a high humus content, and its great capacity to hold moisture.

The low average yield (10 bushels per acre) of Russian wheat land is due in part to erratic rainfall and in part to economic conditions. Absence of proper rotations and of an animal industry sufficient to supply adequate fertilizer tend to reduce the yields.

Wheat is the cash crop of the Russian farmer. Nearly one-fifth of the average harvest is exported. The production of the bulk of the crop in southern Russia is of economic importance, since most of the exports are made through the Black Sea.

In Europe, France is second to Russia in both acreage and production of wheat, but is so large a consumer that the local crop needs to be supplemented by importation. Four centers of dense production are noticeable, the fertile lands of the northern plain, the western coast, the Garonne Basin, and the flood plain of the Saône. In the northwest the maximum rainfall comes in autumn, in the northeast in summer, on the west coast there is little seasonal variation,

while in the Garonne district the maximum comes in the spring. Of all the wheat districts of France the Saône Valley has the most severe winter temperature (35° F. at Lyon). Adverse geographic conditions are shown by the sparsity of wheat in the crystalline hills of Brittany, the bleak heights of the Central Plateau, the low, wet Landes on the Bay of Biscay, the vineyard region of the Mediterranean coast, and the mountainous eastern border.

The average yield of wheat in France is 20 bushels per acre. The highest yields are obtained in the northern departments. The crop is produced mainly by small land-

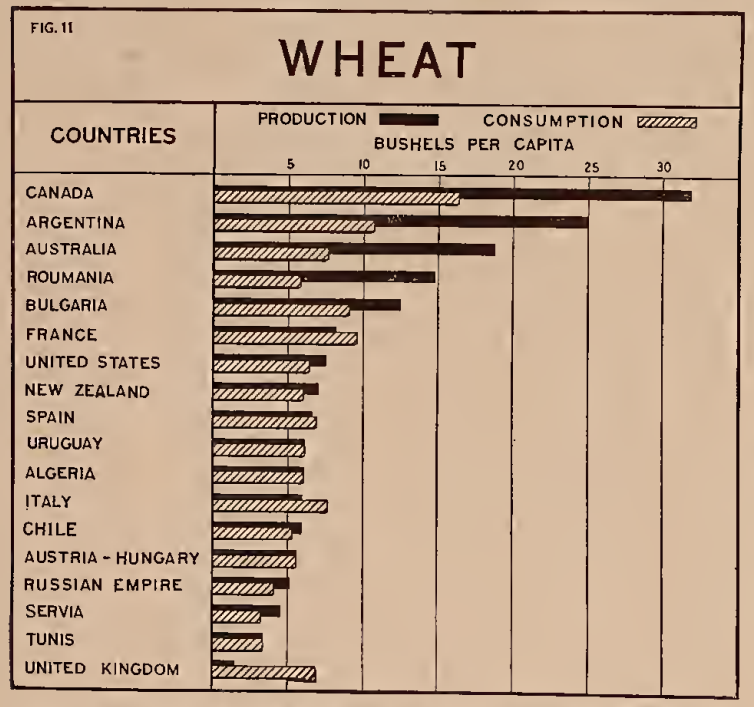


FIGURE 11.—Canada leads all countries in both production and consumption per capita of wheat, with Argentina ranking second, and Australia third in production, while France stands third in consumption. The United States ranks seventh in production per capita and tenth in consumption.

owners, who are, as a rule, neither very poor nor ignorant. The milling industry in France is not strongly centralized; there are more than 2,000 wind, water, and steam driven mills in the country. In the producing centers, and at Le Havre and Marseille, where foreign wheat is unloaded, are large milling establishments.

The countries ranking highest in yield of wheat per acre, Belgium, the Netherlands, the German Empire, Denmark, and the United Kingdom, lie in the northern part of the European wheat belt. The relative importance of the crop in these countries is small, however, being highest in the United Kingdom, where it occupies only 11.5 per cent of the land under crops, and is concentrated in the section having the highest summer temperatures and the lowest rainfall. These northern countries produce soft wheat.

In the Mediterranean countries the relative importance of wheat is high. In Algeria 44 per cent of the cropped land is under wheat; Italy follows with 38 per cent. The latter country is, in many respects, remarkable in wheat production. It is the only country where a large wheat acreage is located in rough land. About one-fourth of the crop is grown on land classed as mountainous, one-half on hill land, and only one-fourth on plains. In the mountainous sections use is made of every bit of fertile valley and terrace land capable of cultivation. In the province of Marches, which is entirely hill or mountain land, 29 per cent of the total area is under wheat, yielding 14.5 bushels per acre. (In Grand Forks County, North Dakota, in the heart of the Red River Valley, 35 per cent of the total area is under wheat, yielding 16 bushels per acre, 1909.) In other mountainous sections of Italy the proportion is not so high nor the yield so good. In northern Italy wheat is cultivated intensively under climatic conditions much like those of France; in southern Italy and Sicily the crop is grown extensively and under conditions more like those of North Africa.

THE UNITED STATES (figs. 15, 16, and 17) produces slightly less than one-fifth of the world's wheat, ranking next to Russia among the wheat-growing nations, and in some years exceeding that country in production. From one-fourth to one-eighth of the crop is exported. The production has, thus far, kept pace with increasing population, the production per capita, in fact, having increased materially since the Civil War (see table below). This is due, in large measure, to the agricultural development of the western and northwestern plains, where climatic conditions are more favorable

Wheat in the United States, 1839–1909.[a]

Year.	Production.			Acreage.	Value.	
	Total (bushels).	Per cent of all cereals (measured in bushels).	Per capita (bushels).		Amount.	Per cent of all crops.
1839	84,823,272	13.7	5.0	Not reported	Not reported	.....
1849	100,486,944	11.5	4.3	....do	....do	.....
1859	173,104,924	13.9	5.5	....do	....do	.....
1869	287,745,626	20.7	7.5	....do	....do	.....
1879	459,483,137	17.0	9.2	35,430,333	....do	.....
1889	468,373,968	13.3	7.4	33,579,514	....do	.....
1899	658,534,252	14.9	8.7	52,588,574	$369,945,320	12.4
1909	683,379,259	15.1	7.4	44,268,592	657,556,801	12.0

[a] Census statistics not available for years prior to 1839.

to wheat than along the humid Atlantic seaboard. During the past century the region of heaviest production has moved westward over the Alleghenies and across Ohio, Indiana, Illinois, Wisconsin, and Minnesota to North Dakota, which State produced more wheat in 1909 than was produced in the entire country in 1839 or 1849. In 1909 six States, North Dakota, Kansas, Minnesota, South Dakota, Nebraska, and Washington, contributed 57 per cent of both wheat acreage and production in the United States. Minor wheat centers are found in southwestern Illinois, and in southeastern Pennsylvania and Maryland, with a fairly even distri-

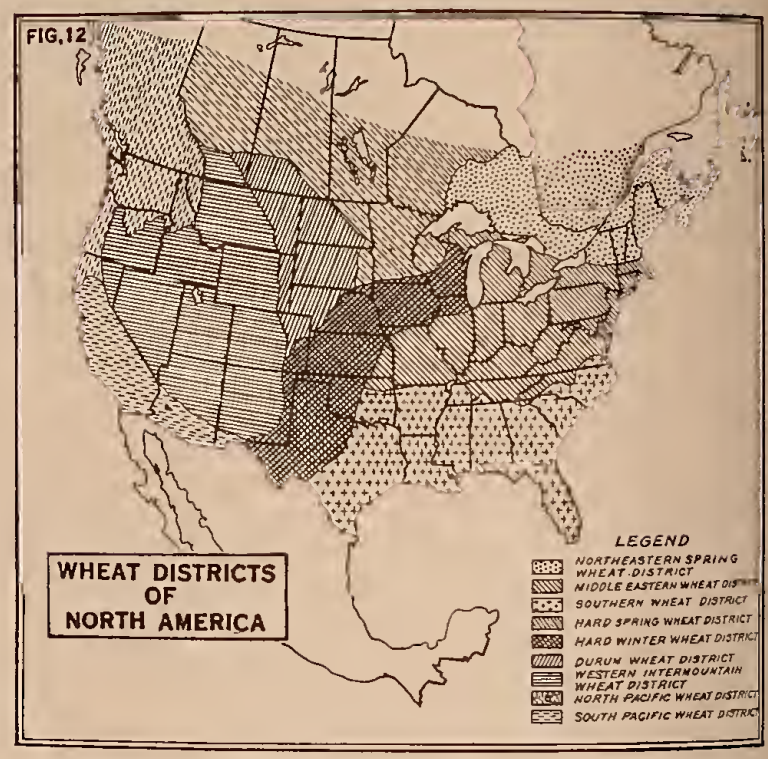


FIGURE. 12.—North America may be divided into nine wheat districts, shown in the map above, which is adapted from a map prepared by M. A. Carleton. The production is very small in the northeasten spring-wheat district and in the southern wheat district.

bution throughout Ohio, Indiana, and southern Michigan. Among the crops of the United States wheat ranks third in acreage and fourth in value.

Although wheat is grown in several localities in the United States on an annual rainfall of less than 10 inches, it is generally not a safe crop where the mean annual precipitation is less than 15 inches, and in the three districts of densest production, central Kansas, North Dakota, and eastern Washington, the annual precipitation ranges from 15 to 30 inches. Nearly 70 per cent of the wheat acreage and production of the United States in 1909 was in regions

having less than 30 inches mean annual precipitation, but since the yield per acre was highest in regions having 30 to 35 inches precipitation during that crop year, this geographical distribution of wheat is evidently due in part to the competition of corn and other crops in the more humid portions of the country. Where the rainfall exceeds 45 inches a year wheat does not thrive, partly because the soils in such regions have undergone more leaching than soils in subhumid regions, but principally because rusts and other fungous diseases are more prevalent. The difficulty of harvesting in rainy weather is also an important factor.

Comparatively little wheat is grown in the South, owing in a measure to the warm, humid spring weather which results in greater injury by fungous diseases than in the North, and also because of the mild winters, the plants often starting to grow only to be killed or damaged by a late freeze. Other factors that have prevented the extensive development of wheat growing in this region are the competition of cotton, a more valuable cash crop, which is picked in the fall when wheat is sown and thinned in the early summer when wheat is harvested, and the system of agriculture with its small tenant farms, lack of capital, and general unfamiliarity with machinery. The soils in much of the South, especially in the coastal plain, also, are poorly adapted to wheat. Wheat is not grown to any extent in eastern New York or in New England, principally because of unfavorable granitic soils and high humidity, but also because the small fields and the uneven topography render production more costly than on the large, level fields of the West.

Wheat is grown in the United States mostly on silt-loam and clay-loam soils and requires less humus than corn. Very little wheat is grown on sandy soils, since the yield is generally too small to be profitable. Soil has less influence than climate upon the quality and chemical composition of wheat, but appears to exert a powerful influence in determining permanency of production. The sections of the eastern United States where wheat has remained an important crop for 50 years—southeastern Pennsylvania, the Shenandoah Valley, western New York, western Ohio, and southwestern Illinois—are areas of silty soils, mostly derived from limestone. Upon such soils wheat probably will retain a place in the rotation permanently.

Canada (fig. 23).—Wheat is Canada's most important crop. It covers 36 per cent of the land in crops and forms 25 per cent of the value of all crops. The centers of production are in the plains provinces and the peninsula of Ontario. The former is vastly more important. Manitoba and Saskatchewan have more than three-fourths of the wheat acreage of the Dominion and rank highest in the value of wheat relative to that of all crops (61 per cent).

The Canadian crop is mainly spring-sown, but winter wheat is found in Ontario and Alberta. In Ontario the heavy snows and lack of extreme winter temperatures favor winter wheat. High rainfall (30 to 40 inches) and humidity produce also a soft wheat. Southern Alberta, owing in part to the warming influence of the Chinook winds, has a shorter and milder winter than the other western provinces. Owing to the dry climate the wheat is very hard. The great wheat belt of western Canada is limited on the north by a short growing season and low summer temperature, and on the southwest by insufficient rainfall.

The small population of Canada does not require the entire supply of wheat produced and on the average nearly one-half

Figure 13.—The yield of wheat in the United States in 1909 was greatest in regions receiving 30 to 35 inches of precipitation during that crop year, this yield of 19 bushels being about the same as that in France, Austria, and Hungary. One cause of the relatively low average yield of wheat in the United States is the large acreage in subhumid and semiarid regions. Half of the wheat of the country is grown in regions having less than 25 inches mean annual precipitation.

of the crop is exported. Nevertheless, Canada has the highest per capita consumption of wheat in the world (16 bushels, including wheat used for seed).

Argentina (fig. 24) ranks fourth among the nations of the world in wheat acreage, but owing to extensive methods of cultivation it is eighth in production. It ranks second in proportion of cropped land devoted to wheat (41 per cent). The Argentine wheat belt lies in a region of dry, open winters and moist summers. The crop is fall-sown (May to July). While generally favorable, the Argentine climate is subject to extremes sometimes detrimental to wheat. Such are the hot, dry winds following moist, foggy weather, and late frosts in early summer. Seasons of severe drought also occur, especially in the south. Offsetting these disadvantages are flat land, fertile soils, and a climate which permits the land to be worked during most of the year and makes the provision of winter food and shelter for work animals largely unnecessary. Until 1877 not enough wheat was produced in Argentina for home use, but now, in spite of low yields (10 bushels per acre), more than half of the average crop is exported.

India (fig. 25).—Wheat ranks third among the crops of India, following rice and the grain sorghums, but occupies less than 14 per cent of the land in crops. Three-fourths of the total wheat of India is produced in the northwestern provinces. It is sown in October, following the cessation of the monsoon rains. The time of harvest depends upon the warmth of the winter—in the Punjab, April or May, while to the east and south March and February are the harvest months. The wheat belt lies in the region of greatest temperature extremes. The annual rainfall varies from 7 inches in the lower Indus Valley to 40 inches in the central Ganges Valley, of which less than one-fourth falls in the winter season. In the Punjab nearly one-half of the wheat is grown under irrigation. The grain is often grown mixed with other crops and is reaped by hand. Although rice and the sorghums are the chief food crops, wheat is required as a supplementary crop. The amount exported varies with the home demand and does not average more than one-sixth of the total production.

Australia (fig. 26) leads in the proportion of cultivated land in wheat (57 per cent). It ranks tenth in acreage and eleventh in production. Wheat is limited to a narrow belt, between the desert and mountains, mostly prairie land, having a low annual rainfall (12 to 25 inches) with a winter maximum. The inner margin of the wheat belt is determined by aridity and its outer limits by increasing humidity and mountain topography. Wheat is very little grown on the east coast, in the small area of southwestern Australia having over 30 inches of rainfall, and in Queensland, except the southern portion. The farms of the Australian wheat belt are large, usually over 300 acres, only a part of which is devoted to grain. The best wheat lands are red, friable loams, formerly timber or scrub lands. They are easily tilled and, in the absence of abundant labor, cultivation and harvest is performed by machinery. As in Argentina and Canada, small population accounts for a small home demand and over half of the crop is exported.

Egypt (fig. 27) was an important wheat producer in ancient times. The entire crop is raised under irrigation. Owing to its ability to thrive in a dry atmosphere, wheat grows farther up the Nile Valley than either cotton or corn (maize). Wheat is sown as a winter crop, during November, and is irrigated about 35 days after sowing and once at a later date. Harvest comes in May and June.

WHEAT

FIG. 14

FIGURE 14.—Distribution of the world's wheat acreage. Eight regions of world importance will be noted: (1) Southern Russia and the Danube Valley, (2) the Mediterranean countries, (3) northwestern Europe, (4) central United States and Canada, (5) eastern Washington and Oregon, (6) central Argentina, (7) northwestern India, and (8) southern Australia. The crop is grown principally in subhumid, temperate climates, most of the important wheat regions of the world having an average annual precipitation of less than 30 inches (see fig. B). The combined acreage of all European countries is more than twice that of North America. The acreage of wheat in the Chinese Empire, in certain African territories, and in the countries of northern South America is not known. In the acreage of winter wheat India is in the lead, followed by the United States and Russia, while the spring-wheat acreage of Russia is between two and three times as great as that of the United States, which ranks second.

FIG. 15

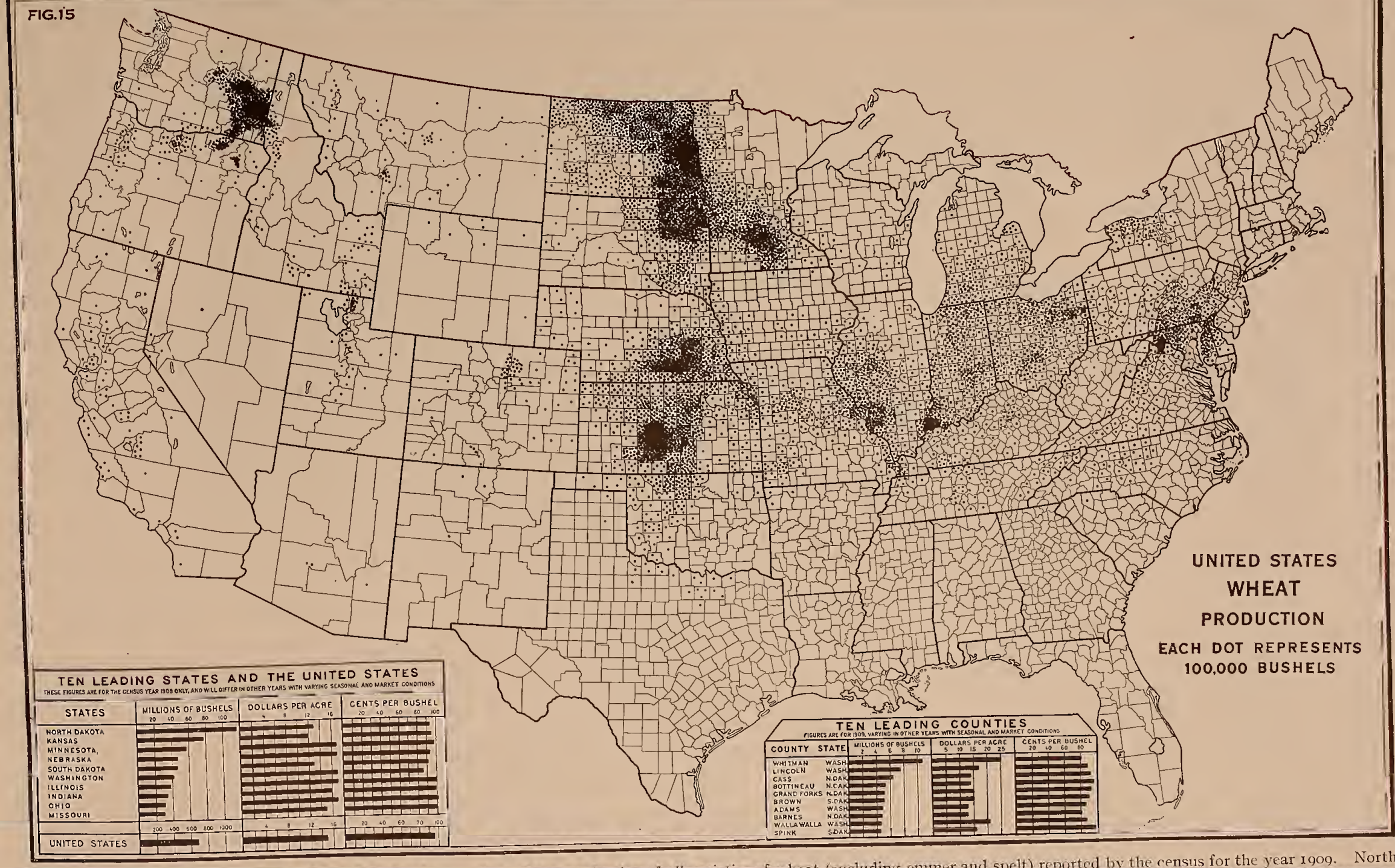


FIGURE 15.—Distribution in the United States, by counties, of the produetion of all varieties of wheat (excluding emmer and spelt) reported by the census for the year 1909. North Dakota produeed nearly 117 million bushels of wheat, about one-fifth of the total for the United States. In that year, Kansas was the seeond most important State, followed by Minnesota, Nebraska, South Dakota, and Washington (see lower left-hand graph). The greatest wheat-produeing county is Whitman, Wash., which grew over 10 million bushels. Lincoln County, Washington, is seeond, followed by Cass, Bottineau, and Grand Forks Counties, North Dakota, and Brown County, South Dakota, each of whieh grew over 5 million bushels in 1909 (see lower right-hand graph). About three-fourths of the wheat produeed in the United States is grown in the eorn and winter-wheat belt, whieh extends from Kansas and Nebraska to Virginia and New Jersey, and in the spring-wheat region of Minnesota and the Dakotas.

64505—3°

FIG. 16

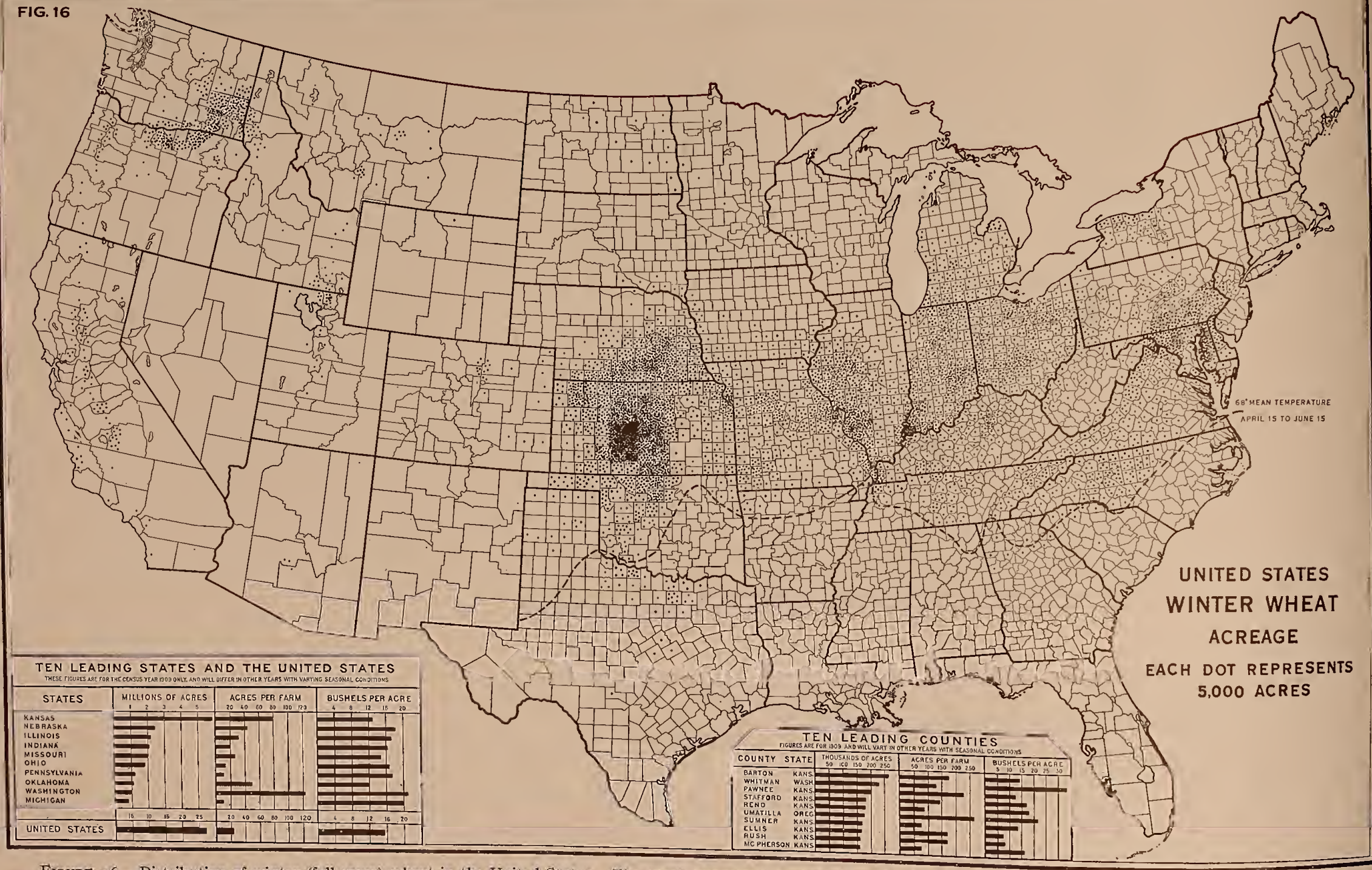


FIGURE 16.—Distribution of winter (fall sown) wheat in the United States. The most important center of production is in central Kansas, extending northward into Nebraska and southward into Oklahoma. Other important producing areas are located in southwestern Illinois, southern and eastern Indiana, southern Michigan, Ohio, southeastern Pennsylvania, and the adjoining States of Maryland and Delaware, and in eastern Washington and Oregon. In the humid eastern United States the southern boundary of the winter-wheat belt follows the isotherm of 68° during the two months preceding harvest (June 15). Early-maturing varieties are a necessity along this southern margin because of the greater damage to late varieties by rust, a week's difference in time of harvest often reducing the yield 10 or 12 bushels per acre. The northern frontier of winter wheat follows in a general way the mean winter temperature line of 20°, which extends in a northwesterly direction from southern Wisconsin and northern Iowa diagonally across South Dakota and Montana. A little winter wheat, however, is grown in the Red River Valley of North Dakota, where the mean winter temperature falls to 5°.

FIG.17

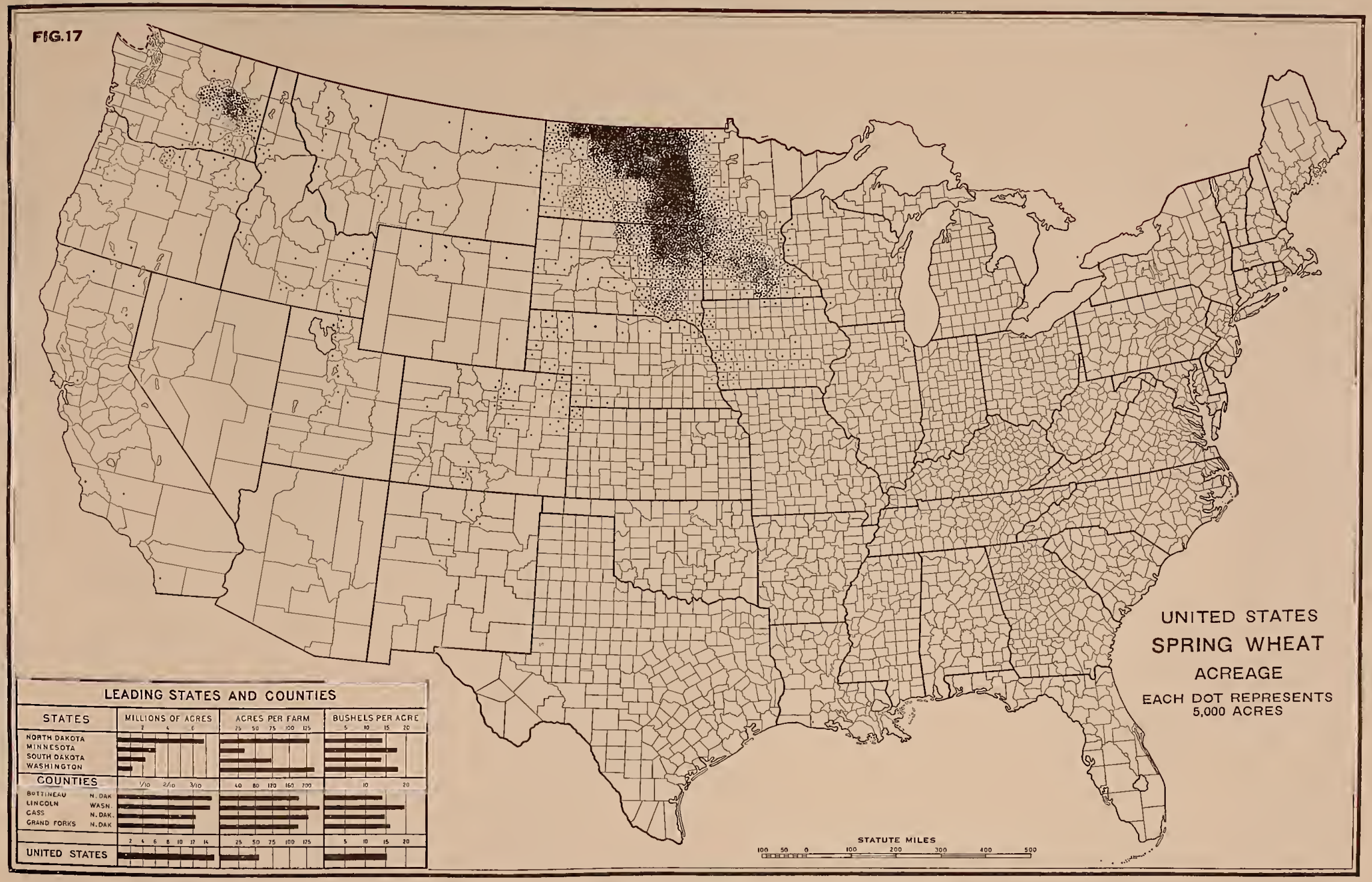


FIGURE 17.—Distribution of spring wheat (including durum or macaroni) in the United States. The important center of production is in Minnesota and the Dakotas, with a secondary center in the Palouse and Big Bend districts of eastern Washington. These four States produce over 90 per cent of the spring wheat grown in the United States. A little spring wheat is grown in northeastern Maine, in New York, in Wisconsin, Iowa, Nebraska, and in all the Western States, but its production in these States is comparatively insignificant. The southern boundary of the spring-wheat belt corresponds more or less closely with the northern boundary of the corn and winter-wheat belt. As a money crop in the corn belt, winter wheat is more profitable than spring wheat, while for a spring grain crop, oats are preferred. Neither the oat crop nor spring wheat is distinctly profitable in this region, but oats are widely grown because of their high feed value and as a nurse crop for clover. The northern limit of spring wheat is approximately the mean summer temperature of 58°, which is found in the United States only in the western mountains.

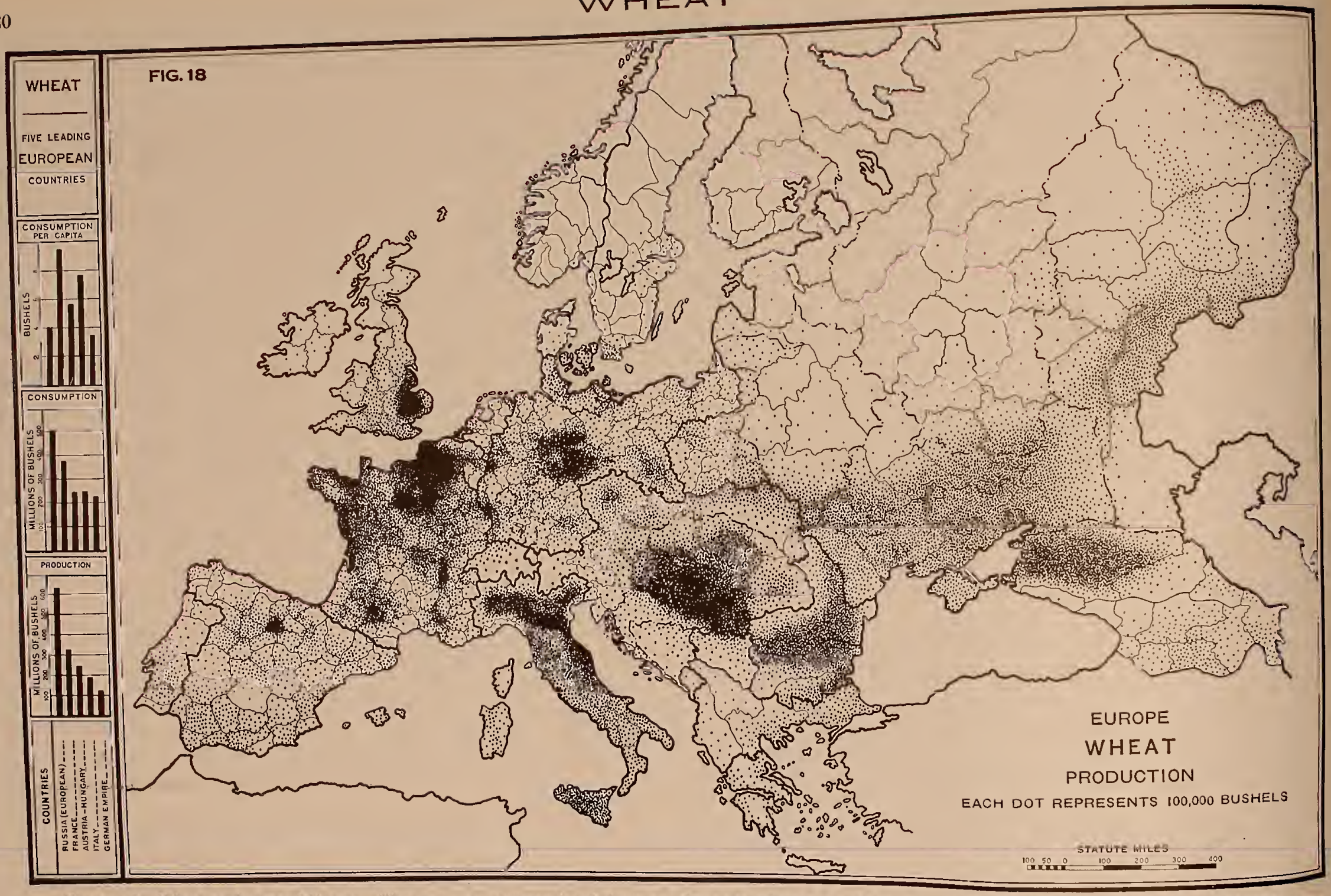


FIGURE 18.—Wheat production of Europe. This map, when compared with figure 19, shows the influence of yield per acre on the relative importance of wheat-producing centers. The scales of figures 18 and 19 are such that a yield of 20 bushels per acre in any province in figure 18 would give it the same number of dots as in the acreage map in figure 19. The relatively low yields per acre in Russia, southern Italy, and Spain make these countries much less prominent in production than in acreage. On the other hand southeastern England, portions of central Germany, and Belgium, having higher yields per acre, show denser areas in production than in acreage. The higher yield per acre in northwestern Europe may be due in part to more abundant and better distributed rainfall, but agricultural methods undoubtedly are the most important factor.

FIG. 19

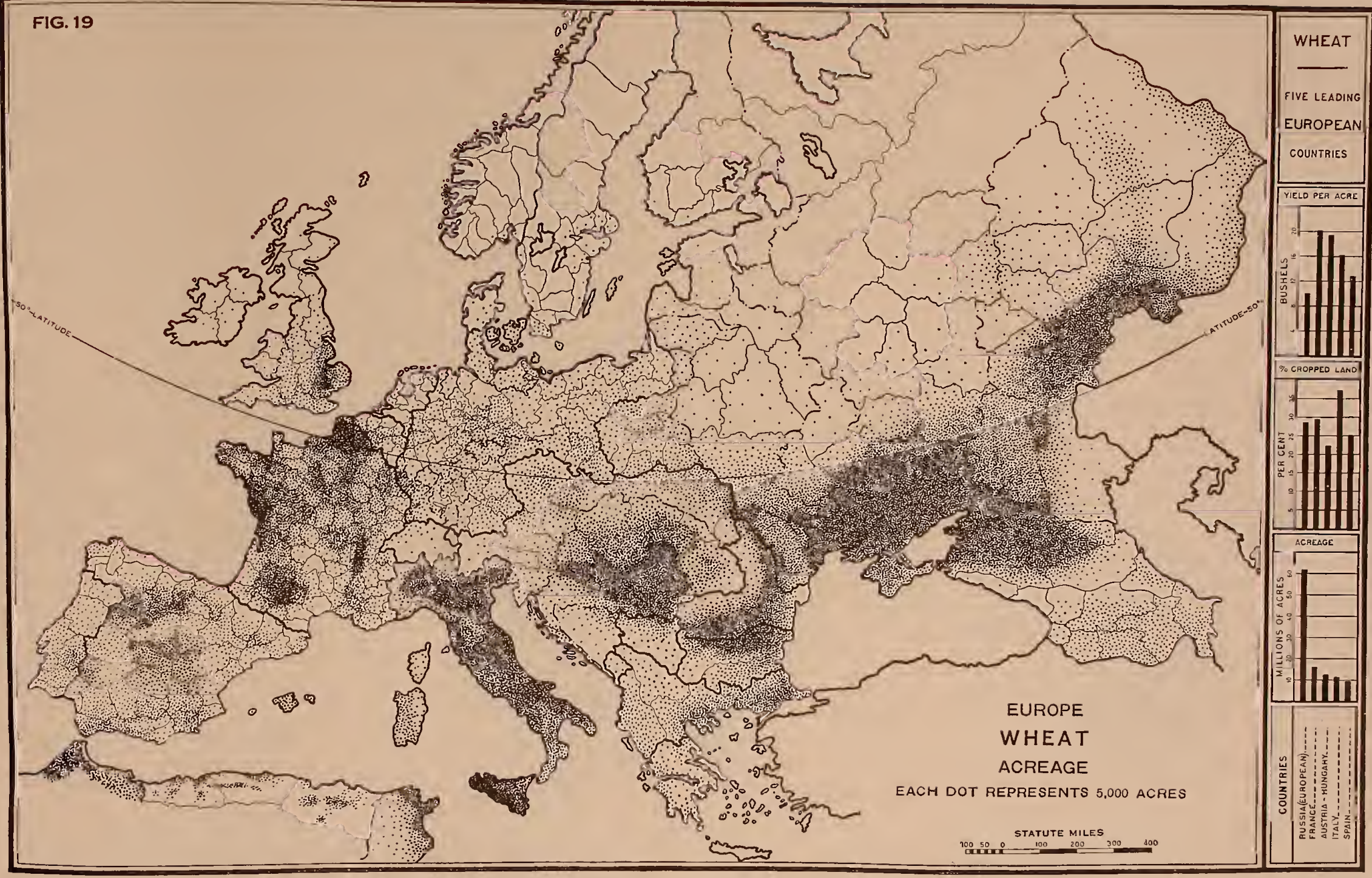


FIGURE 19.—Wheat acreage in Europe. It will be noted that the acreage is largest in the warmer and drier southern portions and that it is, in general, larger on the plains than in the mountainous regions. The base map is a polyconic projection which gives approximately equal areas, but distorts latitude. The parallel of 50 degrees has, therefore, been drawn across the map, and it will be noted that it passes through the center of the Russian wheat belt, slightly north of the wheat region of the Hungarian Plain, and passes across the wheat region in northeastern France. This line of 50 degrees of latitude in North America passes about 225 miles north of Quebec and almost directly through Winnipeg and Medicine Hat. The Russian wheat belt is comparable in latitude with that of Canada.

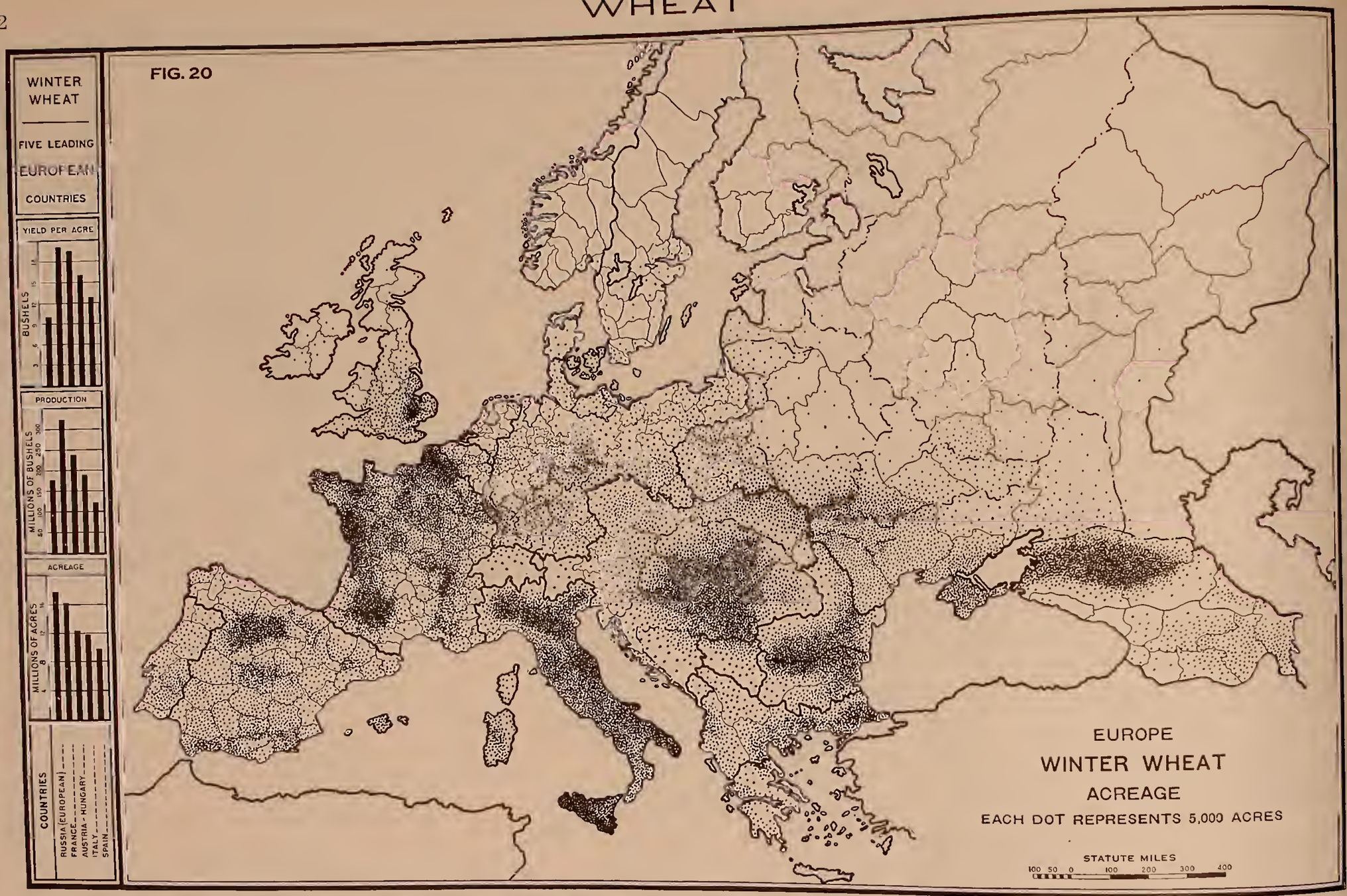


FIGURE 20.—Acreage of autumn-sown wheat in Europe. Practieally all the wheat in western and southern Europe is of this type. Even in northwestern Europe and the Carpathian region severe winter temperatures are infrequent, and in the Mediterranean countries the mild, moist winters and dry summers furnish favorable conditions for the winter crop. In Hungary and in Roumania, however, there is some spring wheat grown. In Russia the area in winter wheat is comparatively small, except in the Caucasus and in the Crimea. Nevertheless Russia aggregates a greater aereage of winter wheat than any other European country, with France a close second. In winter-wheat production three countries, Franee, Austria-Hungary, and Italy, outrank Russia. The yield per acre in France and Hungary is almost twice that in Russia.

FIG. 21

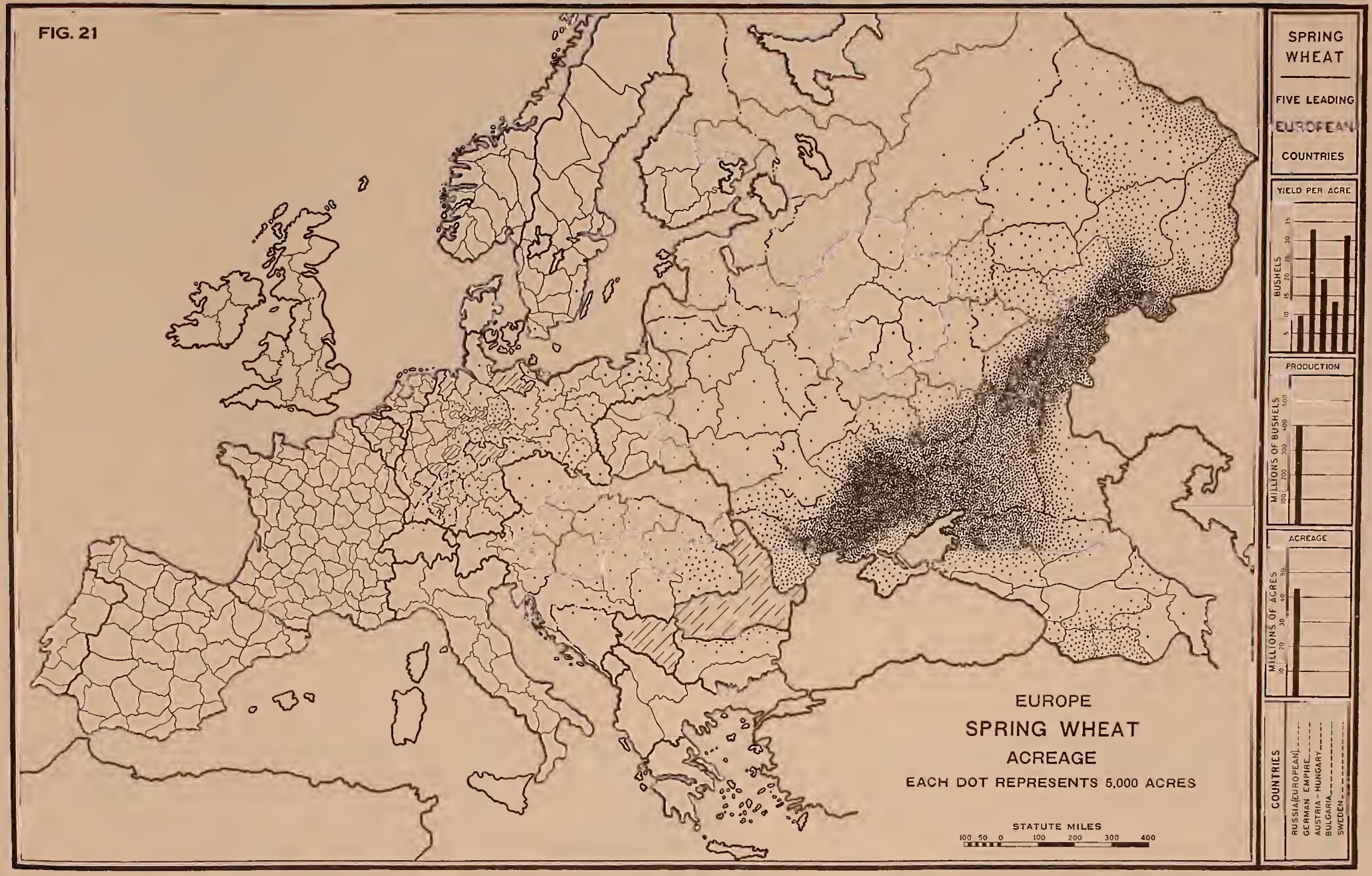


FIGURE 21.—Acreage of spring wheat in Europe. The great center of spring-wheat acreage in Europe is in southern and eastern Russia, including the chernoziom or "black-earth" region. In this region the moderately low rainfall and seasonal extremes of temperature correspond with the climatic conditions found in the spring-wheat regions of the United States and Canada. The absence of wheat from the districts around the Caspian Sea is due both to aridity and to extensive salt marshes. The marginal graph shows even more clearly than the map that almost the entire spring-wheat acreage and production of Europe is in Russia. Small quantities are raised in Germany, Austria-Hungary, Roumania, and Sweden. The yield per acre in the countries of western Europe is, however, three times that in Russia.

FIG. 22

FIG. 23

FIGURE 22.—Acreage of winter (fall-sown) wheat in Canada. It will be noted that the crop is grown almost entirely in the peninsula of Ontario and in the high plains east of the Rocky Mountains. In these regions the winter temperature is not so severe as elsewhere in Canada. Less than 10 per cent of the wheat production of Canada is winter, or fall-sown, wheat.

FIGURE 23.—Combined acreage of autumn-sown and spring-sown wheat in Canada. Both kinds of wheat are grown in the region between Georgian Bay and Lake Ontario, in Alberta, and in British Columbia. Practically all of the wheat acreage in Manitoba and Saskatchewan is spring wheat, while about one-fifth the acreage in Alberta is winter wheat. The spring-wheat belt of Canada directly adjoins the spring-wheat section of the United States. The soils in this region are similar to the prairie soils of the United States and the chernozioms of southern Russia. About nine-tenths of the wheat crop of Canada is produced in the western prairie provinces.

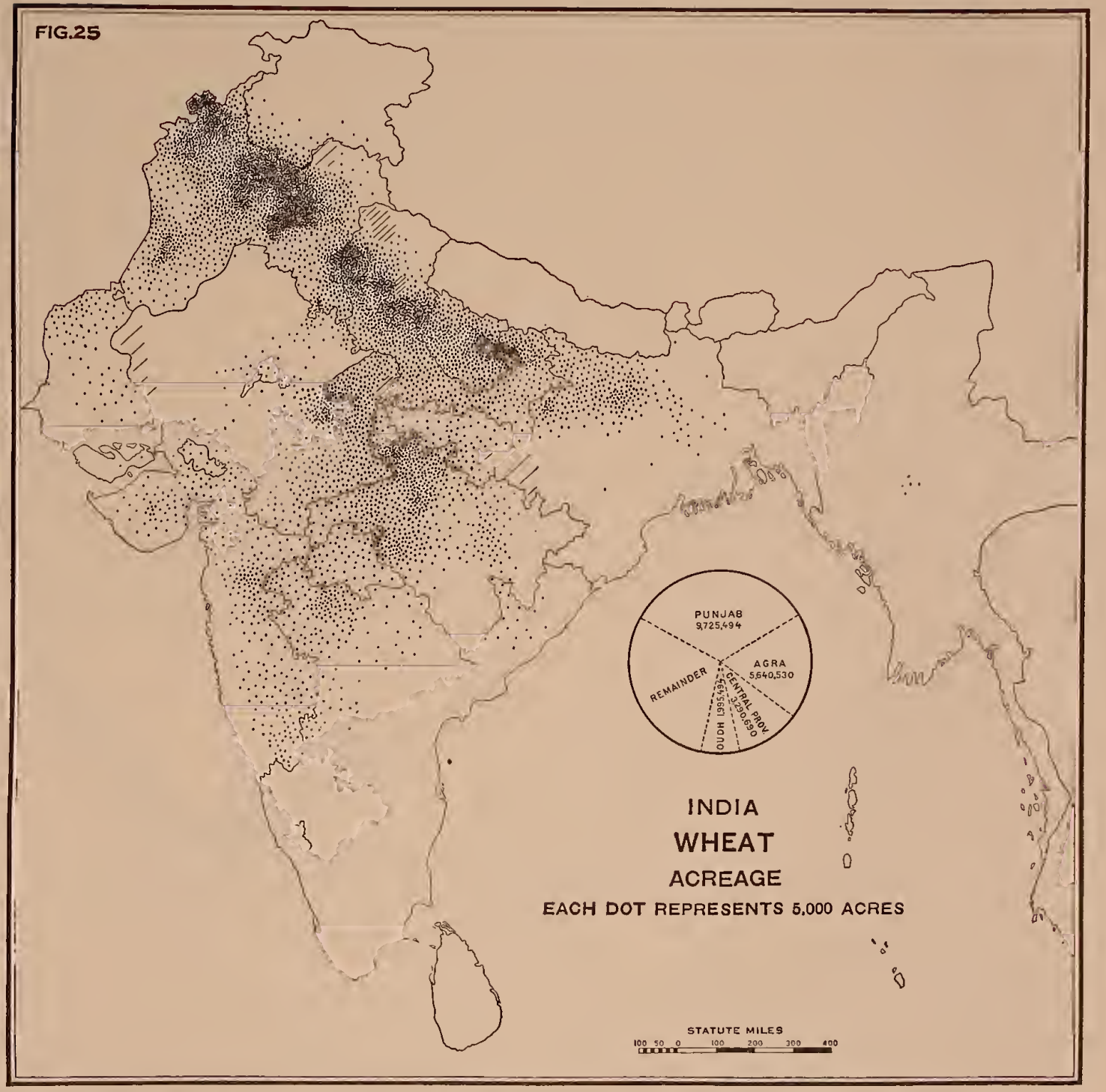


FIGURE 24.—Wheat acreage in Argentina, Chile, and Uruguay. The distribution of the crop is limited on the northeast by increasing temperature and humidity and on the west by increasing aridity. The sparsity of wheat in the highly favorable lands of central Buenos Aires, Entre Rios, and Uruguay is, in large measure, due to the fact that the land is held by great proprietors whose main interest is in cattle and sheep. In portions of this eastern region wheat also meets the competition of corn (see fig. 39).

FIGURE 25.—Wheat acreage in India. The diagonally lined areas indicate districts in which the wheat crop is presumably of some importance, but for which no statistics are available. The importance of wheat in northwest India, where three-fourths of the crop is grown, is the result of a combination of lower rainfall and greater extremes of temperature than are found in the more humid and tropical eastern and southern India.

64505—4°

FIG. 26

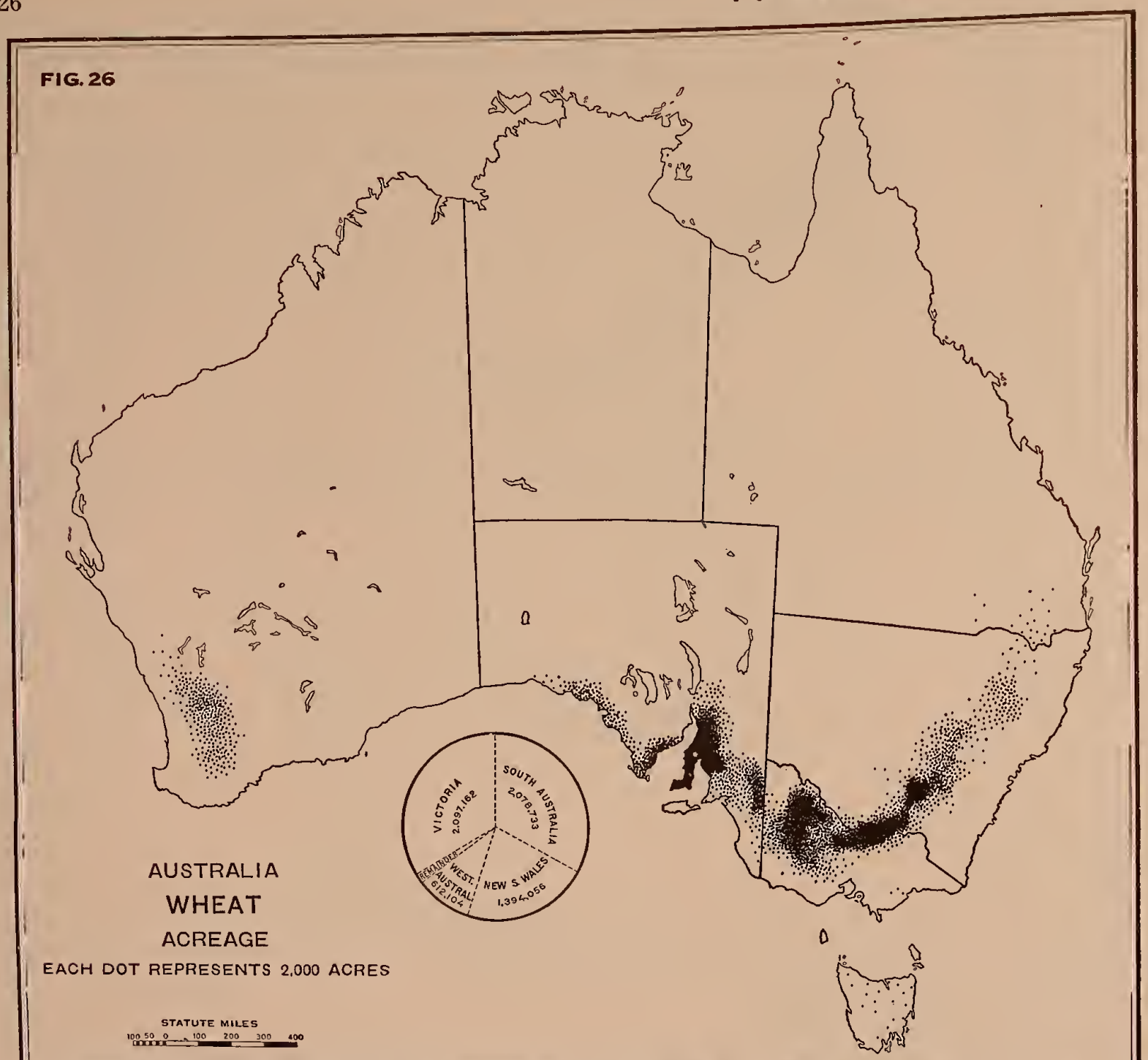


FIG. 27

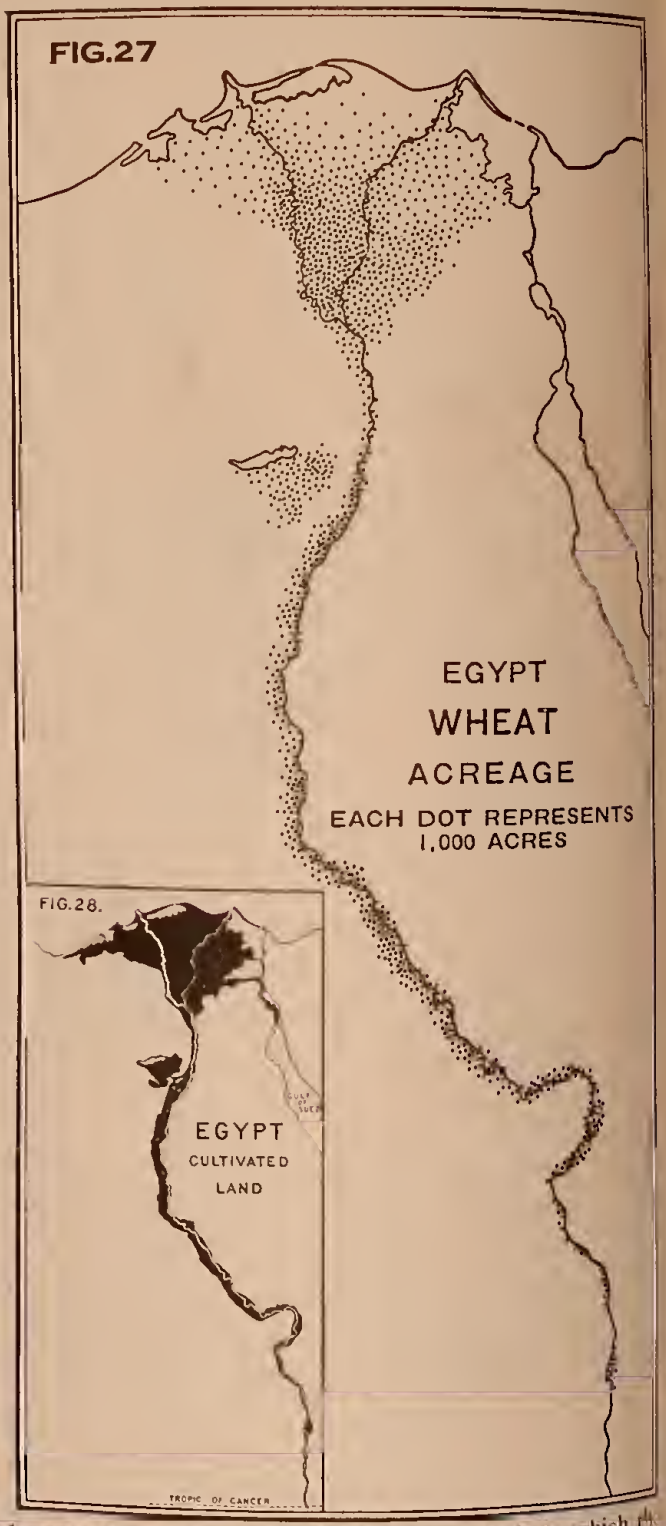


FIGURE 26.—Wheat acreage in Australia. The crop is grown on the plains between the Blue Mountains and the interior desert, along a comparatively narrow belt in which the mean annual rainfall ranges from 10 to 25 inches. Other climatic limitations of the Continent for wheat growing are indicated in the absence of the crop from the more tropical portions of the Commonwealth and from the moist coastal belt on the southeast. Yet over 50 per cent of the cropped land of Australia is in wheat.

FIGURE 27.—Wheat acreage in Egypt. The wheat being grown entirely under irrigation, the distribution of the crop corresponds closely with the distribution of irrigated land (see fig. 28). The low delta margin, with its salty soil, is the only section of the country in which the crop is unimportant.

FIGURE 28.—Cultivated land in Egypt. Practically all the cultivated land is irrigated and hence is limited to the Nile valley and delta and the low-lying oasis of Fayûm, where water can be obtained from the river.

RYE is very largely (about 96 per cent) produced and consumed in Europe. As a crop it is of greatest relative importance in the German Empire, the Netherlands, Russia, Belgium, and Austria-Hungary (fig. 31). Only in the last-named country does wheat outrank rye in the proportion of the cropped land occupied. In Russia the two crops are of nearly equal importance.

It will be noted that the European rye belt is somewhat farther north than the wheat belt and that in some particulars the areas of the two crops are complementary. The ability of rye to produce satisfactory yields in regions of severe winter temperatures, poor soil, or rough topography is well known. Although rye may be either autumn or spring sown, fully 99 per cent of the crop is fall sown. In Russia the zone of largest acreage lies in the region bordering the spring-wheat district, where the temperatures are far too severe for winter wheat. Moreover, since rye is the great bread cereal of Russia and enters but little into commerce, distance from the shipping centers is not an important consideration. The soil is in part the same fertile chernoziom found in the wheat belt. The yields obtained in this section are low (12 bushels per acre), but greater than those of wheat. The rye belt of Poland and Prussia is in the main a region of sandy soils, cool summers, and cloudy skies. In western Europe the capacity of rye to yield returns on areas too poor or wet or bleak for wheat is shown by its occupation in France of the highlands of Brittany, of the Central Plateau, and of the Landes. The same may be said of the rye in northwestern Spain. The absence of rye from the nonwheat-producing areas of the United Kingdom may, no doubt, be largely attributed to a national prejudice against rye products.

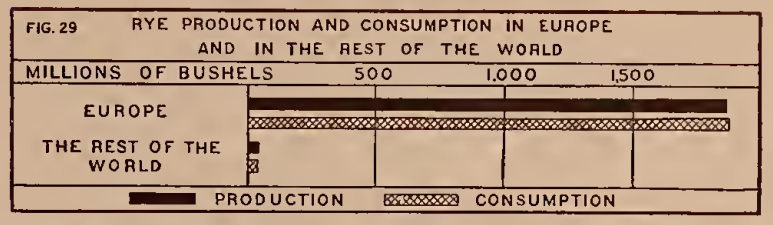


FIGURE 29.—About 96 per cent of the rye crop of the world is produced and consumed in Europe.

UNITED STATES (fig. 30).—Rye is now of only local importance in the United States, forming less than one-half of 1 per cent of the total value of all crops in 1909. Although more rye was grown in that year than in any previous census year, its relative importance has almost steadily declined since the first agricultural census of 1840 (see table). The production per capita of the population in 1909 was less than one-third that in 1839, and only one-twentieth that of wheat. In New England especially rye was formerly much more important than at present, rye and corn meal having been used for bread prior to the development of the wheat industry in western New York. Since 1909 the rye acreage in the country has been increasing.

In the United States rye is grown mostly in regions having a cool climate and sandy soils. The rye belt extends across the lake States about 300 miles north of the winter-wheat belt.

The northern limit of production in the United States follows more or less closely the mean winter temperature line of 15° in Wisconsin and Michigan, but in the Red River Valley rye is grown where the mean winter temperature is about zero and a temperature of 40° below zero is reached occasionally. Very little rye is grown for grain south of the mean summer temperature line of 75°, and the principal centers of production are located where the mean summer temperature is about 70°. The States having an average yield of over 16 bushels per acre are all located in the North.

Rye in the United States, 1839–1909.

Year.	Production.			Acreage.	Value.	
	Total (bushels).	Per cent of all cereals.	Per capita (bushels).		Amount.	Per cent of all crops.
1839	18,645,567	3.0	1.09	Not reported.	Not reported.	
1849	14,188,813	1.6	0.61	do	do	
1859	21,101,380	1.7	0.67	do	do	
1869	16,918,795	1.3	0.44	do	do	
1879	19,831,595	0.7	0.40	1,842,233	do	
1889	28,421,398	0.8	0.45	2,171,604	do	
1899	25,568,625	0.6	0.34	2,054,292	$12,290,540	0.4
1909	29,520,457	0.7	0.32	2,195,561	20,421,812	0.4

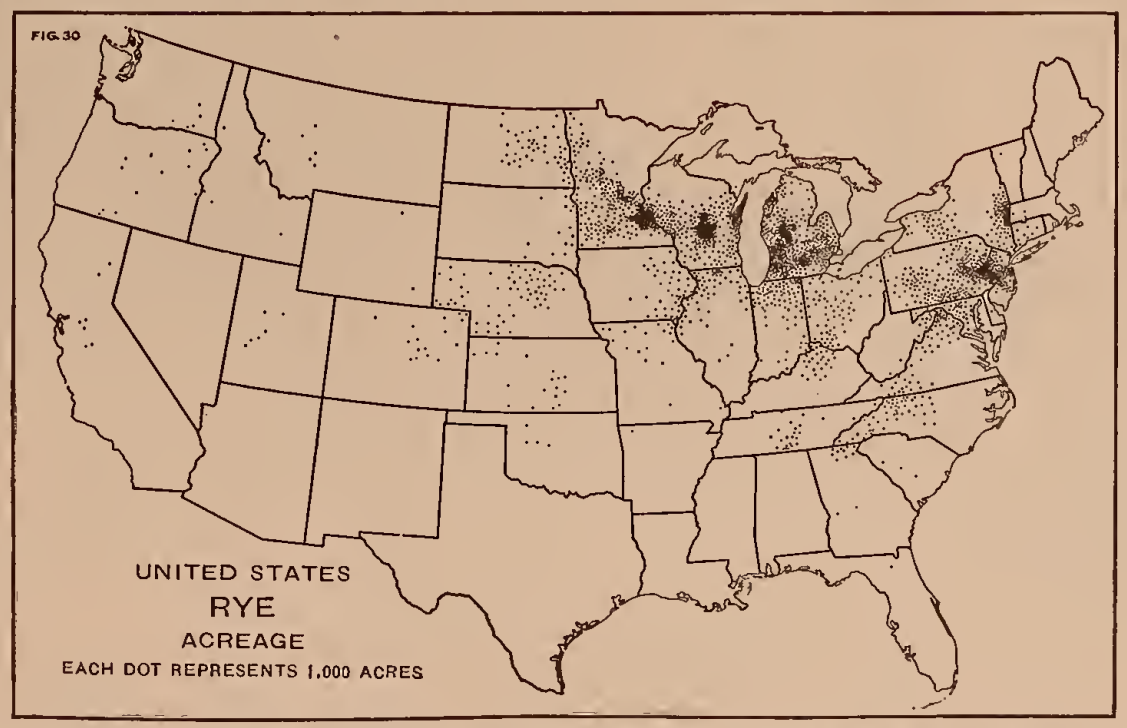


FIGURE 30.—Rye acreage in the United States. Five States—Michigan, Wisconsin, Minnesota, Pennsylvania, and New York—grow two thirds of the rye produced in the United States. In each of these States the crop of 1909 was valued at more than a million dollars. Relative to other crops, however, rye is more important in New Jersey than in any other State. A little rye is grown in the Southern Appalachians, northern Indiana, Nebraska, and recently very important increases in acreage have occurred in the Dakotas.

Rye, however, is grown in small quantities farther south than wheat, but principally for forage and green manure.

Although rye has been called "the grain of poverty," because it will grow on soil too poor for the successful production of wheat, corn, or barley, it thrives best on fertile soils, and in two of the principal centers of production, eastern Pennsylvania and southeastern Michigan, it competes successfully with other crops for the occupancy of the best soils. The rye acreage of western Michigan, Wisconsin, and Minnesota is densest in regions of sandy or loamy soils. In New England rye is often the first crop in a rotation designed to build up worn-out soils, and in the corn belt it is frequently sown in the standing corn or stubble in the fall and plowed under in the spring as a green-manure crop. It is also sometimes used as a winter cover crop in the Southern States to prevent erosion and leaching, as well as to increase the vegetable matter in the soil.

The production of rye would probably decrease in some sections of the United States were it not for the value of the straw. In eastern New York, New Jersey, and Pennsylvania the straw is often as valuable as the grain. Rye straw, being longer and tougher than wheat or oat straw, is in demand as bedding for horses, and is also used in packing fruit trees, pottery, and many other products, for the production of straw articles and in the manufacture of paper. About two-thirds of the rye grain produced in the United States is used as food for domestic animals and about one-third for flour and for the production of alcohol and alcoholic beverages. In Europe rye is used mostly for bread but in the United States comparatively little rye bread is eaten, its use being virtually confined to those who have acquired a taste for it in European countries.

RYE

FIG.31

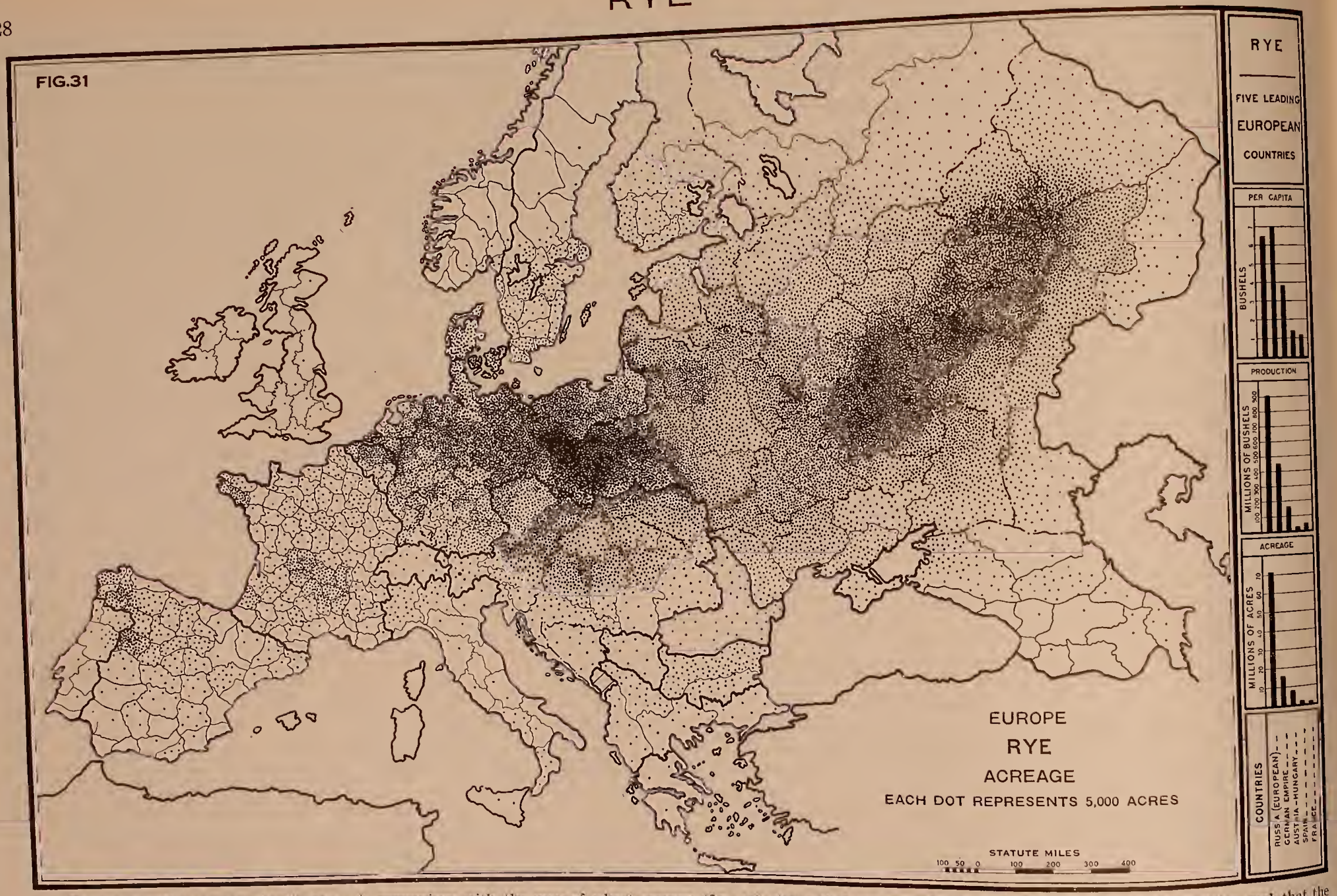


FIGURE 31.—Rye acreage in Europe. A comparison with the map of wheat acreage (fig. 19) shows that rye occupies in general a more northerly position and that the regions growing the two crops are somewhat complementary, rye being the principal grain where wheat does not thrive. Owing to its large area, Russia has more than two-thirds of the total rye acreage of Europe. In acreage relative to the acreage of all crops, however, the Netherlands and the German Empire are close rivals, and the yield per acre in Germany is more than double that of Russia. Inasmuch as 96 per cent of the rye of the world is produced in Europe no world map is shown for this crop.

CORN (maize) was probably first brought under cultivation on the plateaus of Central or South America. Under favorable conditions of soil and climate, corn is capable of relatively large yields, even with the crude cultivation of savage tribes. The best corn soils are well drained, deep, warm, black loams, with a high per cent of organic matter and available nitrogen. The geographic range of corn is limited by temperature and rainfall conditions. Varieties are known which mature in 80 days where the summer temperature is over 65°. Even these requirements nowhere permit it to mature beyond 50° N., though it may be grown for green fodder in Quebec and in southern England. The great corn regions of the world are areas of continental climate. Most of the corn, except where there is supplementary irrigation, is grown in regions having an annual rainfall of at least 20 inches, with a marked summer maximum. In these regions the summer temperatures average about 75° F., and both the day and the night temperatures are high. The summer rainfall, even in India, is of the intermittent thundershower type, in which periods of bright, warm weather occur between rains. Corn does not thrive in regions of cool, cloudy summers.

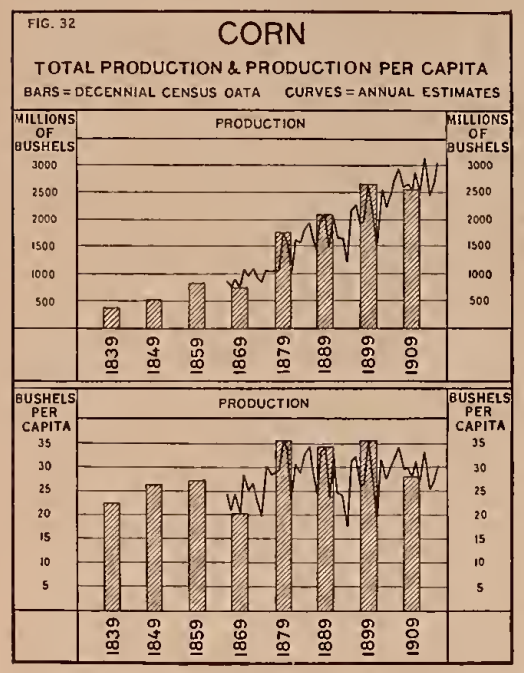


FIGURE 32.—The production of corn in the United States has increased from 377 million bushels in 1839 to over 3 billion bushels in 1912 and again in 1914, but the production per capita of the population has diminished since 1899.

UNITED STATES (fig. 36).—Corn is by far the most important crop in the United States. The acreage and also the value of the corn crop is greater than that of wheat, oats, barley, rye, buckwheat, rice, fruits, and nuts combined. The relative importance of corn as compared with other cereals has remained fairly constant since the first agricultural census of 1840, but the production per capita of the the population shows an increase after the Civil War.

The western limit of extensive corn production in the United States follows more or less closely the line of mean summer (June, July, and August) precipitation of 8 inches, extending somewhat beyond this line in Nebraska and Colorado, while in Texas, where the evaporation and the loss through torrential rains are greater, this line is scarcely reached. The hot winds of the arid portion of the Southwest also dry out the pollen and silks and interfere with pollination. The temperature requirements of different varieties of corn vary widely. Some southern varieties need an average frostless season of 180 days and mean summer temperature of 80°. Practically no corn is grown where the mean summer temperature is less than 66°, or where the average night temperature during the three summer months falls below 55°. Consequently the production of corn along the northern border of the United States and at the higher elevations in the West is negligible.

Corn in the United States, 1839–1909.

Year.	Production.			Acreage.	Value.	
	Total (bushels).	Per cent of total cereals (measured in bushels).	Per capita (bushels).		Total.	Per cent of all crops.
1839	377,531,875	61.3	22.1	Not reported	Not reported	.....
1849	592,071,104	68.3	25.5	.....do.....	.....do.....	.....
1859	838,792,740	67.7	26.7	.....do.....	.....do.....	.....
1869	760,944,549	54.9	19.7	.....do.....	.....do.....	.....
1879	1,754,591,676	65.0	35.0	62,368,504	.....do.....	.....
1889	2,122,327,547	60.2	33.7	72,087,752	.....do.....	.....
1899	2,666,324,370	60.1	35.1	94,913,673	$828,192,388	27.6
1909	[a]2,552,189,630	56.6	27.7	98,382,665	1,438,553,919	26.2

[a] The yield in 1909 was small owing to a drought in the Southwest.

Although corn is thus grown to some extent under a wide range of climatic conditions, the most favorable environment is definitely restricted in area. The climatic boundaries of the region of greatest production in the United States are a mean summer temperature of 70° to 80°, a mean night temperature exceeding 58°, a frostless season of over 140 days, and an annual precipitation of 25 to 50 inches, of which 7 inches occur during July and August. The best corn soils are fertile, dark-colored loams or silt loams, warm, well drained, and well supplied with humus.

These geographic conditions which are essential to large yields of corn are found in only a few regions in the world, and most extensively in the United States. Since corn is a a highly productive crop, yielding on the average about twice as much grain and, including the fodder, over three times as much food per acre as either wheat or oats, the corn crop in the United States, within its optimum geographic limits, reduces other crops, except cotton, to a subordinate position, and especially those which require labor at the same time of year.

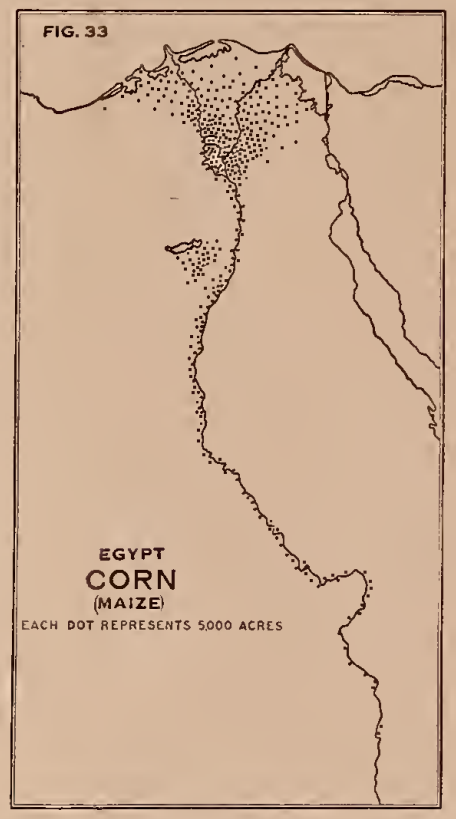


FIGURE 33.—Corn (maize) acreage in Egypt. Though a relatively recent addition to the crops of Egypt, corn now occupies more land than wheat or even cotton. It avoids the swampy lower section of the Nile delta, the area of densest production lying immediately to the north of Cairo.

Corn is preeminently the American crop, grown on three-fourths of all the farms in the United States, which produces nearly three-fourths of all the corn in the world. Within the United States three-fourths of all the corn produced is grown in the Mississippi Valley. There are two centers of heavy production—one is in central Illinois and the other in the Missouri Basin of western Iowa and eastern Nebraska. The total corn acreage of Illinois in 1909 was 10,046,000, or 10 per cent of that for the country as a whole; Iowa had 9,229,000 acres of corn; Kansas, 8,109,000 acres; Nebraska, 7,226,000; Missouri, 7,114,000 acres; and Indiana, 4,901,000 acres; these six States combined having 47 per cent of the corn acreage of the United States and 57 per cent of the production. In this region of concentrated production there has developed a system of live-stock farming adapted to the utilization of corn. Nearly half the swine of the country are in these six States (fig. 190) and one-third of the beef cattle (fig. 173).

While a large part of the total corn crop is thus grown in a limited area, corn is an important crop in nearly all of the eastern portion of the United States; in fact, the acreage in

corn relative to the total aereage in erops is greatest in eertain regions where the aetual aereage and produetion is small. Thus the aereage devoted to corn eonstitutes over 75 per eent of the total aereage in crops in some of the mountainous eounties of eastern Kentueky, where a moderately dense rural population derives its meager livelihood largely from the eultivation of small patehes of eorn, averaging 10 to 15 aeres per farm. The produetion of eorn is small also in Florida and in the southern parts of Alabama and Mississippi, where most of the land is still in forests, yet eorn eonstitutes in this region over 50 per eent of the total land in erops.

Corn is the principal souree of food supply of the Ameriean people, but outside of the South very little of the corn is direetly eonsumed by man. Most of the erop is fed to eattle or hogs, and eonsumed as beef, a pound of whieh represents 10 or 12 pounds of eorn, or as pork, to produee a pound of which 5 or 6 pounds of eorn are required. Much of the eorn raised in eentral and northern Illinois, as well as a considerable portion of that grown in Iowa, is shipped to Chieago, where it is made into stareh, glucose, and eorn meal, or is exported; but outside a radius of about 200 miles from that eity the eorn is fed to eattle and hogs whose eoneentrated value ean better bear the cost of transportation to market. The eorn grown in the South is praetieally all eonsumed at home, being made into "hog, hominy, and hoeeake," the staple food produets of that region.

Europe (fig. 37).—The produetion of eorn in Europe is about one-fourth that in the United States. Hungary, Roumania, southern Russia, and Italy are the leading eountries in aereage. Although 5° farther north than the eorn belt of the United States, this region, with the exeeption of Italy, has similar eonditions of soil, rainfall, and temperature. The broad, fertile plains of Hungary plaee that eountry in the lead among European nations in aereage and produetion, but the relative importance of the erop is greater in Roumania. Here, eorn is both the chief food of the people and an important article of export; it oeeupies over 40 per eent of the eropped land and the produetion is nearly four times as great per eapita as in Hungary. The eorn of Russia is grown mainly in Bessarabia, where the higher rainfall, milder temperatures, and nearness to shipping ports eneourage its eultivation. Russia and Roumania are the ehief eorn exporters of Europe, sending 40 and 50 per eent, respeetively, of their erops to foreign markets.

The eorn of Italy is raised mainly under irrigation. The chief producing region is the Po plain, though one-fifth of the total land under corn is elassed as mountainous. The corn area of France, though small, is interesting geographically beeause it lies between the region of eool summers to the north and of extremely dry summers along the Mediterranean eoast. In Spain and Portugal eorn is grown prineipally along the moister western and northern eoasts.

Egypt and India (figs. 33 and 34).—Corn in Egypt is grown entirely under irrigation. The crop is planted in July and harvested in October and November, being irrigated about every 10 days The rather large corn acreage of India is concentrated mainly on the alluvial lands of the Ganges and the irrigated lands of the Punjab. The corn is used largely for human food, but its relative importance is small, as it occupies less than 3 per cent of the eropped land.

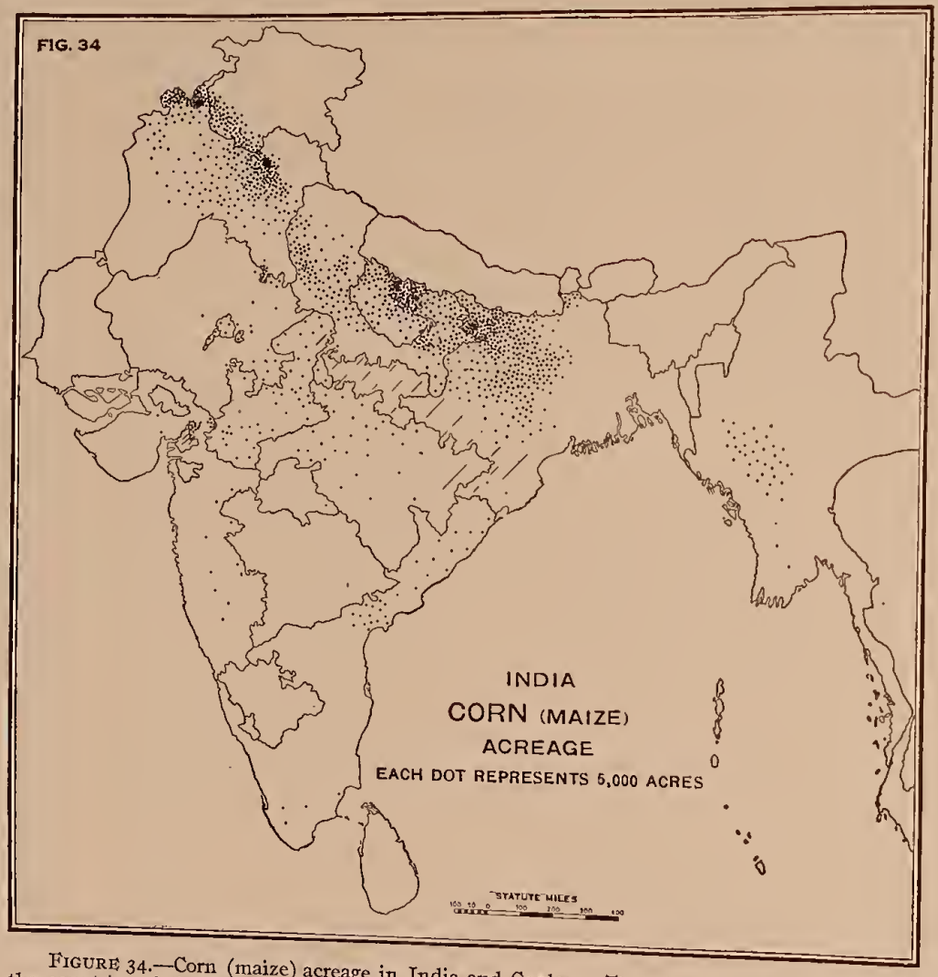


Figure 34.—Corn (maize) acreage in India and Ceylon. Though India ranks fifth among the countries of the world in corn acreage, the local importance of the crop is small, as it occupies less than 3 per cent of the cropped land. The crop is used in part locally for human consumption, but an increasing amount is being exported annually.

Mexico (fig. 38).—The corn aereage of Mexico ranks next to that of the United States. The principal centers of production are located in the southern section of the country, mostly on the high plateau and in Yueatan. On the plateau the summers are warm, but frosts occur oecasionally in the winter months. Poor agricultural methods result in a low yield. Mexico has a greater proportion of cultivated land in this crop, however, than any other country, the acreage of corn about equaling that of all other crops. Most of the eorn is grown in small patches of a few acres leased by the peons from large landholders, and is produeed by very primitive methods. A eonsiderable proportion of the crop is grown under irrigation. The corn is used mostly for corn bread ("tortillas"), which, together with beans ("frijoles"), constitutes the staple diet of the Mexican people. Very little corn is exported from Mexico, and ordinarily over one million bushels are imported annually from the United States.

Canada (fig. 36).—Corn in Canada is practically confined to the province of Ontario, where the elimatic eonditions and types of farming are similar to those in New York State. A large aereage of corn not shown on the map is also cut for silage or fed green.

Argentina (fig. 39).—The corn of Argentina is grown mainly in the states of Buenos Aires, Santa Fe, and Cordoba, on the humid side of the wheat belt. The corn acreage in Argentina shows a general tendency to increase. The erop oecupies 21 per cent of the land in crops, and in per capita production this country ranks next to the United States. The climate is mild, and in the relatively uniform temperatures of the Southern Hemisphere, planting time extends from September to December. The mean temperature during the three warmest months (December, January, and February) averages 75°. The annual rainfall in the corn region averages about 30 to 40 inehes, but, unfortunately for corn growing, the maximum eomes in the late rather than the early summer. The relatively small population of Argentina leaves a large proportion (64 per eent in 1912) of the corn crop available for export. Moreover, most of the corn raised is of a flinty type which stands transportation well. Varieties of dent eorn are now being introduced.

FIG. 35

FIGURE 35.—World corn (maize) acreage. The corn acreage of the United States is nearly double that of all the rest of the world. The other important corn-producing regions are southern Europe, particularly Roumania and Hungary, Mexico, Argentina, and India. Relative to the total population, corn is a more important crop in the United States than in any other country. Relative to the acreage of other crops, it reaches its highest importance in Mexico, where it is the staple food of the poorer classes. The highest yield per acre is found in Canada, which has an inconspicuous acreage and is situated on the extreme northern margin of the corn belt of North America. The combined corn acreage of all European countries is about equal to that of Illinois, Iowa, and Missouri.

FIG. 36

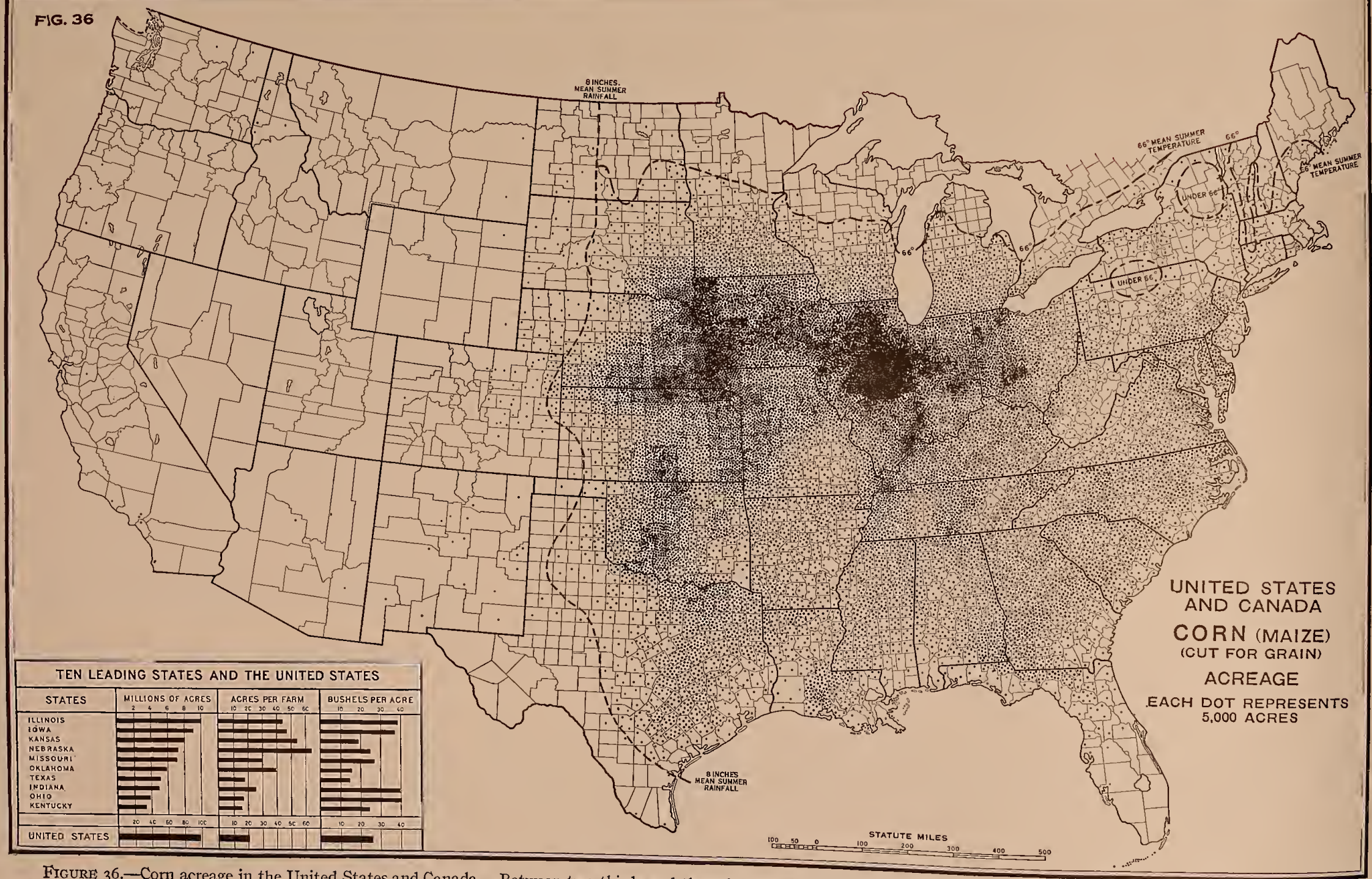


FIGURE 36.—Corn acreage in the United States and Canada. Between two-thirds and three-fourths of the corn acreage of the world is in the United States, practically all east of the line of 8 inches mean summer (June, July, and August) rainfall and south of the line of 66° mean summer temperature. Corn in this area constitutes over one-third of the acreage of all crops; while within the "corn belt," which includes the States of Kansas, Nebraska, Iowa, Missouri, Illinois, Indiana, and western Ohio, about 45 per cent of the cropped land is in corn. The acreage of corn is less dense in the South, owing in part to the competition of cotton, a very profitable crop having an even narrower climatic range than corn, and in part to the fact that a smaller proportion of the land in the South is under cultivation. Very little corn is grown in the West, not alone because of the arid conditions, but also because the cool nights, especially in the higher altitudes and northern latitudes, prevent maturity. In much of New Mexico and Arizona, however, corn is the leading crop, and it is also grown in the warmer valleys of California, Oregon, and Washington.

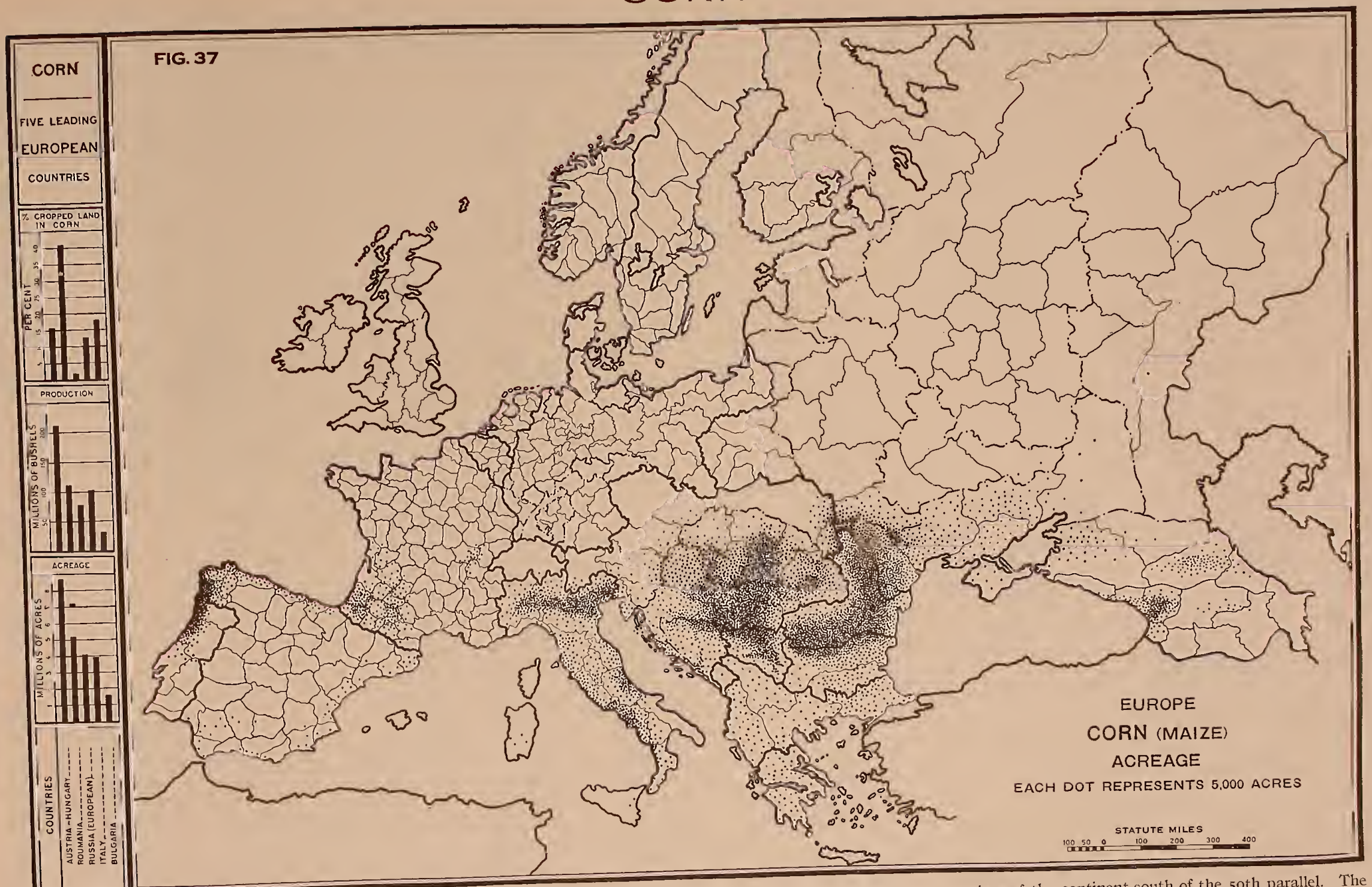


FIGURE 37.—Corn (maize) acreage in Europe. The outstanding feature of the distribution is the limitation of the crop to sections of the continent south of the 50th parallel. The large corn-producing countries are Hungary, Roumania, and Italy, though corn is produced to some extent in every southern European country. A small but dense center of production is located in northern Portugal and northwestern Spain. Corn is also an important crop in southwestern France and in the Balkan territory until recently occupied by Turkey. In Russia the principal corn-producing area is in Bessarabia, which adjoins Roumania, but corn is grown throughout southern Russia, and a fairly dense center is located in the Caucasus.

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FIGURE 38.—Corn constitutes practically half of the acreage of all crops in Mexico, a greater percentage than in any other country in the world. The acreage is even more concentrated than in the United States, over 60 per cent being found in four States—Jalisco (42 per cent), Guanajuato, Mexico, and Yucatan (passing from left to right on the map).

FIGURE 39.—Corn (maize) acreage in Argentina, Uruguay, and Chile. The corn area in Argentina, as in the United States, lies mainly to the east of the wheat belt, yet far enough in the interior to escape any strong marine climatic influences. Transportation lines are also important in determining the producing region. Corn is not extensively grown east of the La Plata River in southern Entre Rios owing to the swampy condition of the land.

OATS

OATS grow best in cool, moist climates, such as are found in most of the northern European countries, in the northeastern United States, and in Canada. The plant has large, pendent outer glumes, and is peculiarly adapted to withstand rain during the flowering period. Oats are not usually profitable in regions of high temperature unless abundant water is available. In California, in Mediterranean countries, and in Australia, however, oats are sown in the autumn, utilize the winter rainfall, and are cut just before maturity for hay. In regions of mild winters, such as the southern United States and southwestern France, oats are also sown in the autumn for grain. On the southern border of the oat belt yields are not usually as high as in the north, because climatic conditions are less favorable for the growth of the crop. Oats are grown on a wide variety of soils and yield well on rather poor soil, provided it is moist. The world distribution of the crop is little influenced by the soil factor.

EUROPE (fig. 43).—Russia is the largest producer of oats in Europe. The region of heavy production is coincident with the rye belt. The oats, however, are spring sown. Their position north of the spring-wheat belt (fig. 21) indicates their preference for a moister, cooler climate. Moreover, oats, like rye, enter less into commerce than wheat and barley, and it is not so necessary that they be produced near the great shipping centers. The hardiness of the crop and the short time required to mature it are shown by the appreciable acreage extending nearly to the Arctic Circle in Finland and Sweden. The importance of oats on the narrow, sandy strip of the German Baltic coast and in Denmark is noteworthy as evidence of the ability of this crop to give profitable returns on poor soil. In France the oat region is coincident with the more humid portion of the wheat belt, where the crop alternates with wheat in the rotation.

The proportion of cropped land occupied by oats exceeds 20 per cent only in the United Kingdom (24 per cent) and Sweden (23 per cent). In these regions of cool, moist climate oats are a very important crop. In Scotland, particularly, this grain, with milk, furnishes an important element of the human diet, especially for agricultural laborers. Oat straw with turnips furnishes the chief winter ration for cattle.

Like rye, oats enter but little into the foreign commerce of European countries. The principal regions where consumption exceeds production are the northwestern countries which have large animal industries, with the United Kingdom in the lead. These countries import about 10 per cent of their supply of oats. An important demand comes also from the countries of southwestern Europe, which import about 5 per cent of their supply. The countries of eastern Europe produce the bulk of the exports. Only about 1 per cent of the European supply comes from other continents.

UNITED STATES (fig. 42).—The oat crop ranks third in acreage and fifth in value in the United States, while in number of bushels produced it exceeds all other crops except corn. The relative importance of oats as compared with other cereals and the production per capita of the total population shows a material increase in the past three census reports over those in previous years.

Although oats are a relatively unimportant crop in three-fourths of the United States, occupying less than one-tenth

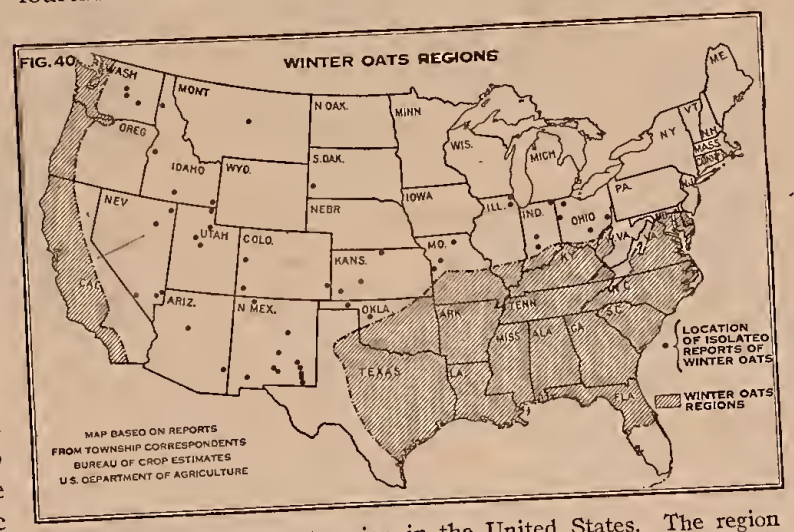


FIGURE 40.—Winter-oat region in the United States. The region of winter-oat production is at present bounded on the north approximately by the mean winter temperature line of 35°. This line crosses the States of Delaware, Maryland, and Virginia into North Carolina, thence swings northwestwardly into southern Illinois, and thence southwestwardly across Missouri and Oklahoma. Along the Pacific Coast both winter and spring oats are grown.

of the improved land, the oat is, nevertheless, the most widely distributed agricultural plant of the country except the potato. This wide distribution is due in large measure to the local use of oats for horse feed. Oats are too bulky to bear the cost of long-distance transportation, and, moreover, no other feed seems to give horses quite as much spirit and energy as does oats, hence they are grown on many farms at a cost which would often involve financial loss if the crop were sold at market prices.

In the great oat-producing region of the central United States this crop is particularly important not only because the grain is desired for feeding work animals, but also because it offers a spring grain needed in the crop rotation with corn, spring wheat not being adapted to this region. As oats are sown in the spring, before corn-planting time, the crop does not require the early removal of the corn, as is the case with fall-sown wheat, and as oats do not mature until after the corn is laid by in early July, there is very little competition with this more profitable crop for labor at critical times of the year. Wherever hay is grown in the rotation, the oats also serve as a nurse crop for the clover or timothy. The climate of this central section of the United States is characterized by seasonal extremes and differs greatly from that of northwestern Europe, where most varieties commonly grown in America originated. Certain varieties imported from southwestern Russia have been found valuable.

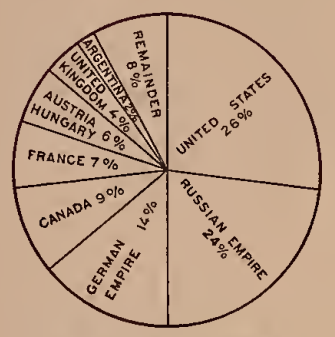
Oats in the United States, 1839–1909.

Year.	Production.			Acreage.	Value.	
	Total (bushels).	Per cent of all cereals (measured in bushels).	Per capita (bushels).		Total.	Per cent of all crops.
1839	123,071,341	20.0	7.2	Not reported	Not reported	.....
1849	146,584,179	13.5	6.3	....do	....do	.....
1859	172,643,185	12.1	5.5	....do	....do	.....
1869	282,107,157	19.3	7.3	....do	....do	.....
1879	407,858,999	15.1	8.1	16,144,593	....do	.....
1889	809,250,666	23.0	12.9	28,320,677	....do	.....
1899	943,389,375	21.3	12.4	29,539,698	$217,098,584	7.2
1909	1,007,142,980	22.3	10.9	35,159,441	414,697,422	7.6

Oats are less exacting as to soils than the other cereals, except buckwheat and rye. On very fertile soils, especially in wet seasons, oats are likely to lodge, and for this reason, as well as because they are less benefited by clover sod than other crops, and can be sown in the spring, oats commonly follow corn or wheat in the rotation, thus occupying the land at its lowest stage of fertility. Oats do not manifest the particular preference for limestone soils that wheat does, but appear to prefer soils rather rich in humus.

CANADA (fig. 44).—Oats rank third in value among the crops of Canada and second in all except the Maritime Provinces and British Columbia. In the prairie provinces the oat belt is nearly coincident with that of wheat. The extension of oats to the north in Alberta is, however, considerably greater, owing to the shorter growing period required by oats. In eastern Saskatchewan and Manitoba the belt of largest oat acreage lies on the northern margin of the wheat belt. The large acreage and production of oats in Ontario and Quebec has an important relation, in connection with the hay crop, to the cattle and dairy industries (figs. 180 and 181).

FIG. 41



WORLD PRODUCTION
4,375,727,000 BUSHELS

WORLD
OATS
ACREAGE
EACH DOT REPRESENTS 100,000 ACRES

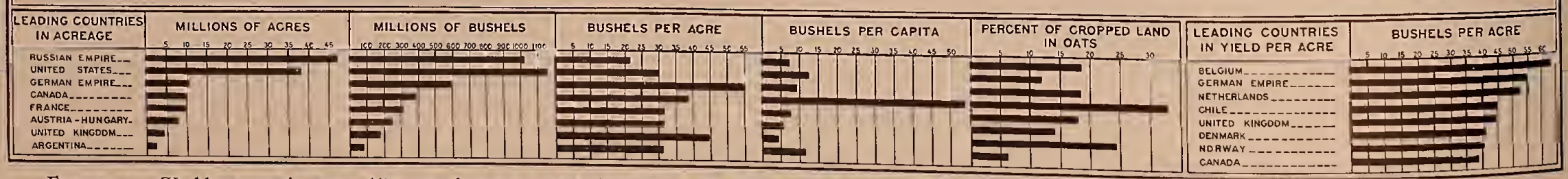


FIGURE 41.—World acreage in oats. The crop is grown mostly in cooler and moister climates than wheat or barley. The three principal regions of oat production are found in the north central and northeastern United States and adjoining provinces of Canada, in northwestern Europe, and in Russia. The United States leads in production, Russia has the largest acreage, while the local importance of the crop, as measured by the proportion of cropped land it occupies and the per capita production, is greatest in Canada. In yield per acre Belgium leads, as it does in wheat, rye, and barley. Most of the world's oat crop is spring sown, but in regions of mild winters, such as the southern United States and southwestern France, it is sown in the autumn. In regions of warm and dry summers, especially California and the Mediterranean countries, oats are also a winter crop and are largely cut for hay.

FIG.42

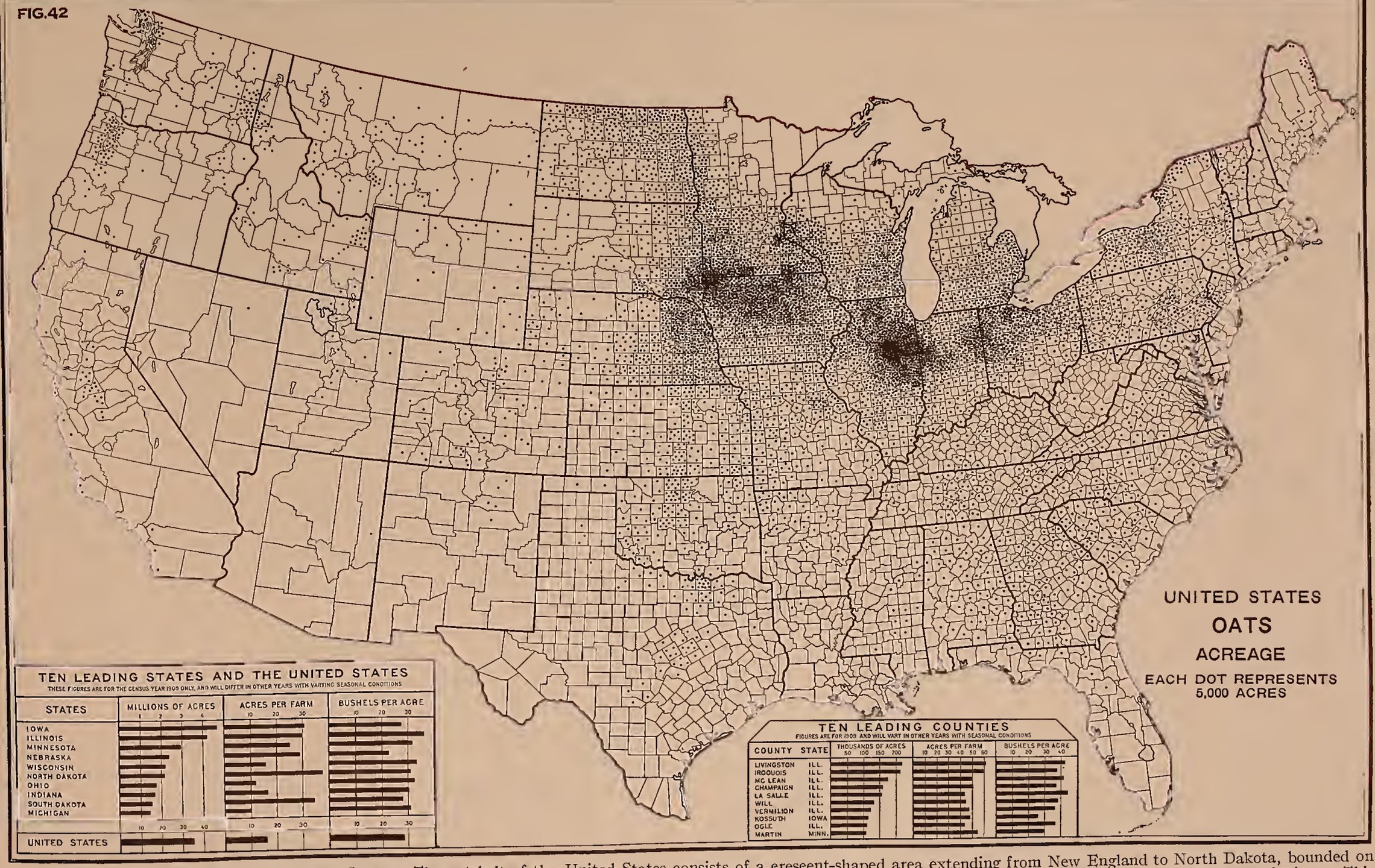


FIGURE 42.—Oat acreage in the United States. The oat belt of the United States consists of a crescent-shaped area extending from New England to North Dakota, bounded on the north by the Great Lakes and on the south and west by a curved line across central Ohio, central Illinois, eastern Nebraska, and thence northward along the Missouri River. This region of dense production encircling the Great Lakes includes four-fifths of the oat crop of the United States. Oats are also an important crop in eastern Pennsylvania, western Georgia, central Tennessee, western Missouri, eastern Kansas, central Oklahoma, central Texas, the Snake River Valley of Idaho, the Palouse region of eastern Washington, and the Willamette Valley of Oregon. Oats prefer a cool, moist climate, the center of production in Illinois being due more to agricultural necessity than to particularly favorable climatic conditions. In the Southern States most of the oats are fall sown, but in the North the oats are sown in the spring and harvested mostly during July.

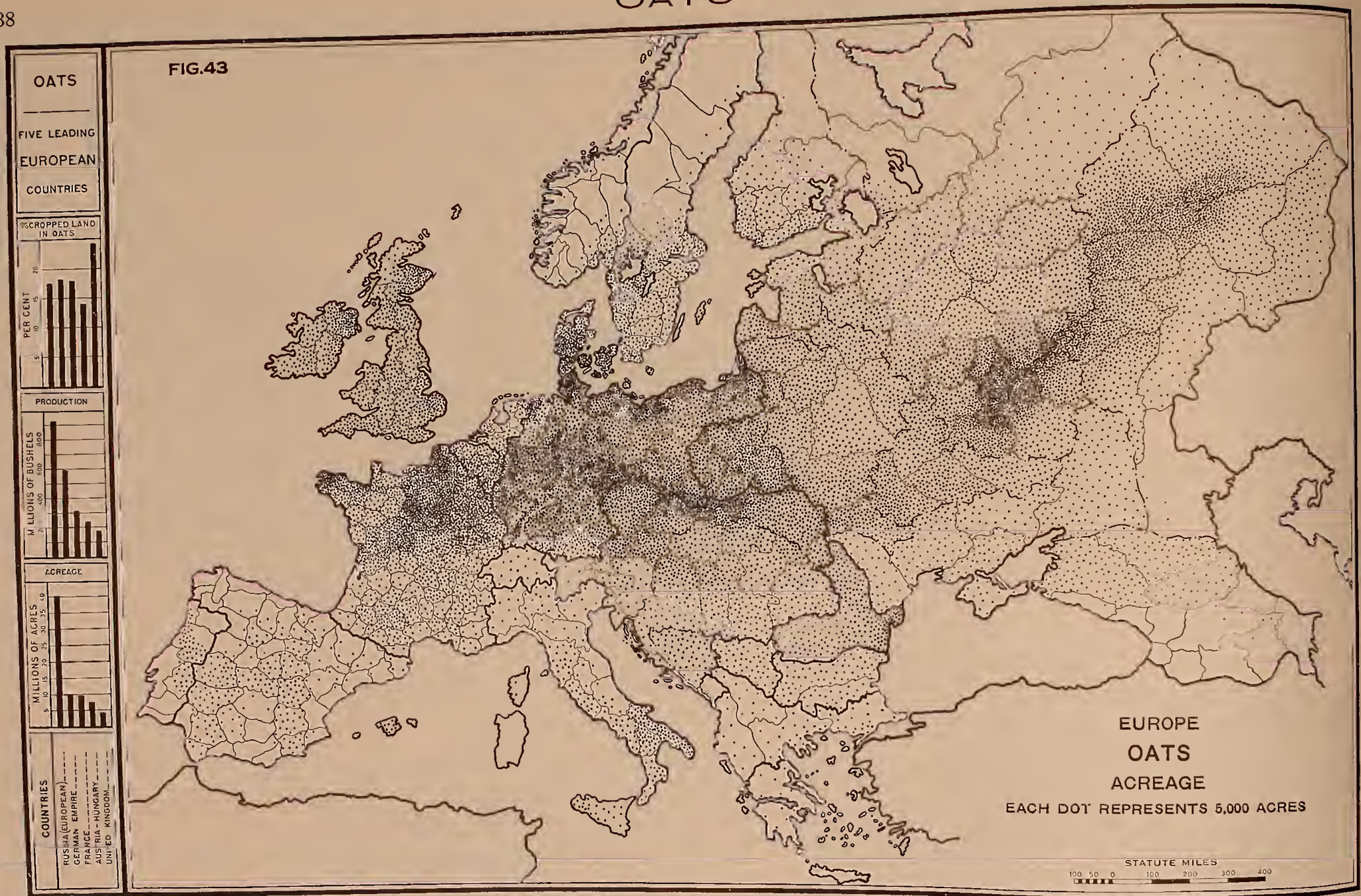


FIGURE 43.—Oat acreage in Europe. More than half of the world's oats are grown in Europe. The crop is cultivated in the more humid portions of the cereal-producing section of that continent. It will be noted that the centers of oat acreage are more nearly coincident with those of rye (fig. 31) than with those of wheat (fig. 19). In western Europe, however, the regions of oat and wheat culture overlap in many places. Relative to land in crops, the oat acreage is largest in the United Kingdom, relative to the population it is largest in Denmark, while the highest yield per acre is found in Belgium.

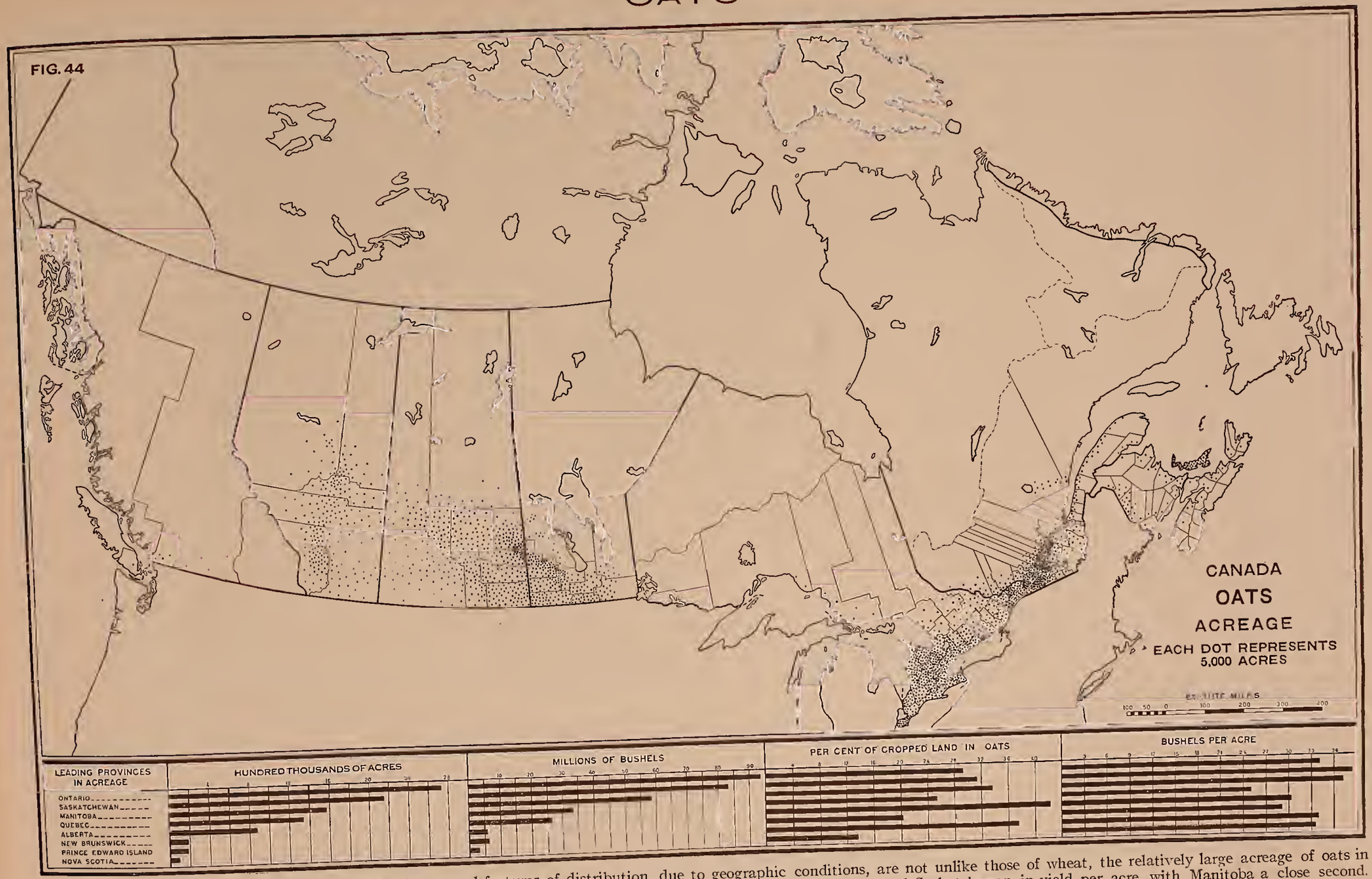


FIGURE 44.—Oat acreage in Canada. While the general features of distribution, due to geographic conditions, are not unlike those of wheat, the relatively large acreage of oats in the eastern provinces will be noted. Alberta, however, leads the provinces in the percentage of cropped land in oats, and Saskatchewan in yield per acre, with Manitoba a close second. Canada produces over 50 bushels of oats per capita of the population, which is many times greater than that in any other country.

BARLEY has a shorter growing season than either wheat or oats. For this reason it is extensively grown in high latitudes, where the summers are short, and also in semiarid lands, where the wet season is short. It is grown for malting, for human food, and for stock feeding. Bright barley is preferred for malting. That grown in moist western England is often discolored. The crop of the eastern counties of England, therefore, and grain imported from dry southern Russia is used for this purpose. Barley forms an important part of the diet of the outdoor laborer of England, parts of Asiatic Turkey, and North Africa. In insular Denmark, the driest portion of the kingdom, barley, with dairy by-products, is the basis of an important swine industry.

EUROPE (fig. 48).—Russia is the world's largest barley producer. The average Russian export of barley is more than 25 per cent of the crop. Most of the crop is grown near the Black Sea. Barley reaches its largest importance relative to the population and to the land in crops in Algeria and in the north of Africa generally. In Libya, in 1909–1910, it occupied 50 per cent more area than wheat. The crop is sown in November to utilize the winter rains; it is harvested in April or May, and thus avoids the dry summer. The bright grain of these dry regions is in demand for malting.

INDIA AND JAPAN (figs. 49 and 50).—The barley crop of India has increased greatly during recent years. It is grown mostly in the valleys of the Ganges and Indus Rivers, largely in the area intermediate between the regions devoted to wheat and to rice. The crop supplements the other food cereals and is an important article of export. Barley is the second cereal crop of Japan. Ordinary barley is largely grown as an upland crop in that country. Naked barley is also grown as a second crop after rice on the lowlands, but rice is the more important crop. Barley mixed with rice is the common food of the country people.

UNITED STATES (fig. 47).—Barley is steadily increasing in importance in the United States. The rapid progress in production is due principally to two causes—the settlement of the West, in which climatic conditions are especially favorable for barley, and the gradual development of its cultivation in the East, where it is used to an increasing extent for feed.

Seven North American barley districts have been recognized by Carleton (fig. 45). In the northeastern district about three-fourths of the crop of the continent is grown, and six-rowed barley gives much the higher yield, the principal variety being Manchuria. In the southern district winter barley is grown and although as yet the production is exceedingly small, barley is rapidly increasing in importance as a feed for live stock. The Northwestern Plains is a two-row barley region. In this district and the Gallatin Valley of Montana the major portion of the North American production of these varieties is grown. The crop is very clean and of good quality. In the Southern Plains district both six-

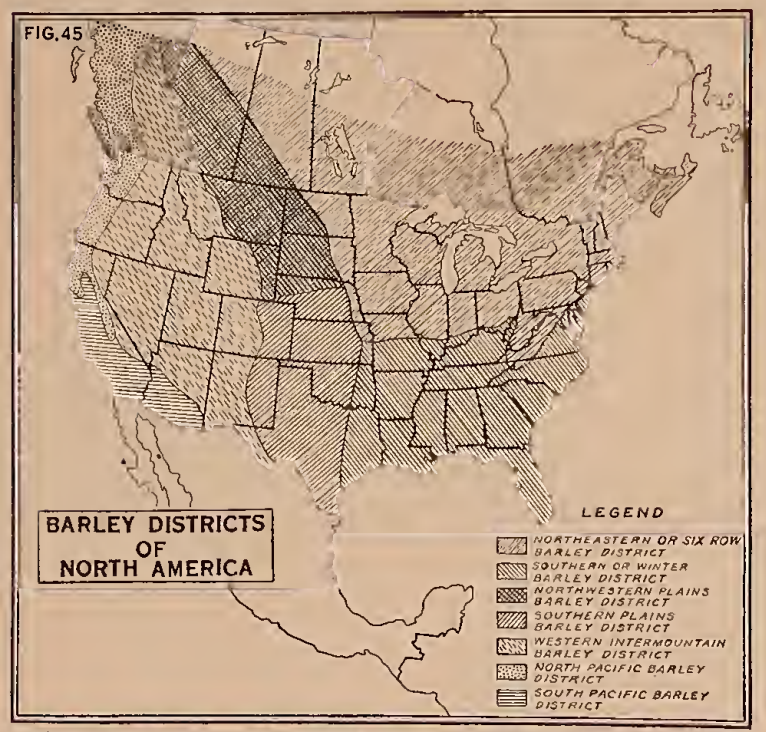


FIGURE 45.—Barley districts of North America (adapted from map prepared by M. A. Carleton). The northeastern district is the most important (see fig. 47). Six-rowed barley is almost exclusively grown. The Northwestern Plains is a two-rowed barley region, while both six-row and two-row barleys are grown in the Southern Plains, the intermountain district, and on the Pacific Coast.

rowed and two-rowed varieties are grown in the northern, and winter barley in the southern portion. The production of this district is small. In the western Intermountain district two-rowed varieties are grown in the northern Rocky Mountain region, six-rowed principally in the south and in eastern Washington, while hull-less and hooded varieties are also grown. In this district barley is grown both by dry-farming methods and under irrigation. In the South Pacific, or California district, climatic conditions are similar to those in the Mediterranean region of Europe, and a local six-rowed variety, known as coast barley, is chiefly grown. Barley is rapidly increasing in importance in this district. In the North Pacific district very little barley is grown as yet and the varietal adaptation is uncertain.

The temperature range of barley in the United States is wider than that of any other cereal. It is grown up to 10,000 feet elevation in Colorado where the summer temperature is only 52° and frosts are frequent, and it is grown in the Imperial Valley of southern California where the summer temperature is 95°. Barley matures on an annual rainfall of less than 10 inches in California, excelling wheat in drouth resistance; but does not endure much wet weather. In general the barley regions of the United States have a slightly subhumid to semiarid climate, with plenty of sunshine.

Barley in the United States, 1839–1909.

Year.	Production.			Acreage.	Value.	
	Total (bushels).	Per cent of all cereals (measured in bushels).	Per capita (bushels).		Total.	Per cent of all crops.
1839	4,161,504	0.7	0.2	Not reported	Not reported	.....
1849	5,167,015	0.5	0.2	.....do.....	.....do.....	.....
1859	15,825,898	1.1	0.5	.....do.....	.....do.....	.....
1869	29,761,305	2.0	0.8	.....do.....	.....do.....	.....
1879	43,997,495	1.6	0.9	1,997,727	.....do.....	.....
1889	78,332,976	2.2	1.2	3,220,834	.....do.....	.....
1899	119,634,877	2.6	1.6	4,470,196	$41,631,762	1.4
1909	173,344,212	3.8	1.9	7,698,706	92,458,571	1.7

Barley can be grown profitably on poorer soils than can wheat; much of the land in the Great Valley of California, for instance, when it has grown wheat for so many years that the yield is too small to be profitable, is then seeded to barley. An interesting division of territory between barley and wheat is found in southeastern Minnesota, where the line of the Wisconsin glaciation separates the regions of dense production of these crops (compare figs. 17 and 47). Wheat is grown on the soils of the more recent Wisconsin glaciation, while barley occupies the older and more leached soils of the Iowan glaciation.

Most of the barley in the United States is grown in Minnesota and the Dakotas; California also raises a large amount, eastern Washington and the famous barley district of eastern Wisconsin constituting the other important centers. A considerable acreage of barley is also found in Kansas, Iowa, eastern Michigan, and central New York. The barley used for brewing is grown almost entirely to the west and northwest of the Great Lakes. Barley is not grown to any extent as yet in the South.

FIG. 46

FIGURE 46.—World's barley acreage. Barley is a much less important world crop than wheat or oats. The important centers of production are southern Russia, northern Africa, and southern Spain, Austria, Germany, eastern England, the north central United States, California, Japan, China, and India. The geographic distribution of barley is more widespread than that of oats, and is similar to that of wheat, though extending somewhat farther north in Europe and slightly farther into the arid regions of northern Africa and southwestern United States. The wide distribution of the crop results from its ability to mature in the short summer of high latitudes and in the short rainy season on the borders of the deserts. In the United States barley has increased in importance more rapidly than any other cereal. Among the most important ten countries shown in the graph, barley occupies in Algeria the largest percentage and in the United States the smallest percentage of the cropped land.

64505—6°

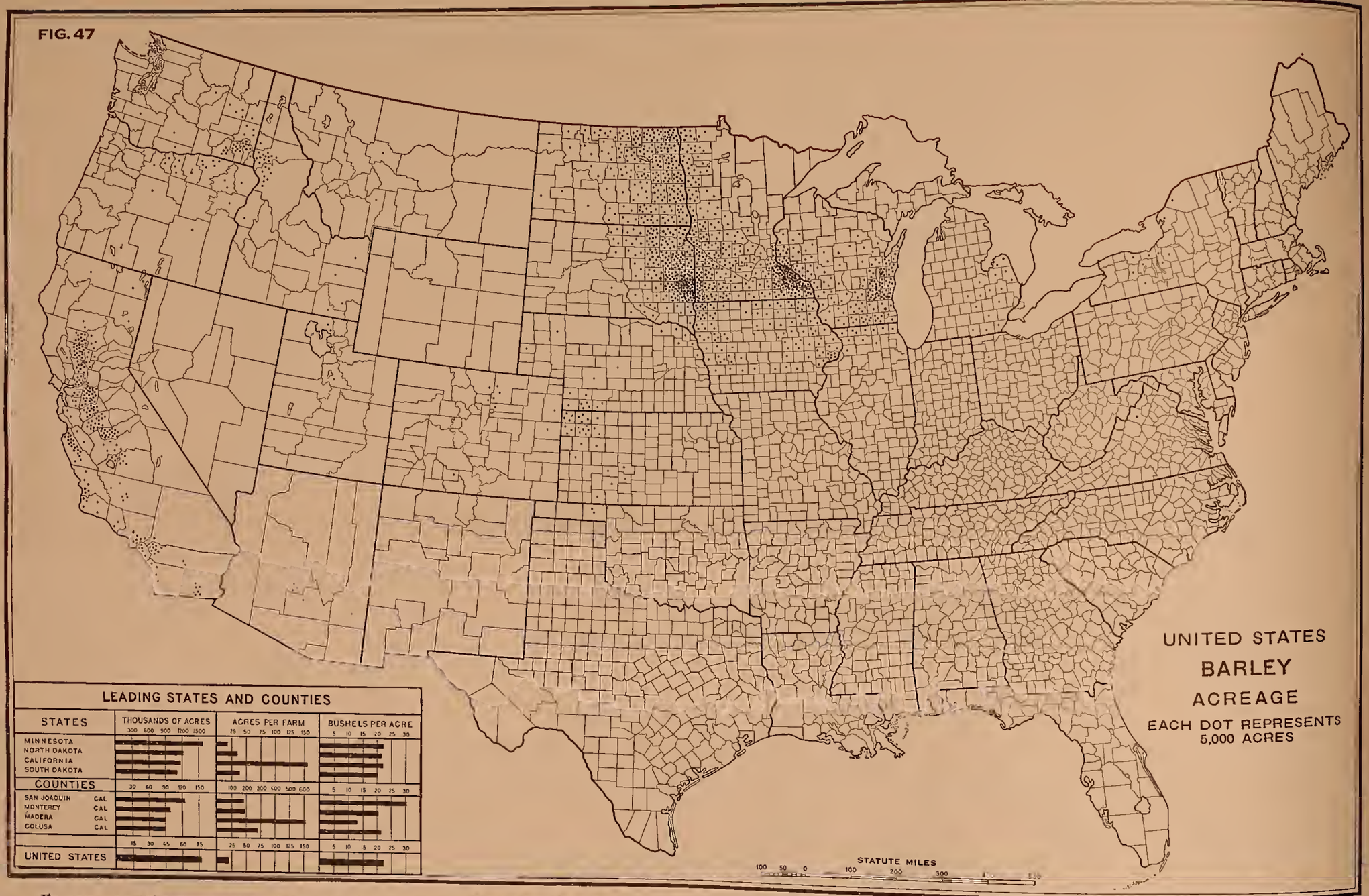


FIGURE 47.—Distribution of barley in the United States. Over three-fourths of the acreage is in Minnesota, the Dakotas, Wisconsin, and California. Minor centers are located in the Palouse region of eastern Washington and northern Idaho, in the Gallatin Valley of Montana, in the Cache Valley of Utah and Idaho, the Salt River Valley of Arizona, the South Platte Valley of Nebraska, in northern Iowa and Illinois, in eastern Michigan and northwestern Ohio, and in the Ontario Shore and Finger Lakes regions of New York. The barley regions of the United States are characterized by eool, subhumid climates, with plenty of sunshine, the erop in California and Arizona being grown during the winter. All the important barley regions in the United States reeeive annually less than 35 inches of rainfall, and have no month during the season of growth in which the mean temperature exeeeds 75°.

FIG. 48

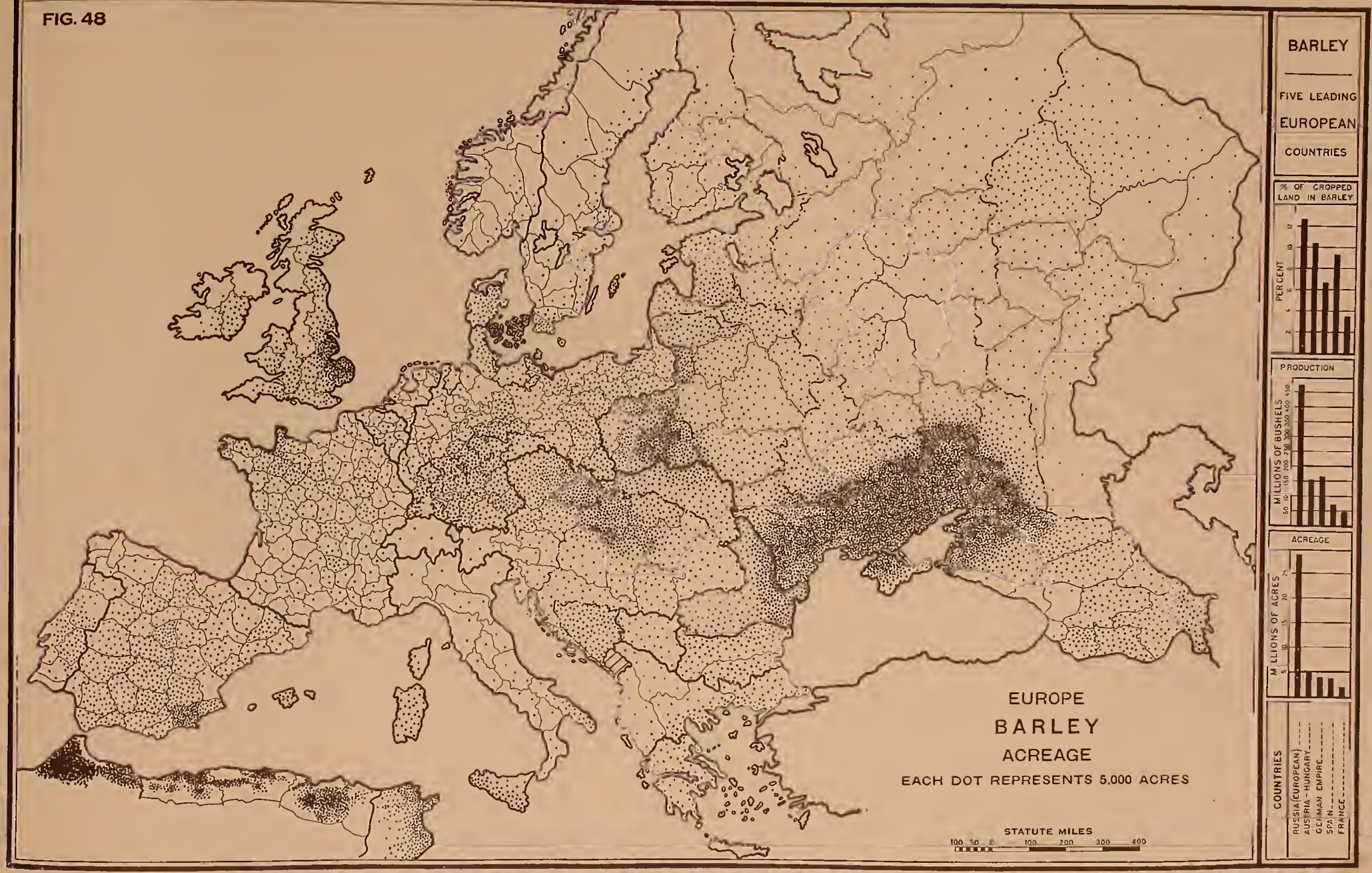
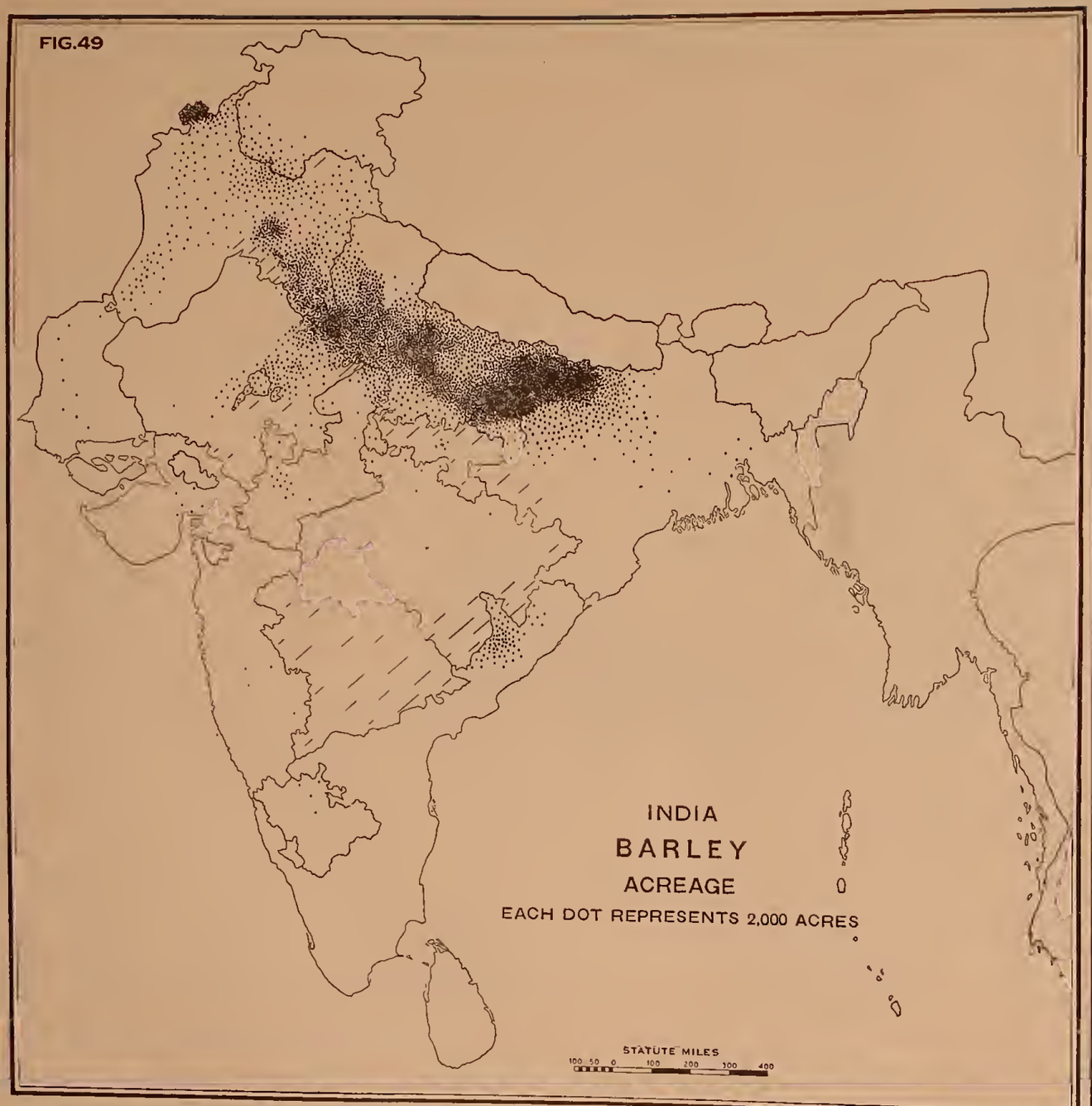


FIGURE 48.—Barley acreage in Europe, Algeria, and Tunis. Russia has much the largest acreage, but the yield per acre is small. Barley ranks fourth among the cereals of Russia in importance and over one-fourth of the crop is exported. Barley reaches its highest acreage relative to the population in two regions of entirely unlike geographical conditions—Denmark and Algeria. In Denmark cool summers make corn production impossible, and barley is grown primarily because of its early maturity and because it yields a larger weight of grain per acre than oats or rye, an important item in connection with intensive animal industries. In Algeria, where early and severely dry summers make an early-maturing grain imperative, barley is the chief food and export cereal. Belgium and the Netherlands have the highest yield per acre.



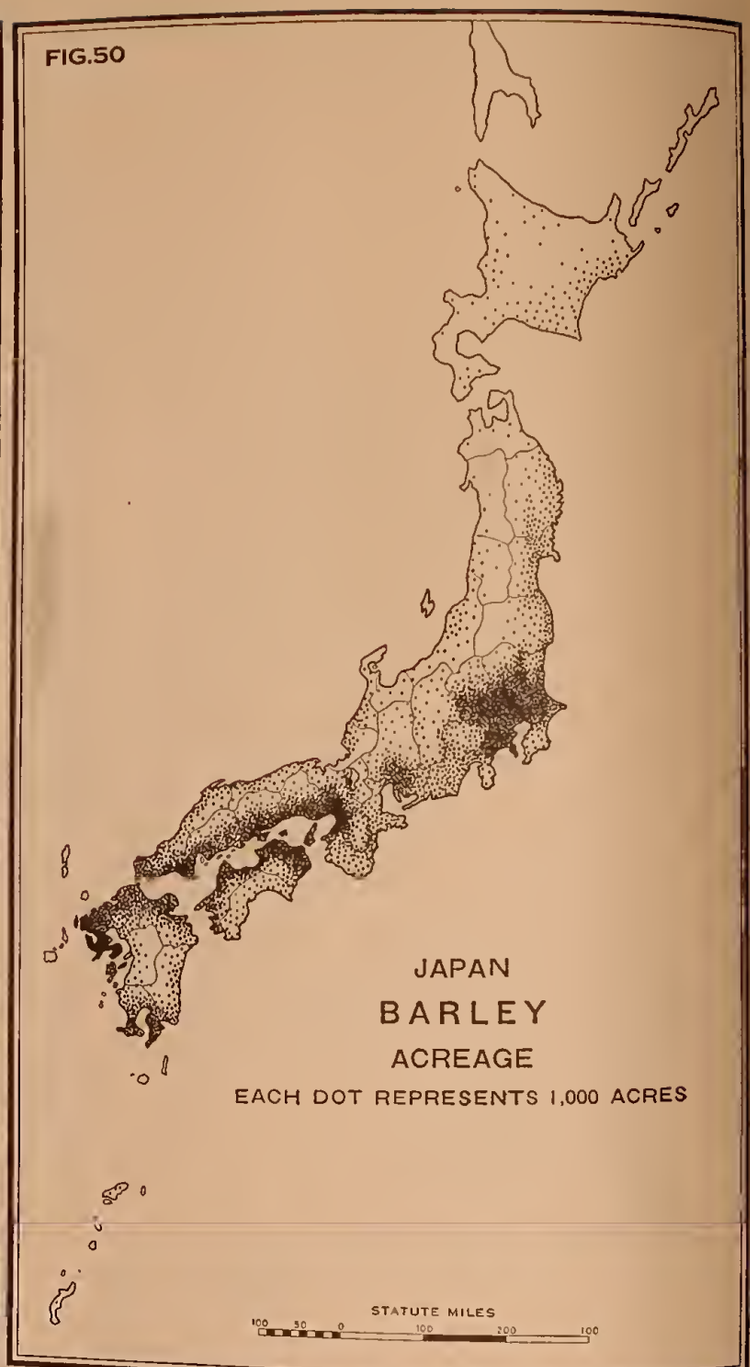


FIGURE 49.—Barley acreage in India and Ceylon. Like wheat and rice, barley is grown mainly on the fertile plains of the Ganges and the Indus. As in Europe, its distribution is in part coincident with that of wheat, but the region of greatest acreage lies in a position intermediate between those of wheat and of rice.

FIGURE 50.—Barley acreage in Japan. The cereal crops of Japan are most abundant in the narrow coastal lowlands and in the coastal valleys. Barley is mostly grown on the southern slopes, which receive the summer monsoon rains.

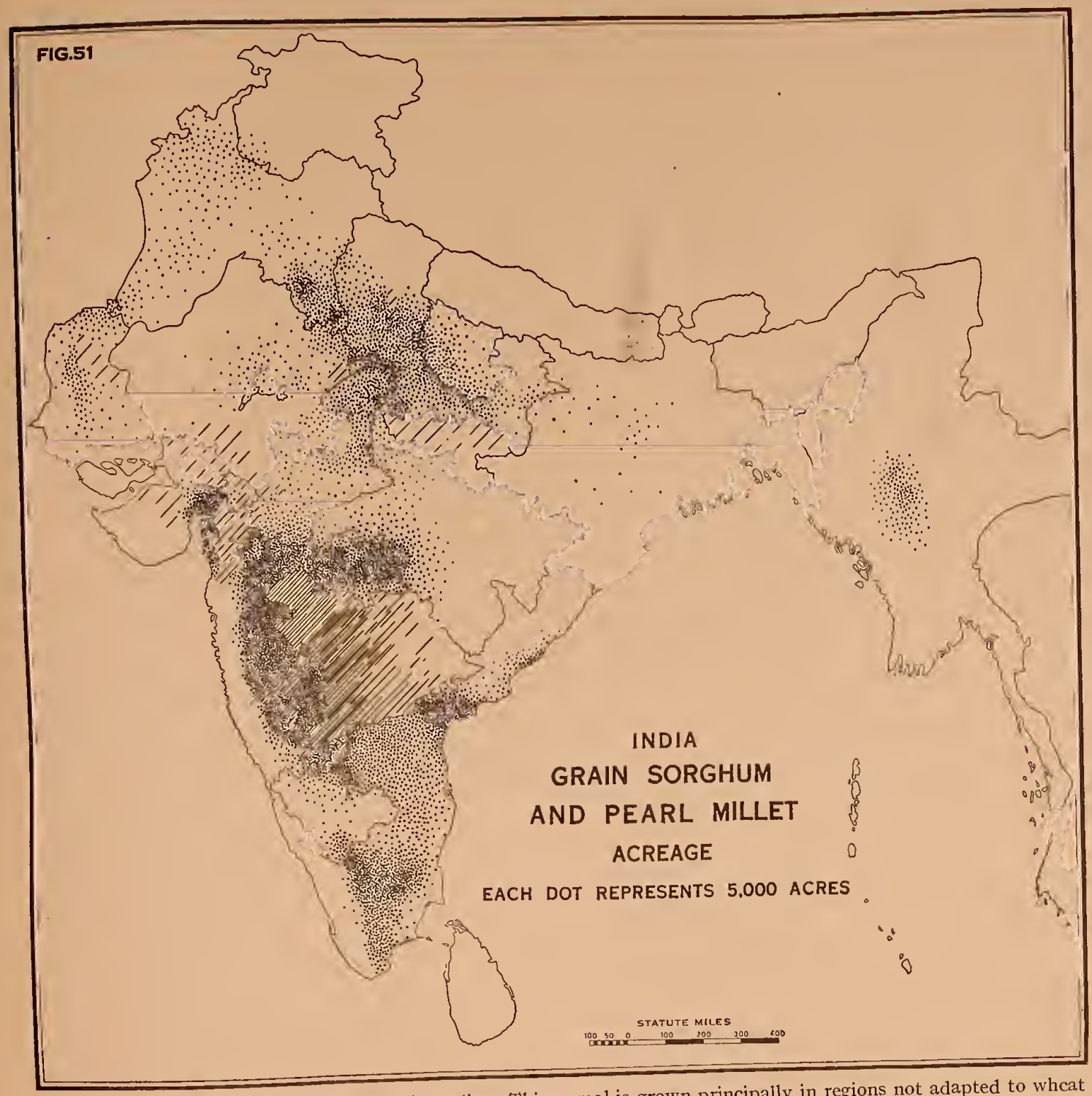


FIGURE 51.—Grain sorghum acreage in India. This cereal is grown principally in regions not adapted to wheat or rice (figs. 25 and 58), which are nearly complementary in distribution. The drought-resistant character of sorghum is strikingly shown in its pronounced absence from wet lands, especially the Malabar coast, also in its presence in the one dry section of Burma. Lack of statistics permits only shading in Hyderabad, where the grain sorghums are probably as important crops as in the adjoining presidency of Bombay.

THE MILLETS, of which there are many varieties, are small seeded cereal and forage grasses. They are grown in the United States and western Europe mainly for hay or green forage, and in China, India, and north Africa principally for the grain which is used both for human food and for feeding live stock. In Russia millet is grown both for human food and for forage.

The three principal groups of millet in the United States are (1) the foxtail, which includes the common millet, the German, the Aino, and the Hungarian; (2) the barnyard millets and (3) the proso, or panicled millets, introduced from Russia, where they occupy a very prominent place in the agriculture of the country. Of the foxtail millets the German scem best adapted to the Southern States, while all

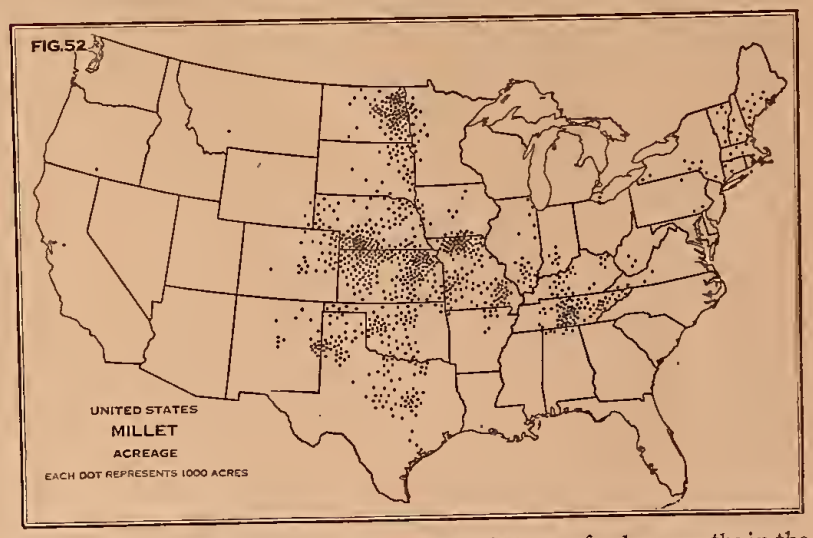


FIGURE 52.—Millet in the United States is grown for hay mostly in the subhumid belt extending from North Dakota to Texas. A considerable acreage is also grown in Missouri, Kentucky, and Tennessee.

varieties are grown in the Eastern and Central States. In the Middle West mostly the common millet and Hungarian are grown, owing to their drought resistance, while the prosos give the best yields in the semiarid northern Great Plains, especially at altitudes above 4,000 feet. The barnyard millets require much more moisture and are grown in the Eastern and Central States and in irrigated areas.

Millets in the United States are grown usually as a supplementary or catch crop, often being planted after the failure of another crop, such as corn or clover. In the Western States they are sometimes seeded in place of the summer fallow, and in the East and South for smothering out weeds. The millets are grown principally for forage, but are used also for silage, soiling, and pasture. The seed of the proso varieties is also being fed to live stock, more especially where corn can not be grown and the sorghums will not mature.

RICE is the great food crop of the Orient, but it has been introduced into Europe and the New World, and a grain of high quality has been produced in these regions. After several centuries of cultivation, however, the non-Oriental rice regions are still comparatively unimportant, producing less than 3 per cent of the world's crop.

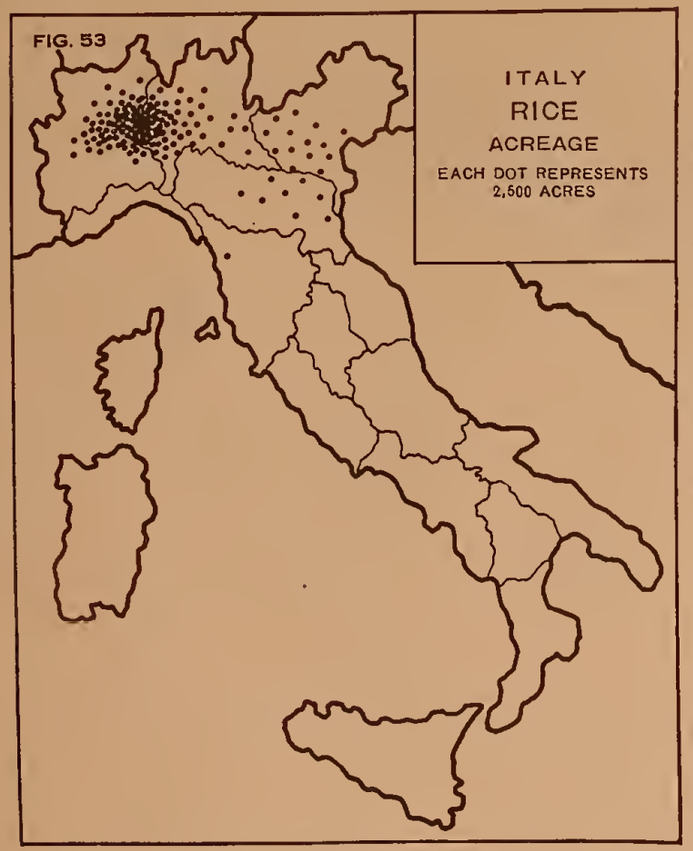


FIGURE 53.—Rice acreage in Italy. The warm climate of the protected Po valley, the flat land, abundant labor supply, and copious irrigation here furnish the necessary conditions for rice on the extreme northern margin of its zone of cultivation.

Rice is not a bread grain. It is poorer than other cereals both in fat and protein, and is supplemented in the diet by legumes, fish, or other foods. These deficiencies give it, however, excellent keeping quality in hot, humid climates.

An exceedingly large number of varieties of rice are grown in the Orient, doubtless as the result of lack of intercourse between peoples who live in noncontiguous regions. These varieties differ in size, color, composition, climatic requirements, and season of maturity. They may be grouped into two general classes on the basis of their water requirements. These are known as "hill rice" and "swamp rice." The latter is much more extensively cultivated.

The important condition requisite for rice cultivation is availability of water. Swamp rice requires flooding at frequent intervals from the time it is sown until near its maturity. For this reason the water supply and features of surface configuration determining suitability for irrigation are of the largest importance. Hill rice is grown without irrigation in portions of the Orient where rainfall is abundant and the topography unsuited to irrigation. The yield is normally less than half that from irrigated rice.

In Louisiana rice is found to need an amount of water equivalent to ½ inch of rainfall daily for 90 days, or 45 inches of water. As about 20 inches usually falls during the season, 25 inches, or 675,000 gallons per acre, are supplied by irrigation annually. In parts of the Philippines the rainfall of 45 inches during July, August, and September floods the rice fields without the necessity of irrigation. The best rice regions have an annual rainfall of 50 inches or over, and a rainfall of 5 inches a month during the growing season. Rice also prefers a damp climate. The warm and wet Gulf winds have made the southern Louisiana and Texas region peculiarly adapted to the growth of rice of high quality.

Although a tropical cereal, thriving in regions of great heat and high atmospheric humidity, rice is also successfully grown well into the temperate zone. Rice requires a growing season throughout the monsoon region of Asia about six months in length, but in Italy only four months are needed. In the Carolinas and Louisiana rice is planted in April and early May and harvested in September. If planted at any time from March to early June, it apparently ripens at approximately the same time. The crop is seldom successful where the mean temperature during the four months' growing season is less than 75°. In Japan, however, rice is cultivated as far north as latitude 42°, where the summer temperature is 70°, and in Italy it reaches latitude 45° in the valley of the Po. Rice could be grown in the United States as far north as the mouth of Ohio River.

Rice is grown on a large variety of soils, their suitability being determined primarily by their physical consistency and ability to hold irrigation water. A most favorable condition is found when a friable loam overlies a heavy clay. The upper layer permits root development, while the clay prevents underdrainage and holds the water that is so essential for rice growing. Such soils are found on coastal lowlands, particularly in deltas, where the nearly level surface is also ideally adapted to irrigation. Evidence of the favorable nature of these conditions is found in the importance

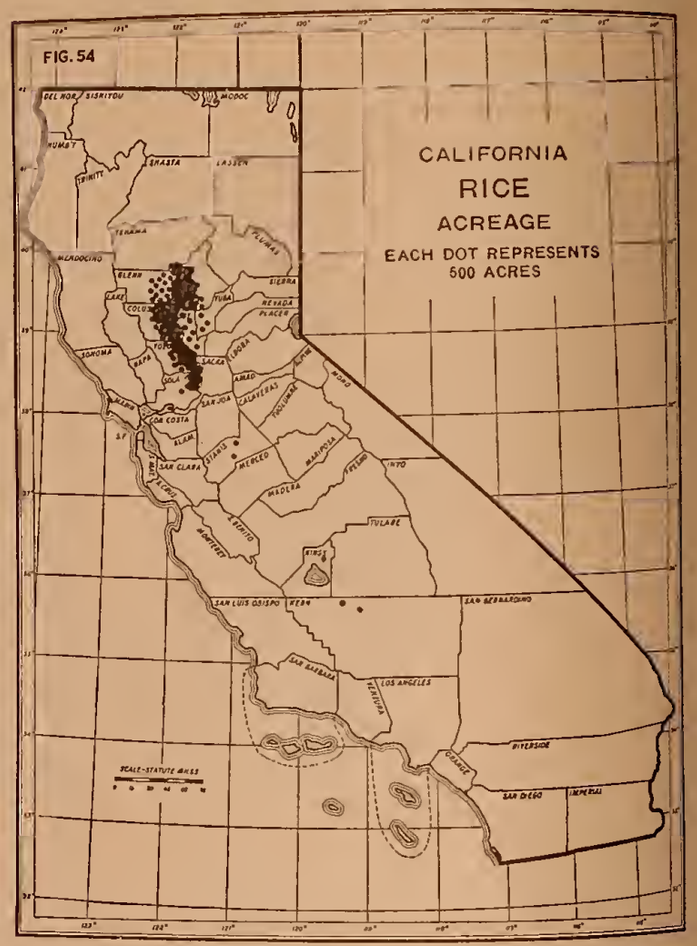


FIGURE 54.—About 67,000 acres of rice were grown in the Sacramento and San Joaquin Valleys of California in 1916. This extensive development has occurred since 1909.

of the rice crop on the deltas of the rivers Ganges, Yangtze, Irrawaddy, Mekong, Po, Nile, and Mississippi.

INDIA (fig. 58), including Burma, produces over 70 per cent of all rice produced outside of China, for which country statistics are not available. Comparison of figure 58 with the physiographic and rainfall maps (figs. 1 and 2) shows the close relationship between rice production and lowland

and heavy rainfall. The general distribution of the rice area is also complementary to that of wheat and sorghum (figs. 25 and 51). Rice is doubtless the most important food cereal of India, but the impression that it is equally important in all sections of the country is unfounded. Many densely populated districts produce no rice at all.

India has several rather widely separated rice-producing districts. The narrow strip of lowland lying between the Western Ghats and the coast produces rice throughout its length, the southern or Malabar coast section being most important. The climate of this coast is very humid. It receives the monsoon winds almost at right angles and the steep slopes of the mountains cause a heavy precipitation on the coast, ranging from 75 inches per year in the north to more than 100 inches in the south. The temperature is high and uniform. The east coast of peninsular India is also a rice-producing section. The climate is somewhat drier, the annual rainfall being, in all except the northern portion, under 50 inches. The areas of most intensive rice cultivation are found upon the irrigated deltas of the rivers Mahanadi, Godavari, Kistna, and Cauvery.

The region of largest importance in the production of Indian rice is the delta and lower flood-plain of the Ganges. This lowland is densely populated, except on the seaward margin, where dense jungles predominate. The rainfall ranges from 50 inches in the western portion to 100 inches on the east, and comes chiefly between June and November. The land is divided into plats by low embankments and the soil reduced to a thin mud by plowing with bullocks or buffaloes. In this mud the rice is sown or transplanted by hand from seed beds. The crop is harvested in autumn, usually before the coming of the dry season.

The rice-producing regions of India proper have a dense population and little rice remains for export. Such is not the case in Burma, where a large amount of the grain is produced on the coastal lowlands. The less densely populated portions of Malaysia produce a relatively large surplus. India, including Burma, exports but little more than 10 per cent of its rice crop, while Siam exports over 50 per cent.

JAPAN (fig. 59) differs little from India in general methods of rice production. The coastal lowlands and the river valleys are the most important rice lands. Hill rice occupies less than 2 per cent of the area under this cereal, ordinary swamp rice 90 per cent, and a glutinous rice the remaining 8 per cent. The importance of rice to the people is very great, the per capita production being over 170 pounds. Limited land area and dense population give an average value of $500 and sometimes more than $1,000 per acre to the best rice land. Abundance of labor and the high price of land cause an intensive form of cultivation and a product of high quality.

CHINA.—Accurate statistics of rice production in China are wanting. The crop is grown on the coastal lowlands and terraced hill slopes of the country, except in the north and in the western highlands, where it is replaced by wheat, barley, and other grains. The total rice acreage of China is undoubtedly very large, probably larger than in India.

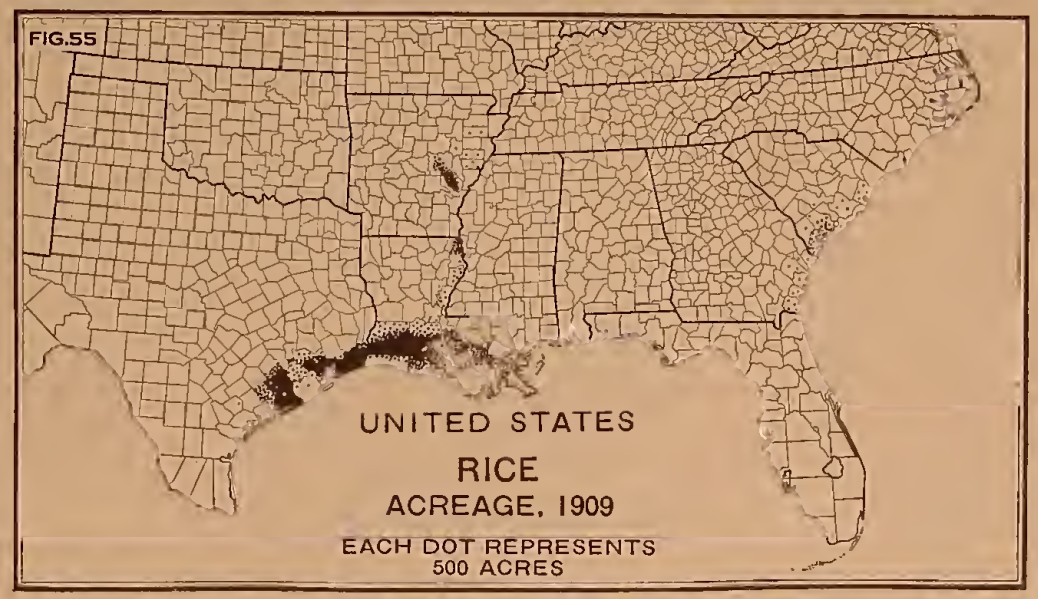


FIGURE 55.—Rice acreage in the southeastern United States, 1909. Over three-fourths of the rice is grown on the coastal prairies of Louisiana and Texas, and practically all the remainder in Arkansas, California, and South Carolina.

Other important oriental rice lands are found in Java and the Philippine Islands. Methods of production and the conditions which surround the industry are, however, much the same as those found in India and Japan.

UNITED STATES (figs. 54 and 55).—The rice production of the United States is insignificant compared with that of oriental countries, but owing to the small consumption per capita (9.6 pounds), the production is about 75 per cent of the consumption. The development of the rice industry in the United States has occurred principally in five regions:

(1) In the Carolinas and Georgia rice is grown on the tidal deltas, protected from the sea and rivers by levees, flooded at high tide by fresh water from the rivers, drained when desired at low tide. This is the old rice-growing region of America, rice having been introduced here in 1694. The Civil War, however, almost ruined the Carolina rice industry.

(2) In the alluvial river bottom lands of Louisiana rice is grown mostly on old sugar plantations. The irrigation is from the river with drainage through large parallel ditches back to the bayous.

(3) The prairies of southwestern Louisiana and eastern Texas now grow most of the rice in the United States. The water is largely pumped from wells and the bayous. The rice is grown in level fields of 20 to 100 acres in extent and is planted and harvested by machinery. The use of modern machinery in rice culture, introduced by a few northwestern wheat farmers who settled in the region about 30 years ago, is known in no other country in the world and permits the profitable production of rice without the cheap labor of the Orient. The average number of acres of rice per laborer and the labor cost of production per acre has been estimated by Dr. S. A. Knapp as follows:

	Acres per laborer.	Farm wage and board per year.	Labor cost per acre.
Japan	½ to 1	$10 to $18	$10 to $36
China	½ to 2½	8 to 12	4 to 6
India	3	10 to 20	4 to 7
Egypt	4	15 to 30	4 to 8
Italy	5	40 to 60	8 to 12
United States:			
Carolina	8	96 to 120	12 to 15
Mississippi Delta	10	120 to 144	12 to 14
Louisiana-Texas	80	160 to 240	2 to 3

This rice belt is capable of development from the Colorado River in Texas, 500 miles northeastward to the Mississippi Delta in Louisiana. It extends about 60 miles inland and possesses an average elevation of 6 to 40 feet. The surface is practically level, the soil a sandy loam to a clay, underlain by tenacious clay at an average of 15 to 18 inches, while water-bearing gravel is found at 60 to 250 feet to supplement the irrigation from the rivers. This is the great future rice region of the United States.

(4) A similar, though much smaller, development has taken place on the prairies in eastern Arkansas.

(5) Recently the Sacramento delta lands in California have been utilized for rice production, and the industry in that State is rapidly expanding (fig. 54).

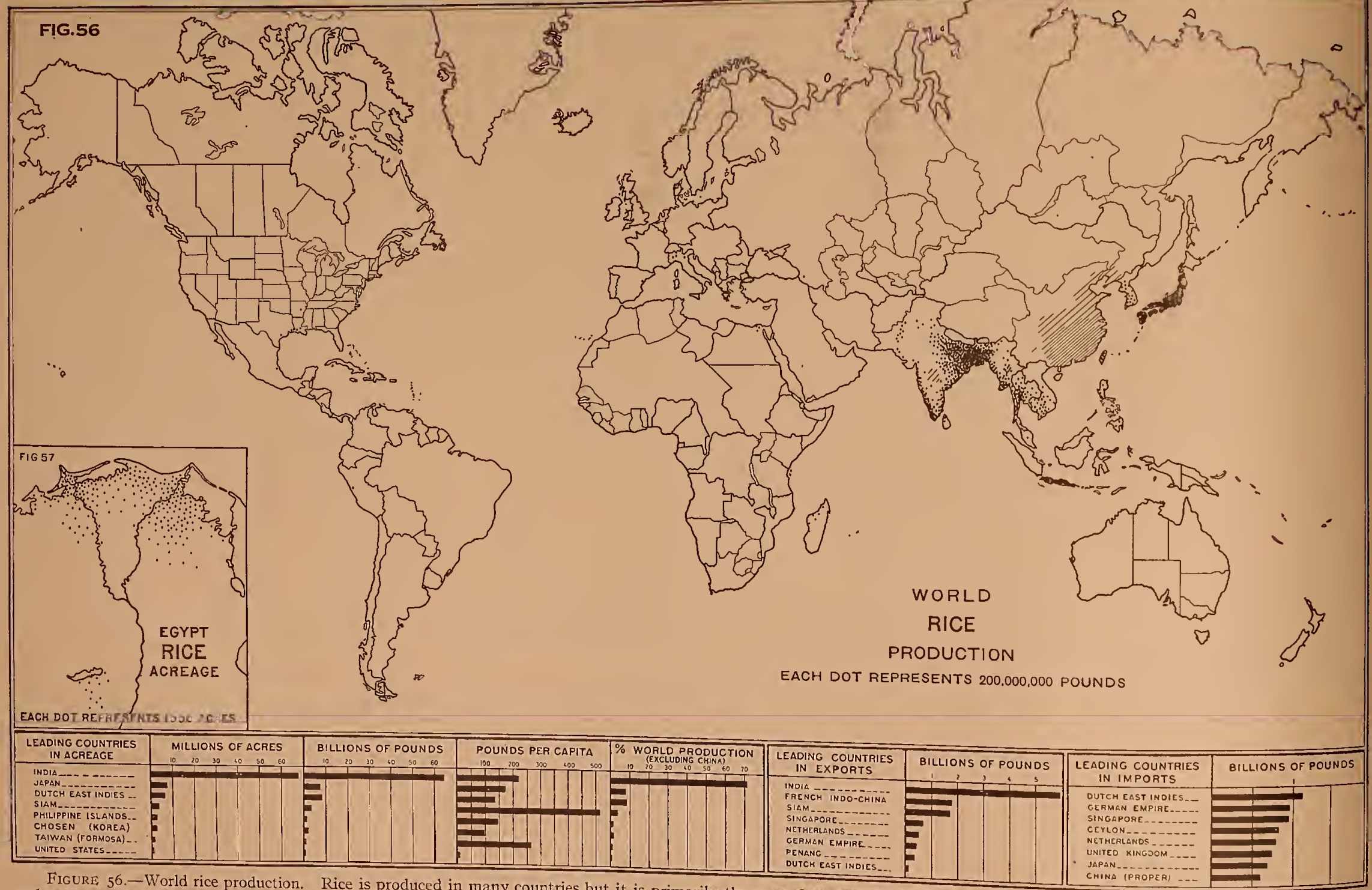
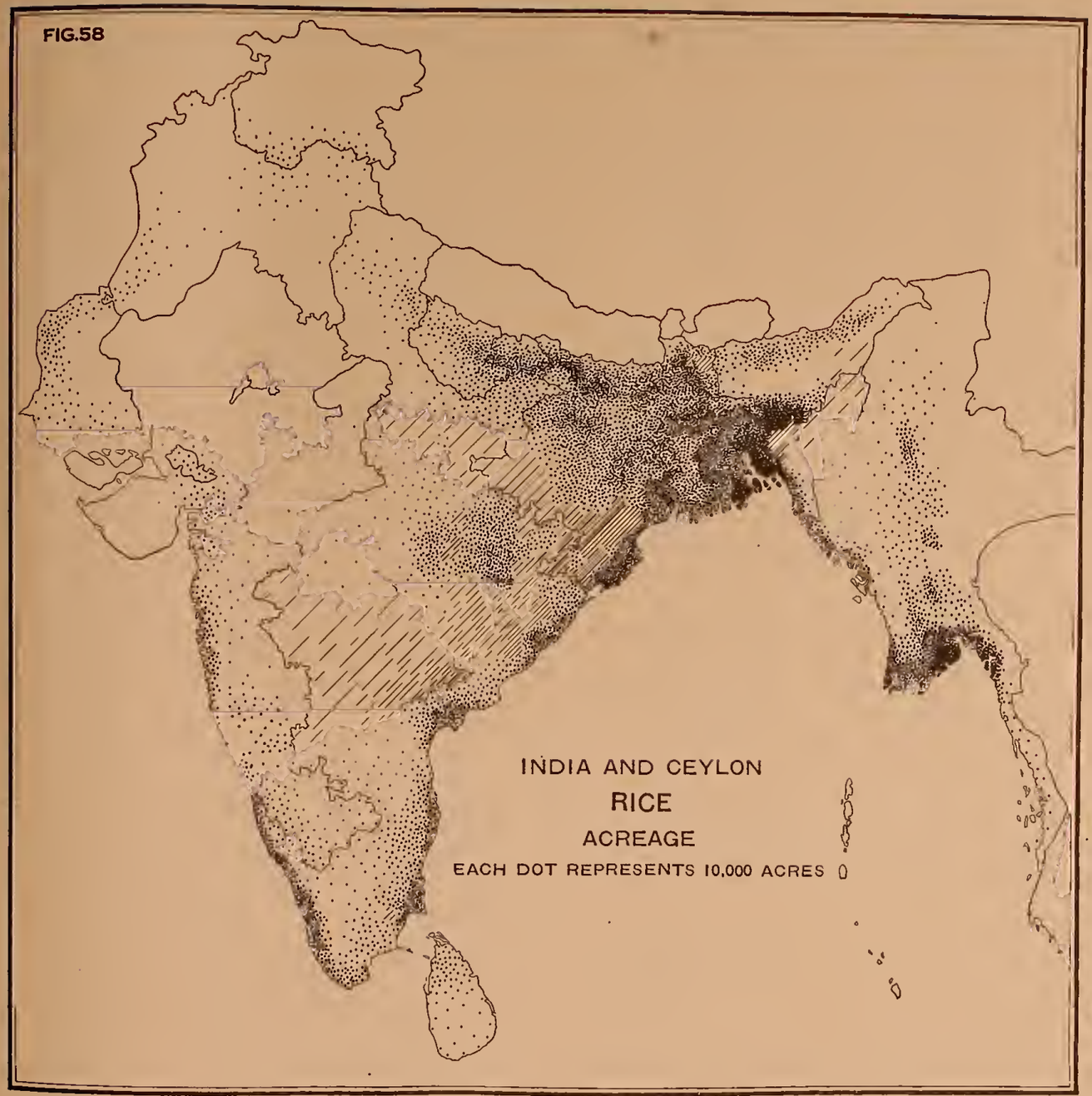


FIGURE 56.—World rice production. Rice is produced in many countries but it is primarily the crop of the Orient, 97 per cent of the world's production being grown in southern and eastern Asia and adjoining islands. In general, rice is grown on level, wet lands, particularly river deltas, such as those of the Yangtse, Ganges, Nile, Po, and Mississippi. In some regions the level land is artificially produced by terracing. For such agriculture the dense populations and cheap labor of the Orient is necessary. The rice production of Africa and the American continents is so small that it barely shows on the map.

FIGURE 57.—This insert map shows the land in Egypt under rice in 1913. The crop is largely confined to the outer margin of cultivable land on the delta.



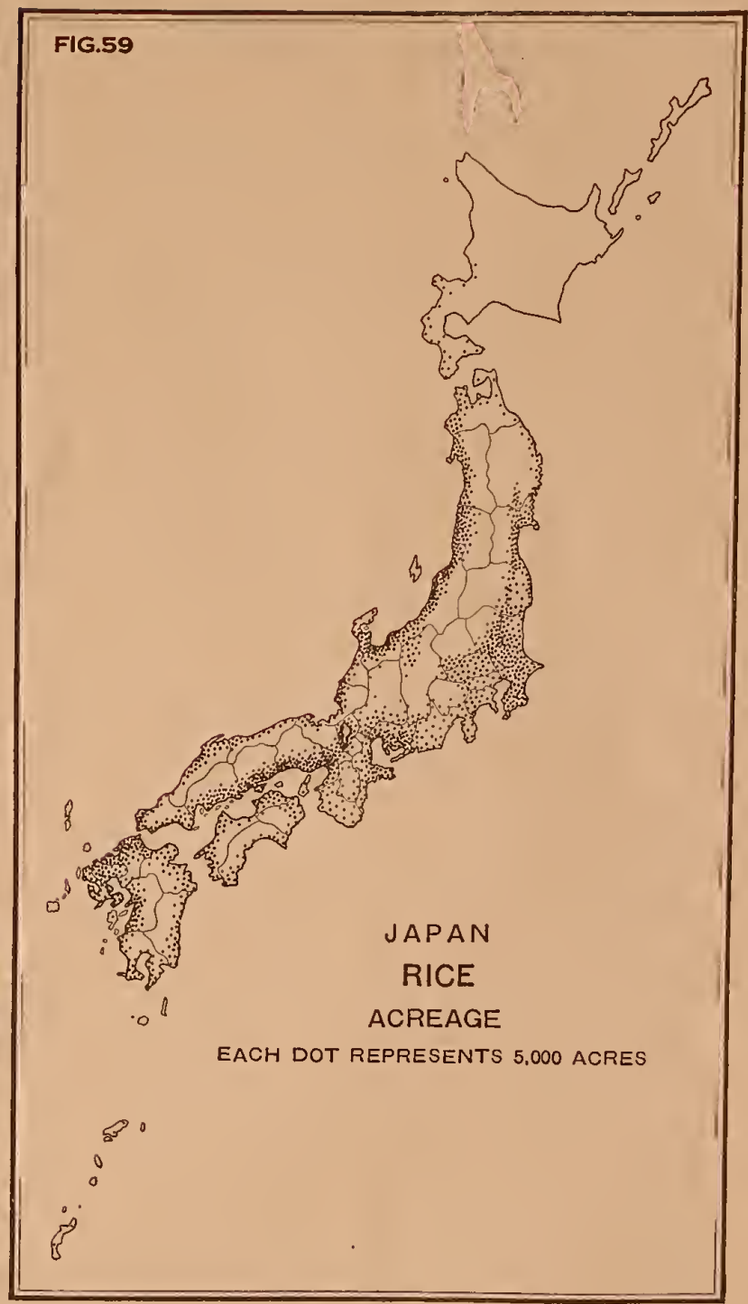


FIGURE 58.—Riee acreage in India and Ceylon. The many varieties of riee may be elassified as upland or "hill" riee and irrigated or "swamp" rice. The latter is much more important, the chief centers of produetion being loeated in the lower Ganges valley and delta, the irrigated borders of the Indus, the eoastal margin of the Deccan, and the valley and delta of the Irrawaddy. The upland riee is grown in small quantity in the interior of the Deecan and in northwestern India. Compare the geographic distribution of riee with that of wheat (fig. 25), barley (fig. 49), and the grain sorghums (fig. 51).

FIGURE 59.—Rice aereage in Japan in 1912. The importanee of rice to the Japanesc is shown by the fact that it normally oeeupies nearly one-half of the total cultivated land of the Empire, while the value of the crop is about twiee that of all other crops.

64505—7°

COTTON

COTTON has had a recognized value for many centuries, but the cost of separating the lint from the seeds permitted only a restricted use. With the invention of the saw gin in 1793 this fiber rapidly replaced linen and wool for many common purposes. The demand has become so great that the world is being searched for places suited to its cultivation.

Cotton is of tropical origin, but is now grown in many places between 40° N. and 30° S. The world's commercial crop, however, is almost all produced in the Northern Hemisphere (fig. 62). Sixty per cent of it comes from that section of southeastern United States between 30° and 37° N. The cotton plant, in most of its forms a perennial shrub, is forced to change its habit of growth in these northern regions. As commonly cultivated it is an annual which finds in the summer season the necessary high temperatures. Since the plant grows rather slowly, it requires at least six months free from frost. Moreover, the summer temperatures should be warm both day and night. Although cotton requires considerable rainfall during the growing period, continuous rainfall and cloudiness are detrimental. The ideal rainfall is of the summer thundershower type with periods of bright, warm weather between rains. As the cotton matures and the bolls open, frequent rains are especially undesirable, as the exposed fiber is thereby discolored and damaged. Cotton is grown on an extraordinary variety of soils, but the rich alluvial delta lands of the Mississippi, the Colorado, and the Nile produce the highest yields.

Although cotton is successfully planted and cultivated by machinery, the picking of the fiber remains a hand process, making a plentiful supply of cheap labor during the picking season one of the economic requirements of a cotton-producing region.

UNITED STATES (fig. 65).—Cotton ranks second in value among the crops of the United States and occupies fifth place in acreage. It is the most important commercial crop of this country and within the cotton belt has a value exceeding that of all other crops combined. About three-fifths of the world's cotton is produced in the United States. The production of cotton has increased at a somewhat greater rate than the population since 1840.

Four principal commercial types of cotton are grown in the United States—short-staple upland cotton (under 1⅛ inches in length), which is by far the most important; long-staple upland (1⅛–1½ inches), which is largely confined to the Yazoo Delta in Mississippi, a few counties in South Carolina, and the Imperial Valley of southern California; Egyptian cotton (staple 1¼–1¾ inches), recently established in the Salt River Valley of Arizona; and Sea-Island cotton which has a very long staple (1½–2 inches), and is grown along the South Carolina coast and inland in southern Georgia and northern Florida.

Cotton in the United States, 1839–1909.

Year.	Production.		Acreage.	Value.	
	Total 500-lb. bales.	Per capita (bales).		Total.	Per cent of all crops.
1839	1,580,959	0.09	Not reported.	Not reported.	Not reported.
1849	1,975,274	.09	.....do.....	.....do.....	Do.
1859	4,309,642	.14	.....do.....	.....do.....	Do.
1869	2,409,597	.06	.....do.....	.....do.....	Do.
1879	5,755,359	.11	14,480,019	.....do.....	Do.
1889	7,472,511	.12	20,175,270	.....do.....	10.8
1899	9,534,707	.12	24,275,101	$323,758,171	12.8
1909	10,649,268	.11	32,043,838	703,619,303	

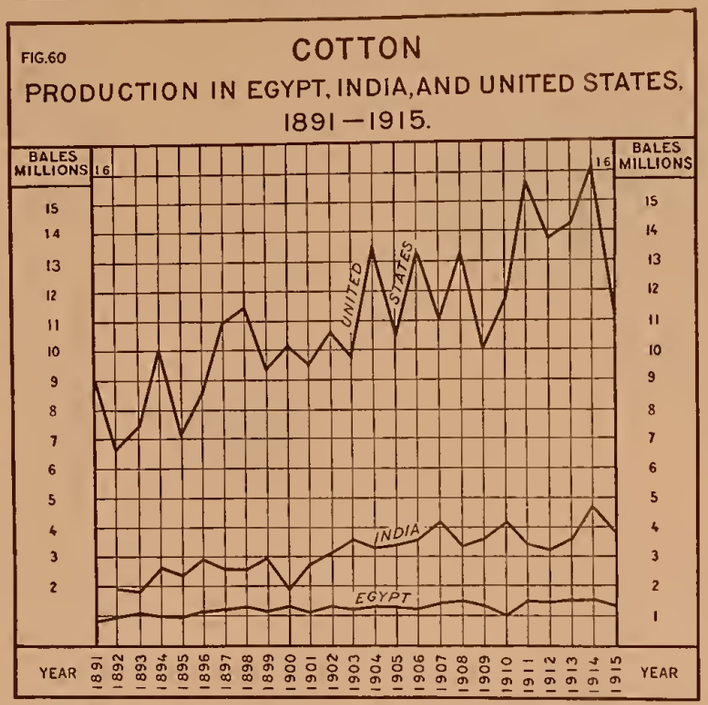


FIGURE 60.—The cotton crops of Egypt and India, as well as the United States, have nearly doubled during the past quarter century.

The northern limit of cotton growing in the United States follows closely the mean summer temperature line of 77° and very little cotton is grown where the frostless season is less than 200 days. The western limit of cotton is approximately the line of mean annual precipitation of 23 inches. Within these outer boundaries the more favorable climatic conditions are a frostless season extending from April 1 to November 1, with warm and moderately moist weather from April to August. The autumn weather, on the other hand, should be dry and rather cool, as this results in a better quality of cotton and facilitates picking. Very little cotton is grown along the Gulf coast and practically none in southern Florida, owing partly to the swampy or very sandy soils and partly to the greater autumn rainfall.

The best cotton soils are fertile silt or clay loams, though in a wet season sandy loams are safer, as the cotton on such soil is less likely to run to wood with a small production of lint. The centers of production stand out clearly on the map, the Piedmont and upper Coastal Plain of South Carolina and Georgia, where large amounts of artificial fertilizers are used (fig. 66), the Black Prairie of central Alabama, which curves around into northeastern Mississippi, the rich Yazoo bottoms along the Mississippi, and, most prominent of all, the fertile Black Prairie region of Texas.

Since most of the staple crops have a wider geographic range than cotton, it is more profitable to produce cotton in those sections of the United States where it can be grown, than to produce other crops; and since cotton requires labor throughout almost the entire year, where cotton is grown the other crops become of minor importance. However, since the picking of cotton requires a large amount of hand labor, and the acreage is therefore limited to that which can be picked by the farmer's family, a small acreage of other crops is cultivated without interfering seriously with the cultivation of the more important cotton crop. Throughout most of the cotton belt 50 to 80 per cent of the cropped land is in cotton, and most of the remainder in corn, which is indispensable as the source of food supply.

Land devoted to cotton continuously, or in alternation with corn, declines in fertility, principally because of the erosion of the frequently cultivated soil, and depletion of the organic matter and humus. Despite this, however, and also the fact that rotation with other crops, especially cowpeas, has proved of great value, the continuous cultivation of cotton year after year is still the common practice. In order to secure a profitable yield commercial fertilizers are largely used, more especially in the eastern sections of the cotton belt which have been under cultivation for a longer time.

A serious menace to the cotton-growing industry in the United States appeared in 1892, when the Mexican cotton boll weevil invaded Texas. This insect has extended its devastations northward and eastward, leaving a diminished cotton production, lowered land values, and economic depression in its wake, until it has now reached the South Atlantic States (fig. 65). The more extensive planting of other crops,

greater diversification in agricultural enterprises, especially the production of more live stock, and closer attention to methods of cotton culture have proven the most effective remedies, so that by some this plague is even esteemed a blessing in disguise.

INDIA (fig. 67) has long occupied second place in the commercial production of cotton, the crops of 1907 to 1910 averaging nearly 18 per cent of the total for the world. The crop is distributed over a large part of the country and is grown under widely differing conditions of soil and climate.

The cotton soils of India may be divided into three general regions: (1) The recent alluvium of the plains of the Indus and the Ganges; (2) a central western zone extending from Rajputana to the Deccan and characterized in part by dark, limy, clay soils called "regur," the famous cotton soils of the country; (3) a southern region of crystalline rock with red and yellow residual soils high in iron. The regur is also found in limited portions of this region.

The highest grade of Indian cotton is grown in southern Madras near Tinnevelly, Madura, and Coimbatore. In this region the maximum rainfall comes between June and October, the annual amount being only 27 to 30 inches. The period of extreme drought comes in March. Since there is no danger of frost in such low latitudes the crop is planted in October at the end of the wet season and picked in March or April before the coming of the monsoon rains. Owing to insufficient rainfall, irrigation is necessary in some years in Madras. Water is obtained mainly from wells. In this region there is also some perennial cotton.

The most important cotton-producing region of India lies along the rivers Nerbudda and Tapti and extends across the Bombay Presidency, Baroda, and Berar. In the latter province nearly one-half the cultivated area is in cotton. This district, particularly Berar, is the chief region of regur soils. These soils do not always overlie the same geologic formation, but have in common their blackness and high clay content which makes them very sticky when wet and subject to cracking when dry. The annual rainfall of the coastal portion of this cotton belt is over 40 inches, but in Berar barely over 30 inches. The rainy season begins in June and ends with October. In Berar the cotton is planted in June and picked from October to January during the dry weather. In Bombay the planting is in July or August and the picking lasts from January to April. The cotton of this region is called Surat and is of average quality.

The cotton of the Punjab and the lower Indus Valley is grown under irrigation. There are large areas of land suitable to cotton production in this region if irrigation were possible. The cotton of the lower Indus Valley, known as Sind, is short staple and brings a low price. The yields are comparatively high, however, owing to irrigation.

Indian cotton is almost universally raised at great expenditure of hand labor on small private landholdings. Improved machinery is used in ginning and baling.

EGYPT (fig. 58) ranks third in commercial cotton production. The average crop during 1911–1913 was 6 per cent of the world crop. As in northern India, cotton raising is possible only with irrigation, the rainfall being but 8 inches at Alexandria, about 1 inch at Cairo, and practically nothing in upper Egypt. The cultivable land is limited to the delta and a strip, in some places no more than a mile wide, to which the waters of the Nile can be carried (fig. 28). Although cotton is grown in the southern half of the valley, more than three-fourths of the crop comes from the delta.

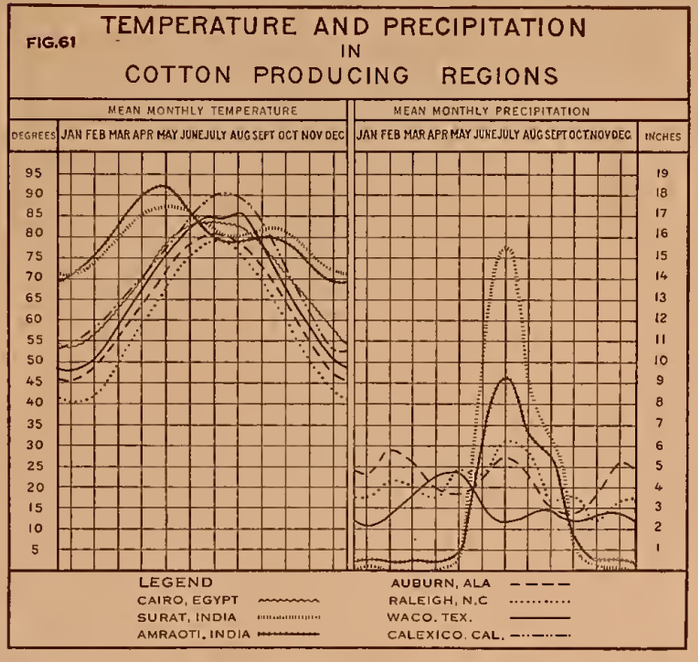


FIGURE 61.—The summer temperatures in the various cotton producing regions are similar, having a mean July temperature between 80° and 90°; and the distribution of precipitation, though varying greatly in amount at other seasons of the year, is similar in showing an October rainfall of 3 inches or less. Heavy rains in the fall interfere with picking and also reduce the quality of the crop.

In upper Egypt cotton planting begins in February. Picking extends from late in August to October. In the delta the planting comes in March or April and picking continues as late as December. Although frosts are rare, cold dews and foggy weather in March sometimes retard germination and occasionally damage is caused by violent rains and excessive heat and sunlight. Irrigation practice differs slightly in upper and lower Egypt. In general the land is watered before plowing, again when the seed is sown, a third time after about 20 days, then a rest of about 40 days, followed by irrigation about every 15 days until the flood. During the flood the water is held from the fields by dikes and permitted to enter only at stated intervals. On the delta irrigation serves also to wash from the soil alkali and salt water which would otherwise permeate much of the arable land. The cultivation of Egyptian cotton is very intensive, 90 per cent of the landowners having 5 acres or less, and more than 50 per cent less than 1 acre.

Other countries which figure in the world's cotton production are China (probable production about 16 per cent), the Russian Empire (4 per cent), and Brazil (nearly 2 per cent). All other countries combined, including the much-discussed sections of Asia Minor and tropical Africa, do not produce 5 per cent of the world's crop.

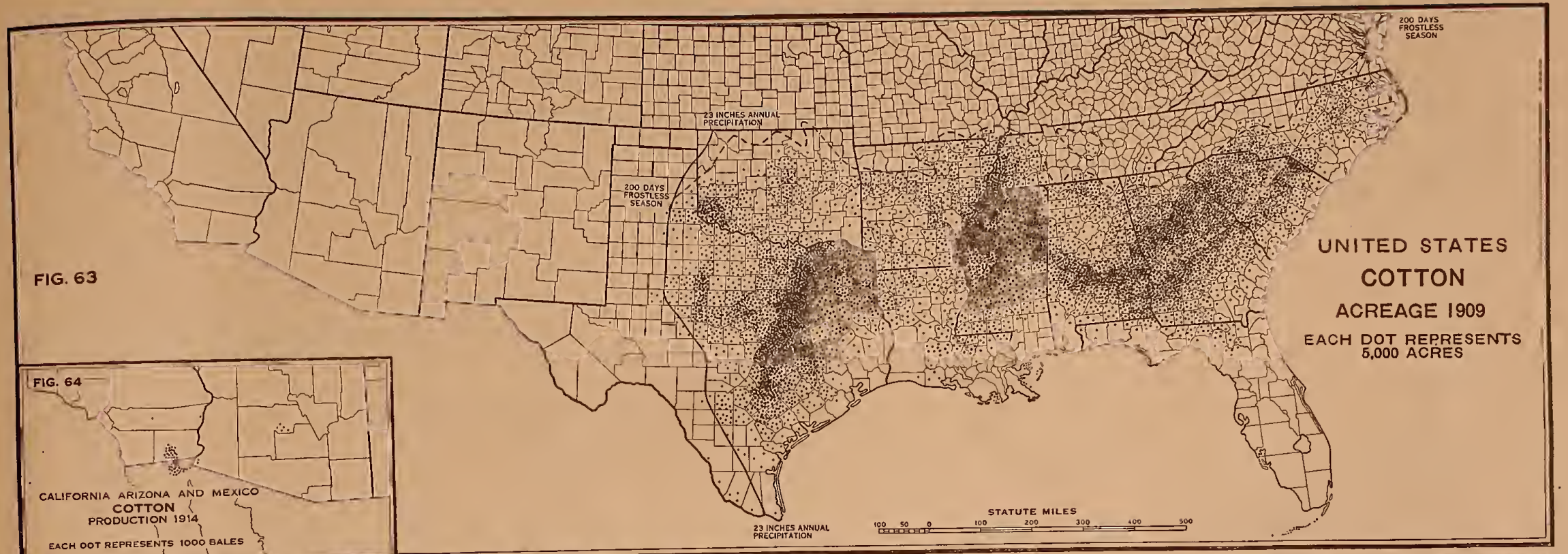
CHINA'S cotton crop is estimated at about 4,000,000 bales, of which 1,800,000 bales constitutes the commercial crop. This is a somewhat larger production than that of India. The cotton is grown in the valleys of both the Yangtse and Hoangho Rivers and is especially important along the Grand Canal connecting these rivers. Considerable cotton is grown in Yunnan in southwestern China and a small amount in Manchuria in northeastern China. A little cotton is also grown in Chosen (Korea) and in Japan.

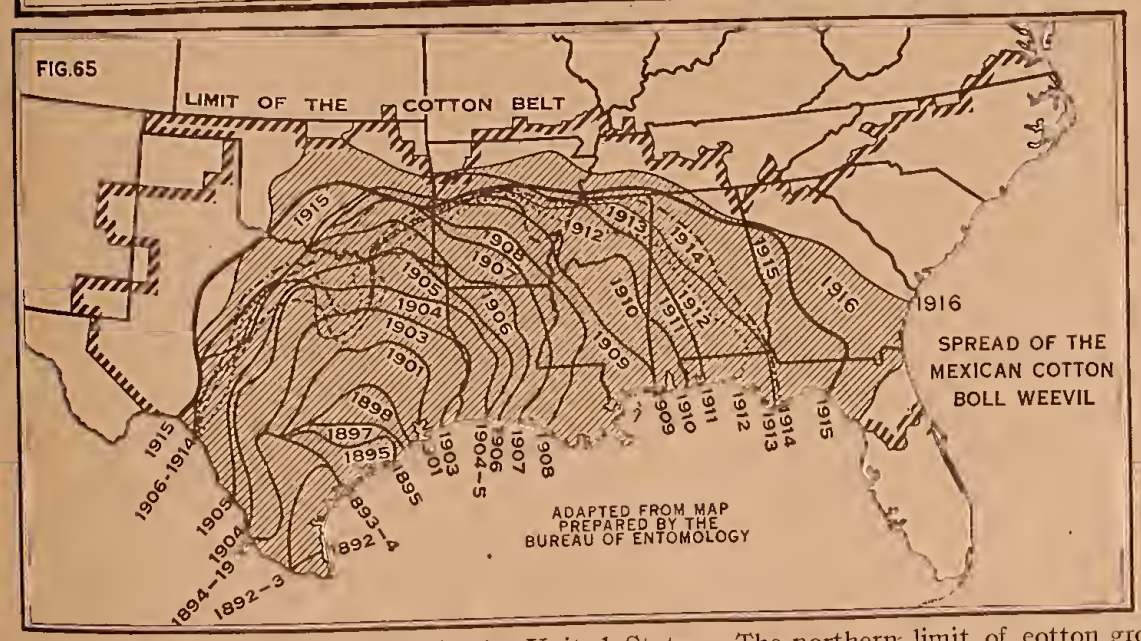
RUSSIAN cotton is grown mainly in Turkestan, chiefly in the provinces of Ferghana and Syr Darya. Some cotton is grown also in Transcaucasia. In Turkestan the climate is of the semiarid continental type. The annual rainfall ranges from 5 to 15 inches. The soil is loess and alluvium. Cultivation is limited to the river valleys which can be irrigated, about 1.8 per cent of the total area. Less than 10 per cent of this small area is in cotton. Most of the cotton goes to European Russia.

BRAZIL was formerly a large cotton producer, but as the coastal region is rather wet and the adjacent interior is subject to drought the crop has declined in importance. Most of the present crop is grown by small landholders.

PERU, though a small producer, is important because of a special grade of cotton, which constitutes about 30 per cent of the crop, all of which is grown under irrigation in the alluvial bottoms of the coastal valleys. This cotton is crinkly, and brownish in color, and can be mixed successfully with wool in the production of expensive fabrics.

FIGURE 62.—World's cotton production. The United States produces about three-fifths of the world's cotton, India and Egypt being the only other countries with cotton crops of much commercial importance. China and Russian Turkestan produce considerable cotton, but export almost none. A little cotton is grown in eastern Brazil, in Peru, in Mexico and in Asiatic Turkey. Extensive production of cotton is restricted to regions having an average frostless season of 200 days or more, and 95 per cent of the world's crop is grown south of the 37th parallel of latitude. Russian Turkestan, and southern Manchuria, however, are at about the same latitude as New York. The production for China is merely estimated and is included in the circle graph under "remainder", while the distribution, though based upon the best available information, is only a rough approximation. In South America and Africa there are extensive areas climatically adapted to cotton production but undeveloped owing to labor and transportation difficulties.





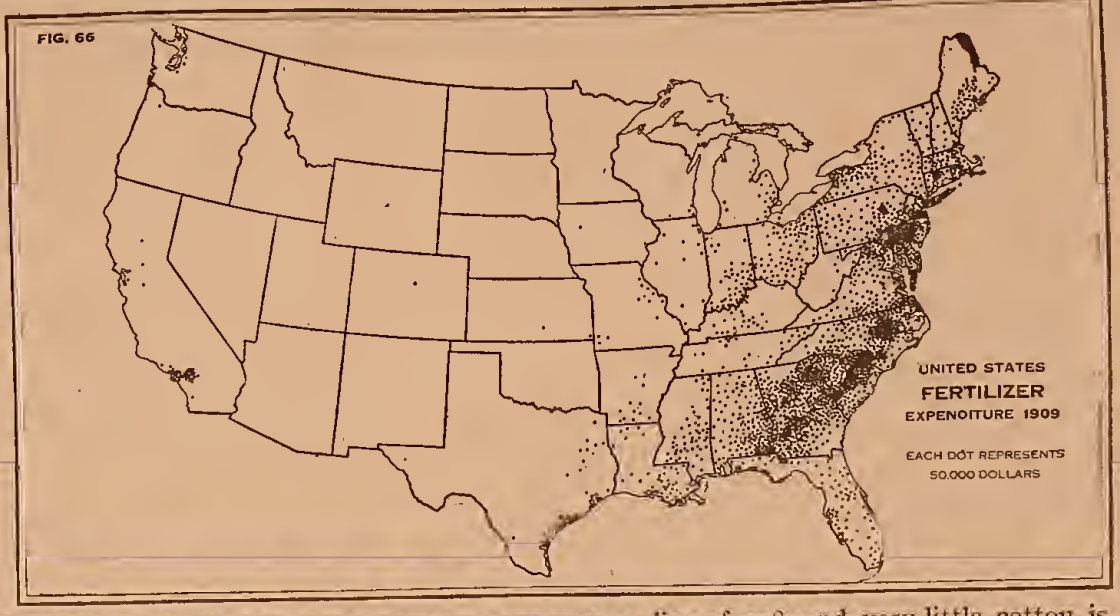


FIGURE 63.—Cotton acreage in the United States. The northern limit of cotton growing follows closely the mean summer temperature line of 77°, and very little cotton is grown where the average frostless season is less than 200 days. The western limit of cotton is approximately the line of mean annual precipitation of 23 inches. The densest areas on the map are regions of richer soils—the Piedmont and Upper Atlantic Coastal Plain, with the belt of Sand Hills between, the Black Prairie of Alabama and Mississippi, the Yazoo-Mississippi Delta, the Red River Valley in Arkansas, and, most important of all, the Black Prairie of Texas.

FIGURE 64.—Cotton is a new crop in the Southwest. In 1909 there were only 324 acres in California and 19 in Arizona; but by 1914 the production increased to 48,800 bales in the Imperial Valley, including both the California and Mexican portions, and nearly 7,000 bales in Arizona. The Arizona production is principally Egyptian.

FIGURE 65.—The Mexican cotton boll weevil entered southern Texas in 1892, and has now spread into all the cotton States except the Carolinas and Virginia.

FIGURE 66.—The expenditure for fertilizer is large in the Atlantic Coastal Plain and Piedmont areas, but in the western portion of the cotton belt very little fertilizer is used.

FIG. 67

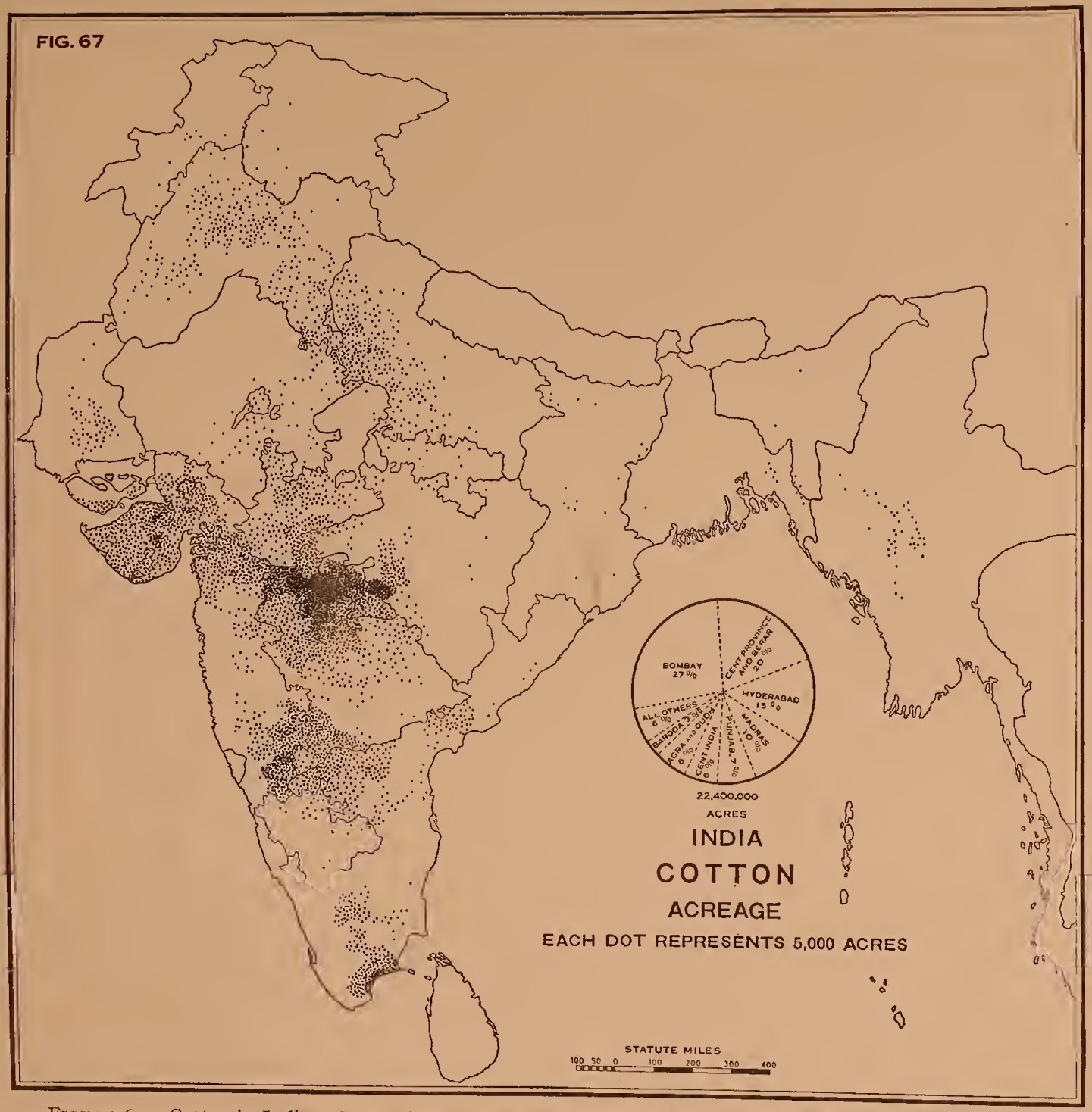


FIG.68

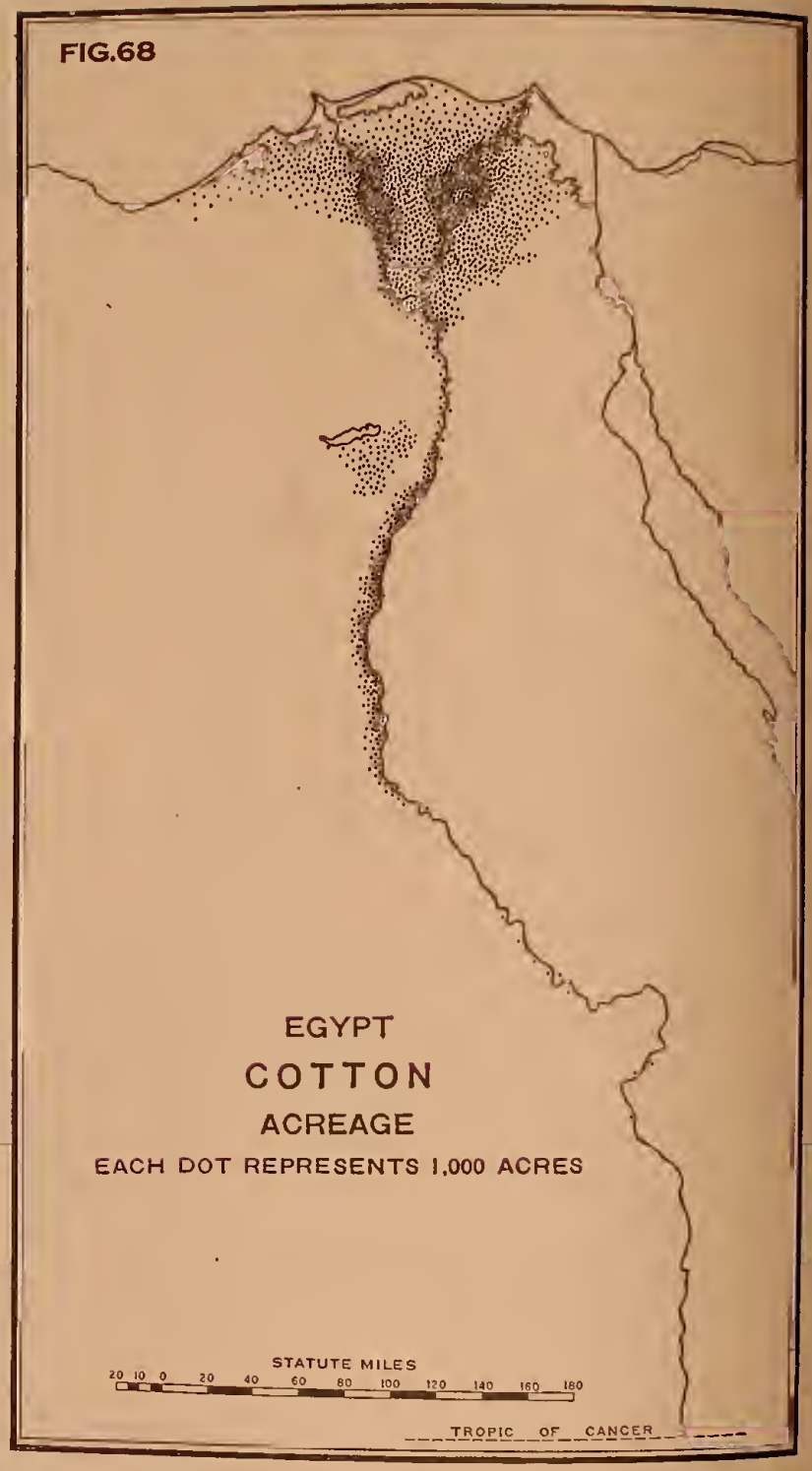


FIGURE 67.—Cotton in India. Cotton is grown in nearly all parts of India except on the unirrigated desert land of Rajputana and the Punjab, the lowlands of the Ganges in Bengal, and the Malabar and Burma coast, where the rainfall is very heavy. The region of heaviest production is Berar, which, together with a small area in the Central Provinces, has one-fifth of the acreage of India. Other important centers are in southern Madras, in southeastern Bombay, and in northern Bombay and Baroda.

FIGURE 68.—Cotton acreage in Egypt. Among the countries of the world Egypt ranks fourth in cotton production, while in commercial importance its crop stands next to that of the United States and India. All the Egyptian cotton is grown under irrigation. The acreage is densest on the rich delta lands which produce a high yield of high-grade cotton. The average yield per acre in Egypt is twice that in the United States and four times as great as in India. In lower Egypt cotton is the most important crop, but in upper Egypt the acreage of cotton is much less than that of wheat or corn (maize).

FLAX is grown both for fiber and for seed. Although considerable flaxseed is secured as a by-product from plants grown for fiber, little or no fiber comes from the most important regions of seed production, since seed flax does not produce a fiber suitable for fine spinning purposes. The conditions of climate and methods of culture typical of the two phases of the industry are essentially different.

Flax for fiber.—Nearly all of the world's flax fiber comes from Europe, about four-fifths of it from Russia (see bottom graph, fig. 70). The most important fiber-producing centers (fig. 72) are northwestern Russia, the Netherlands, Belgium, northern France, and the north of Ireland.

The soils of the flax regions are not uniform. In general, the crop is grown on soils retentive of moisture and yet well drained. High lime or humus content is not required, but tough or sticky soils, or such as are so porous or stony as to dry out quickly, are avoided. In Russia the flax region lies in the zone intermediate between the open cereal regions to the south and the northern forests. The land is level, rather swampy, light, and frequently impoverished by continuous cropping without fertilization. In western Europe the crop is found alike on light sand, clay, and rich polder land.

The climatic conditions of the flax-fiber regions are somewhat more uniform. They are in general regions of high humidity, moderate rainfall, and rather cool and uniform summer temperatures. The crop normally is sown early in April, and late frosts sometimes do considerable damage to the young plants. The period of rapid growth is in June and July and bright, warm days with mild nights are then desirable. Showers are favorable at this time, but heavy rains are likely to cause lodging. It is believed that the continual waving of the maturing plants in light winds strengthens the fiber during September and October. If dew-retting is practiced, as is the case in many localities, the most favorable climatic conditions are heavy dews and light rains with light frosts in the late fall. Such conditions are characteristic of the coast of Europe from Brittany to the Netherlands and to a less extent of the Russian flax region.

The large amount of hand labor employed heretofore in flax-fiber production has prevented the development of the industry in many sections of northeastern United States and the Pacific Northwest that are admirably suited to its production from the standpoint of soil and climate. The common practice in Europe is to pull the crop by hand, and then to thrash it, commonly by hand, in order to save the entire length of fiber from the root to the branches. These are processes for which satisfactory mechanical devices are just coming into use in America.

About one-third of the world's supply of linen is spun in Ireland, to which center much Russian and Belgian flax is exported.

Flax for seed.—Flaxseed produces linseed oil, much used in the manufacture of paints, linoleums, and other important products, and, as a by-product, oil cake, used as a stock feed. Although much flaxseed is produced in the fiber-raising sections of Europe, the bulk of the world's crop is raised in regions of very different characteristics. Because of adaptability to varied climatic conditions, the seed crop has a much wider range than the fiber crop. Aside from Russia, the most important seed-producing regions (see fig. 70) are central North America, Argentina, and India, which have certain climatic characteristics in common, particularly high summer temperatures, and occasional droughts. Given a subsoil retentive of moisture, flax for seed thrives exceptionally well under extreme conditions of heat and drought. Because of liability to disease when grown continuously on the same land, flax is grown almost universally on new lands. In the United States, Canada, and Argentina newly turned prairie sod is very commonly sown to flax before a crop of wheat is put on the land. In the Russian fiber-crop region newly cleared scrub lands are often employed and in the Netherlands the newly reclaimed polder lands.

The cropping procedure in the seed-flax regions of Canada and the United States is similar. The crop is sown in the spring after all small grains are seeded. It is sown, cut, and thrashed by processes differing but slightly from the similar processes for wheat. The area of production in North America centers in the spring-wheat region (see fig. 71) in the States of Minnesota, North Dakota, South Dakota, and Montana, and in the Canadian provinces of Manitoba and Saskatchewan. In Argentina (fig. 74) the flax is grown almost entirely in the provinces of Buenos Aires, Entre Rios, Santa Fe, and Cordoba, on the lowlands bordering the Parana, between the wheat region to the west and the great sheep-raising estates of the east. In this region efficient railway transportation is an added advantage.

In India (fig. 73), owing to the low latitudes, monsoon rains, and abundant labor, the practice in flaxseed production is very different. Historically, flax is one of a group of oil seeds, including rape, mustard, and sesame, grown for cooking and lighting oils. Linseed oil has, however, risen to a very important place in the list of Indian exports. The Indian flax crop is rather widely distributed, though the most important areas are found in the Central Provinces, in the United Provinces, and in Bengal. Much of the crop is grown in admixture with these other oil crops. It is sown in October or November, grows during the dry season, and is harvested in March or April before the beginning of the monsoon rains. The soils of the main flax area of the Central Provinces are derived from ancient crystalline rocks, while those of the northern region are alluvial. The cheap labor of India does not encourage the use of the mechanical processes noted in connection with the flax regions of the New World.

In dry southern Russia there is a considerable flax area devoted to seed production alone. The crop, which is declining in importance, is raised in part for oil and in part to supply the demand for seed from the fiber growers of northern Russia, who believe they themselves can not raise suitable seed. New lands in the Caucasus are generally used for this crop.

HEMP is an ancient fiber plant. The plant yields a coarse fiber which is used mainly in wrapping twine, fishing lines, and carpet warp. It was formerly grown to a considerable extent in the United States, especially in the blue-grass region of Kentucky, but declined in importance from about 1860 until 1913, owing to the increasing cost of labor and the competition of other coarse fibers, until the production was only about one-half the consumption. Between 1913 and 1917, however, the acreage has increased tenfold, and the combined acreage of Ohio, Indiana, Wisconsin, North Dakota, and California now exceeds that of Kentucky.

The geographic conditions favorable to hemp-fiber production are similar to those for flax. The chief requirements are a moist, temperate climate with about four months free from frost and either limestone or silty soils which are neither very sticky nor very porous.

Most of the world's hemp is produced in eastern Europe (fig. 69). The finest fiber, however, comes from Italy, where two restricted regions are most important. Ideal conditions for hemp culture are found in the section of Campania which extends northward to the Volturno River and westward to the coastal swamps and sand dunes. From these limits as far south as Mount Vesuvius nearly half the cultivated land is devoted to hemp. The soil is volcanic, gray-black, of a light, granular texture, is easily worked, and retentive of moisture. The north Italian hemp fields lie on the half-marshy plain between the Po and the Etruscan Appenines. The soil is clay and so sticky that the formation of a crust after rain is sometimes harmful to the young plants, but is deep, penetrable by water, and very rich.

FIGURE 69.—Hemp acreage in Europe. This crop, formerly much grown for its fiber and in places for seed, has declined in relative importance because of the cheapness of certain tropical fibers, particularly sisal and abaca. Hemp is raised chiefly in Russia and Italy. In Russia over a million and a half acres were in hemp in 1912. Austria-Hungary, Roumania, Bulgaria, and France each had a small acreage in hemp. The production per capita was about as great in Italy as in Russia. Hemp is cultivated extensively in Manchuria and China for the seed, which yields an oil superior to linseed oil, but the hemp grown for seed does not yield good fiber.

FIG. 70

FIGURE 70.—World acreage in flax. Flax is grown both for its fiber and its seed, but it seldom attains high quality in both at the same time. Four centers of flax culture are to be noted—Russia, India, Argentina, and central North America. Of these only Russia is important in the commercial production of flax fiber. Smaller centers of fiber production are located in northern France, Belgium, and northern Ireland. In the American continents the scarcity of labor makes it difficult to produce flax fiber at a profit under existing prices. These western centers and Italy and Japan, produce over half of the flaxseed of the world. In India, also, flax is grown for its seed; climatic conditions, the varieties used, and possibly also lack of experience preventing the production of high-grade fiber.

64505—8°

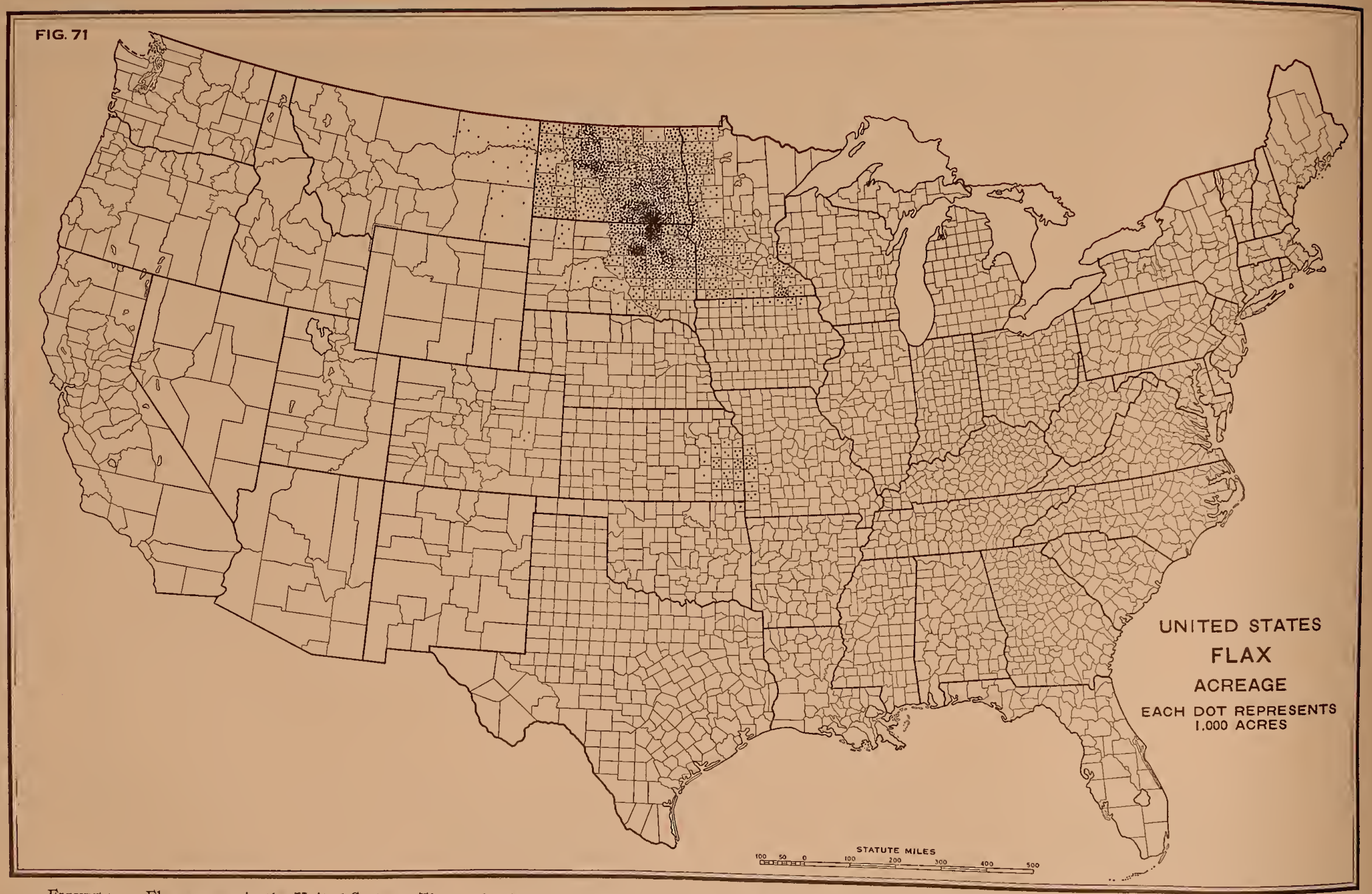


FIGURE 71.—Flax acreage in the United States. The production of flax in the United States is almost entirely for the seed, very little fiber being produced. The seed flax area coincides with the spring-wheat region of Minnesota, the Dakotas, and eastern Montana, only a little flax being grown outside this region, principally in eastern Kansas and western Missouri. Flax is commonly sown as the first crop on the newly broken prairie sod, partly because it grows better on such land than other crops and partly because the soil is free from flax wilt, a disease caused by a fungus which often lives several years in the soil and which is particularly difficult to control in regions where flax has been grown for some time. The flax is grown mostly in large fields, sown and harvested by machinery, and the seed shipped to the terminal markets, where it is pressed for oil.

FIG.72

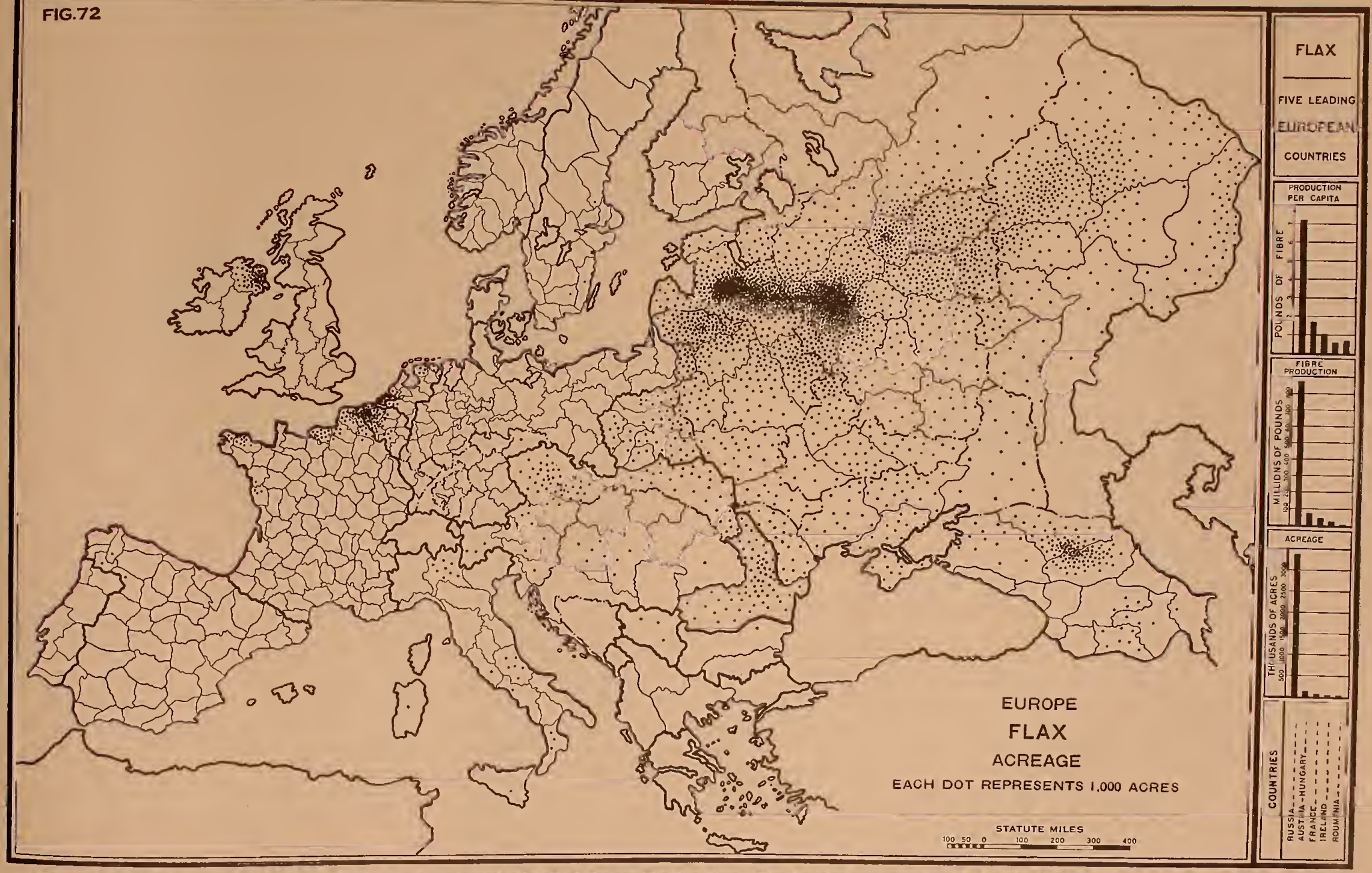


FIGURE 72.—Flax acreage in Europe. Europe produces practically all of the world's flax fiber. The Russian governments of Livonia, Vitebsk, and Smolensk constitute the center of the greatest producing area. The north of Ireland, Belgium, and the Netherlands are famed for the quality of their flax. The size of these regions makes their crops relatively inconspicuous on this map. The ratio of flax acreage to the acreage of all crops is, however, as high in these countries as in Russia. The flax fields of Ireland and Belgium have occasioned the establishment of large linen manufactures to which much Russian fiber is brought.

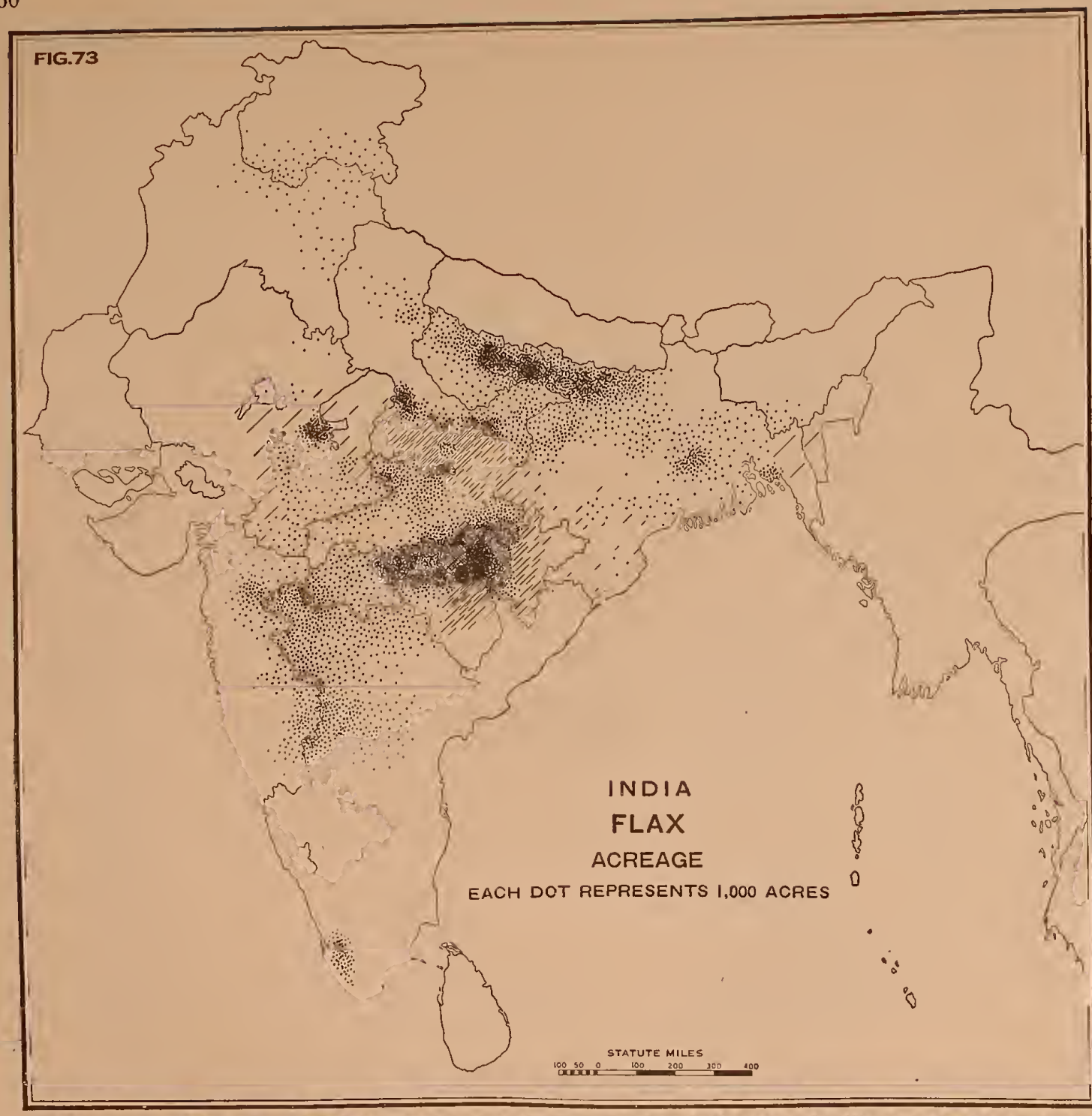


FIGURE 73.—Flax acreage in India. The crop is here grown entirely for its seed. The considerable importance of linseed and linseed oil in Indian exports indicates the value of flax as a cash crop. The two large centers of production are in the central provinces, adjoining the cotton district on the east, and along the northern side of the Ganges Valley in Oudh and Bihar.

FIGURE 74.—Flax acreage in Argentina and Uruguay. It will be noted that the flax area, which is densest in northern Buenos Aires and Santa Fe, is in part coincident with that of wheat (fig. 24) and that of corn (fig. 39). Flax is here grown only for seed, in which product Argentina ranks first among the countries of the world.

TOBACCO was generally used at the time of the discovery of America by the natives of South, Central, and North America, and its culture became a commercial enterprise at Jamestown as early as 1612. From the outset tobacco became a leading article of export in the Colonies and has continued up to the present to exert a favorable influence on our balance of trade. The Indians were found growing *Nicotiana rustica* but the early settlers adopted for commercial culture varieties of *Nicotiana tabacum* obtained from South America and the West Indies. From Virginia and Maryland the pioneer settlers carried tobacco culture with them into Ohio, Kentucky, and Tennessee, and it also became established in New England and Florida at an early date. The tobacco plant (both *N. tabacum* and *N. rustica*) was early introduced into Europe and the Orient and tobacco is now grown in nearly all parts of the globe. The production per capita of tobacco in the United States is at present about the same as in 1840.

Tobacco in the United States, 1839–1909.

Year.	Production.		Acreage.	Value.	
	Total (lbs.).	Per capita (lbs.).		Total.	Per cent of all crops.
1839	219,163,319	12.8	Not reported	Not reported	Not reported.
1849	199,752,655	8.6	.....do.....	.....do.....	Do.
1859	434,209,461	13.8	.....do.....	.....do.....	Do.
1869	262,735,341	6.8	.....do.....	.....do.....	Do.
1879	472,661,157	9.4	638,841	.....do.....	Do.
1889	488,256,646	7.8	695,301	.....do.....	Do.
1899	868,112,865	11.4	1,101,460	$56,987,902	1.9
1909	1,055,764,806	11.5	1,294,911	104,303,856	1.9

The tobacco plant may be grown successfully on any agricultural soil and through a wide range in latitude, but the commercial value of the product is more affected by the soil and climatic conditions under which it is grown than that of any other important farm crop. There are several distinct properties or qualities which go to make up the commercial value of the tobacco and the requirements as to these qualities vary with the uses made of the leaf in manufacture. Hence, there are many distinctive types of tobacco, each of which is produced only in certain localities possessing those soil and climatic conditions which will best develop the special qualities required for this type. In this country we have three general classes of tobacco, namely, (1) cigar leaf, (2) the manufacturing types, and (3) the export types.

The culture of cigar leaf as such became established during the first half of the nineteenth century in New England, Pennsylvania, New York, and Ohio, and after the Civil War also became an important industry in Florida and in Wisconsin. The three types of cigar leaf are wrapper, binder, and filler. Excellent wrapper and binder leaf are produced in the Connecticut Valley, and in Florida, including high-grade wrapper leaf grown under artificial shade. Wisconsin grows mainly binder leaf, New York binder and filler leaf, and Pennsylvania and Ohio chiefly filler leaf. The manufacturing types are those used for the domestic manufacture of all forms of tobacco other than cigars, the distinction being based partly on the fact that cigars are

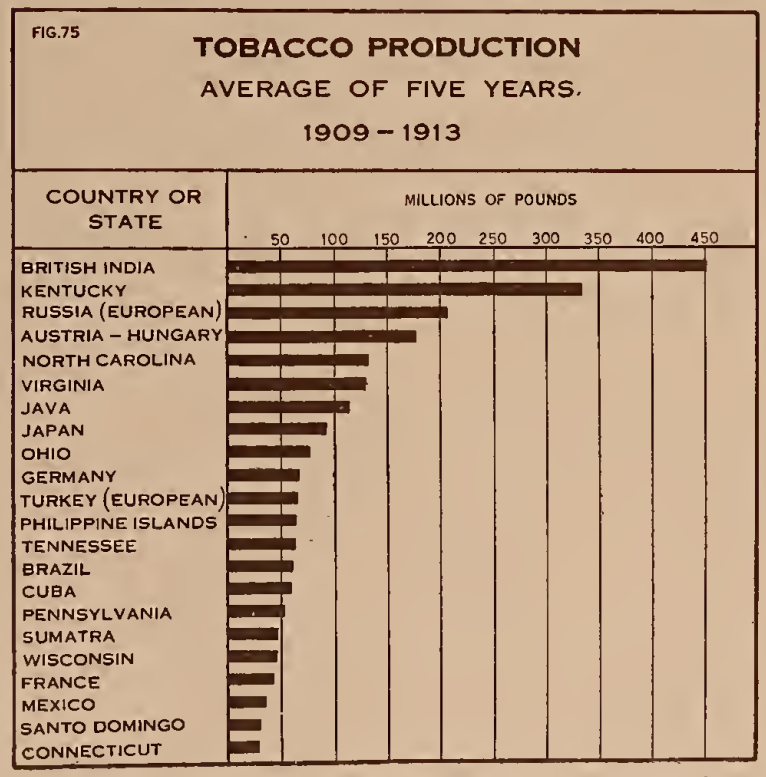


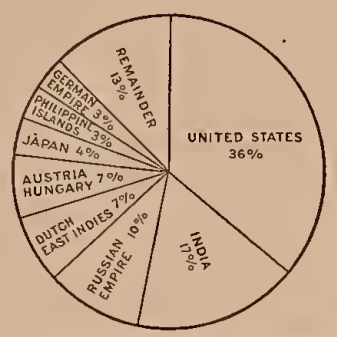
FIGURE 75.—The United States produces over one-third of the world's tobacco, the principal foreign countries of production being India, Russia, and Austria-Hungary. Kentucky, however, produces more tobacco than any foreign country except India.

largely made by hand, often by a single workman, whereas the manufacture of other forms of tobacco usually involves the use of extensive machinery and equipment. The leading manufacturing types are Burley and flue-cured. Burley is grown in large quantities on the fertile soils of the blue-grass region in Kentucky and adjoining portions of Indiana, Ohio, and West Virginia. It is chiefly used for the manufacture of chewing and smoking tobaccos. Flue-cured or bright tobacco is grown in very large quantities on the light sandy loam soils of southern Virginia and the Carolinas. This type is largely used in the manufacture of chewing plug and granulated smoking tobacco and is the leading domestic cigarette type. It is also one of the leading export tobaccos. In the portion of Kentucky and northern Tennessee immediately west of the Burley region dark air-cured tobaccos are grown. These types are used both for domestic manufacture and for export. Typical export tobaccos are the dark, heavy, fire-cured types of western Kentucky and Tennessee and central Virginia, grown on rather heavy loams, and the light, mild Maryland leaf, grown on light sandy soils. Nearly all of the fire-cured leaf is exported, except a small proportion used for snuff. The greater portion of Maryland tobacco, also, is exported.

Outside of the United States the leading tobacco-growing countries, in point of total quantity produced, are India, Russia, Austria-Hungary, and the Dutch East Indies. Of these only the last named produces standard commercial tobaccos of high reputation. Sumatra is famed for the excellence of its cigar wrapper leaf, of which the United States annually imports about 6,000,000 pounds. Java also produces a fine wrapper leaf and, in addition, larger quantities of lower-grade leaf. Turkish tobacco requires special mention as the world's finest cigarette leaf. It bears the same relation to the cigarette industry that Cuban tobacco bears to the cigar industry. In Macedonia are located the tobacco-growing centers of Xanthi, Cavalla, Uskub, and Saloniki, of which the first two are especially famous. In Asia Minor there are four important producing districts for Turkish leaf, namely, Smyrna, Samsun, Trebizond, and Latakia. Samsun and Smyrna tobaccos are strong and highly aromatic, Trebizond tobacco is light and mild, while Latakia is artificially flavored with certain herbs in the process of curing. Our imports of Turkish leaf have increased enormously and prior to the outbreak of the European conflict amounted to some 20,000,000 pounds annually, mainly from Cavalla, Smyrna, and Samsun. Trebizond leaf goes largely to Egypt while Latakia goes chiefly to England. Austria-Hungary uses large quantities of Cavalla, Samsun, Saloniki, Xanthi, and Smyrna.

Cuba easily leads the world in the excellence of its cigar leaf for flavor and aroma. Tobacco is grown in nearly all parts of the island, but the fine grades are produced only in certain well-defined areas. Most important is the famous Vuelta Abajo, producing leaf worth as high as $20 per pound. This area embraces only about 25 square miles, lying south of the mountains in western Pinar del Rio Province. The region surrounding the true Vuelta Abajo constitutes the semi-Vuelta district which produces the third grade of Cuban leaf. In eastern Pinar del Rio Province and the western half of Havana Province is the Partidos district, which stands second to the Vuelta in the excellence of its product. In Santa Clara Province the Remedios district produces Cuba's fourth quality of leaf. Oriente Province produces a less esteemed tobacco known as Yara. Porto Rico produces good cigar leaf, though it is less aromatic than Cuban.

FIG. 76



WORLD PRODUCTION
2,661,600,000 POUNDS

WORLD
TOBACCO
PRODUCTION

EACH DOT REPRESENTS 5,000,000 POUNDS

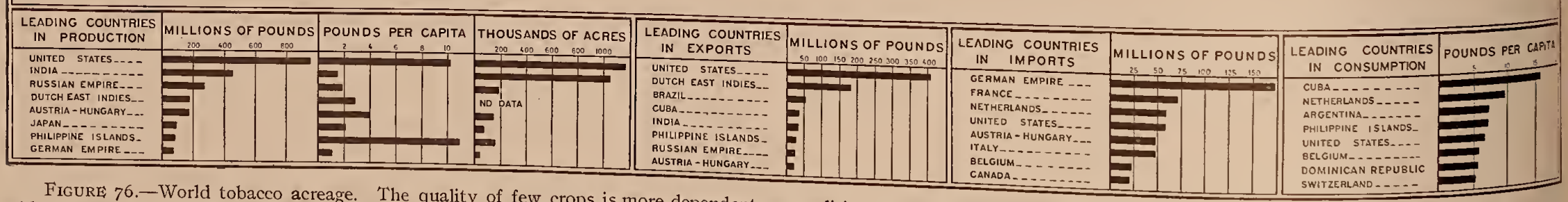


FIGURE 76.—World tobacco acreage. The quality of few crops is more dependent on conditions of soil and climate than is that of tobacco, yet few crops are cultivated under a wider range of geographic conditions. From 55° N. lat. in Europe and 45° in North America to 40° S. there are areas in nearly all countries in which tobacco is grown, at least for home consumption. Only a few areas, however, situated so favorably as to yield a leaf of superior quality or fostered by governmental support of the industry, produce tobacco on a commercial scale. The more important centers of production are Kentucky and Ohio, the Carolinas, Virginia, Pennyslvania, Connecticut, and Wisconsin in the United States; Pinar del Rio, Cuba; Dordogne in France; Flanders in Belgium; Baden in Germany; central Hungary, the Danube Valley, and the shores of the Aegean; Chernigov, Poltava, and Tambov in central Russia; the shores of the Black Sea in southern Russia and Turkey; the Rangpur district in India; Sumatra and Java; the Philippines, and Japan.

FIG. 77

FIGURE 77.—Tobacco acreage in the United States. Over 80 per cent of the tobacco acreage is in five States—Kentucky, North Carolina, Virginia, Tennessee, and Ohio. Smaller centers of production are located in South Carolina and in northern Florida, in southern Maryland, in southeastern Pennsylvania, in the Connecticut Valley, and in Wisconsin. Kentucky produces the well-known Burley, used in the manufacture of chewing and smoking tobacco, and also a dark fire-cured export tobacco; Virginia and the Carolinas flue-cured or bright tobacco, used for chewing plug, granulated smoking tobacco, and cigarettes. Much of the Virginia tobacco is exported and most of the Maryland crop. The Connecticut Valley and Florida produce excellent wrapper and binder leaf for cigars, Wisconsin grows mainly binder leaf, Pennsylvania and Ohio chiefly filler leaf. Tobacco is grown mostly in small fields, often rented on shares, and requires a large amount of hand labor.

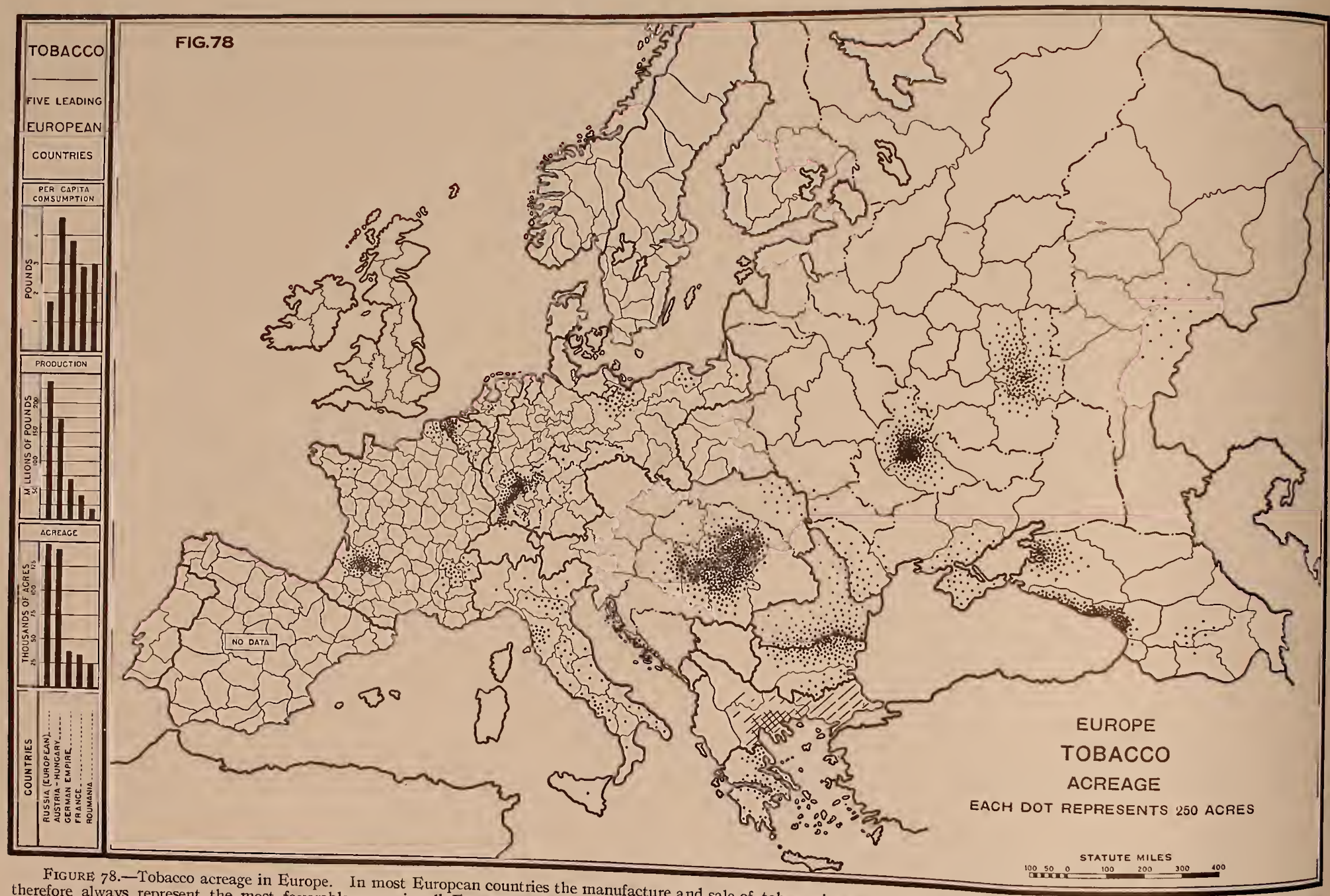


FIGURE 78.—Tobacco acreage in Europe. In most European countries the manufacture and sale of tobacco is a strict governmental monopoly. The centers of production do not therefore always represent the most favorable areas in all Europe, but selected areas in each country. The types of tobacco produced vary widely. French tobacco is dark and heavy, suitable only for snuff and plug tobacco; that of the German Empire is a heavy cigar leaf; that of northern Russia is similar to French tobacco, while southern Russia produces a light cigarette tobacco similar to that of Turkey. Doubtless Turkish cigarette tobacco is the most famed of the European products. It comes mainly from the region about Cavalla and Xanthi in Macedonia.

FIG.79

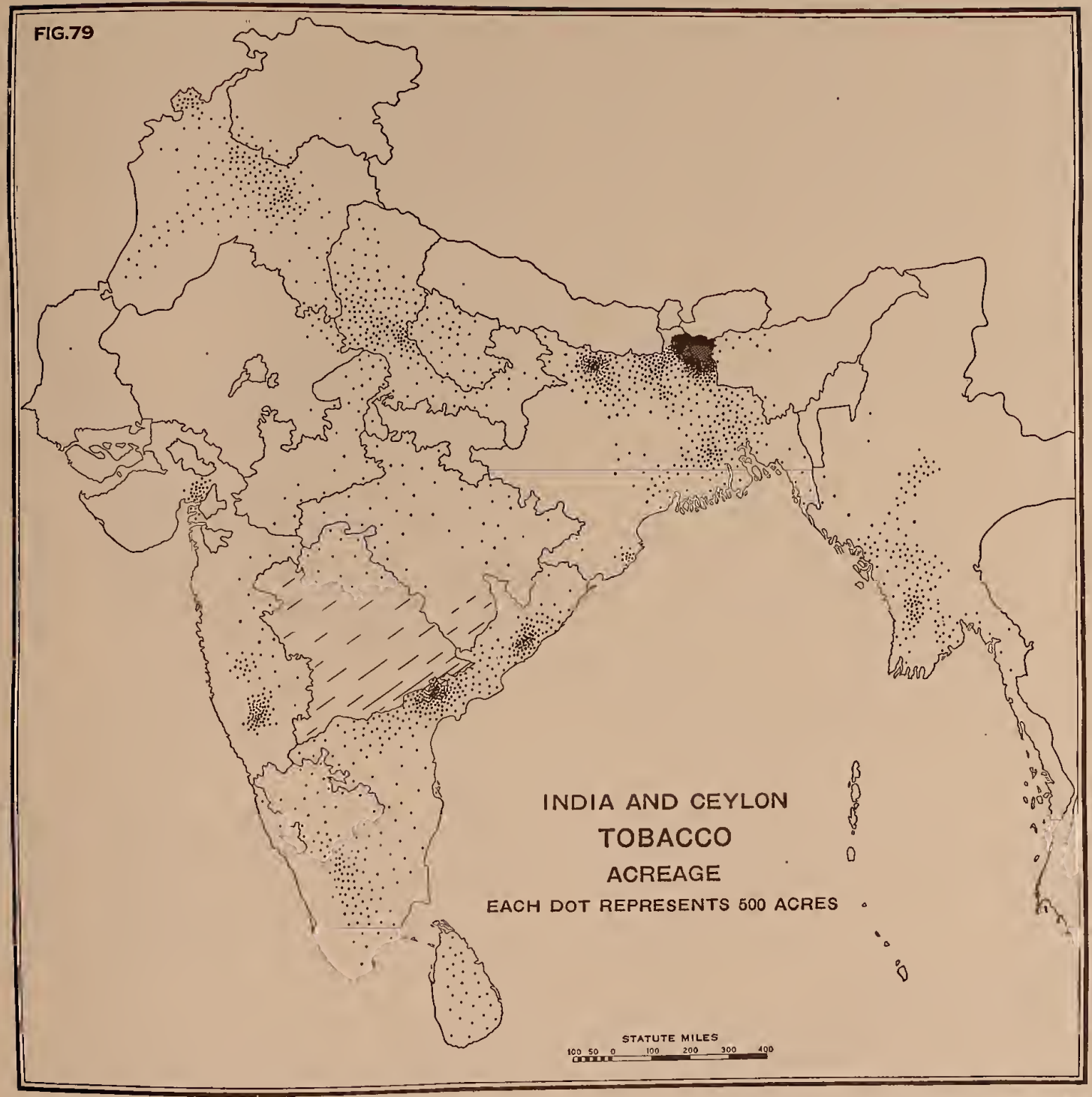


FIG.80

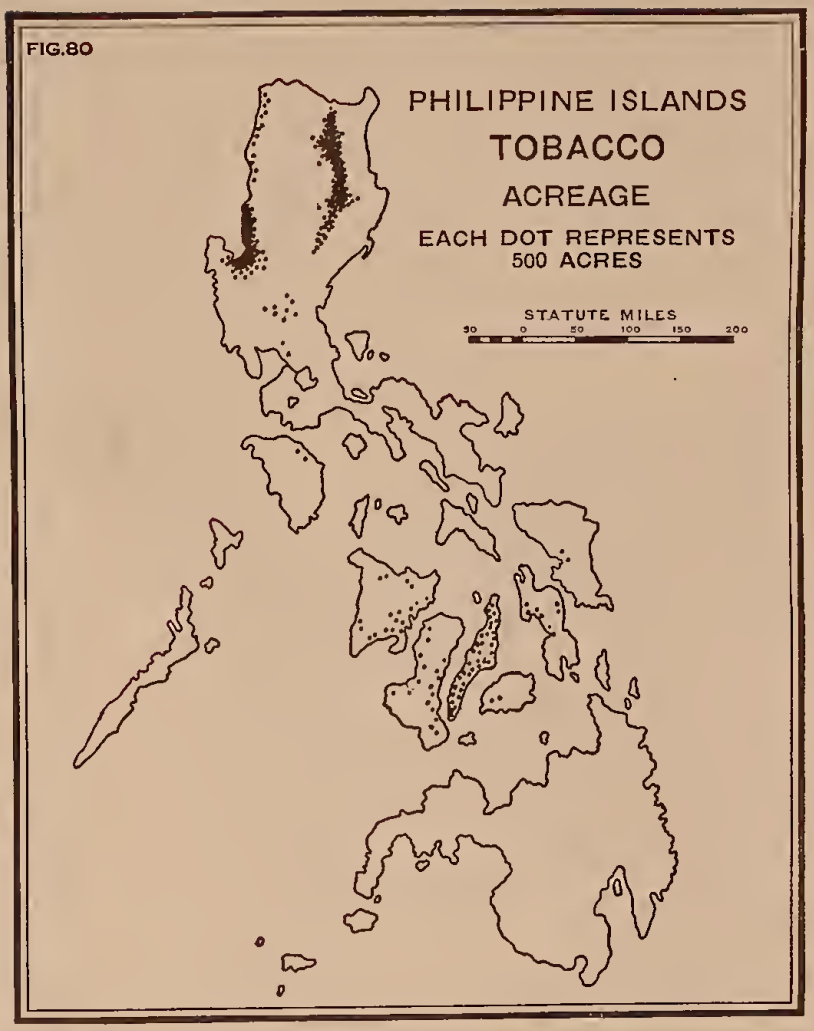


FIG.81

FIGURE 79.—Tobacco acreage in India and Ceylon. The chief tobacco-growing center is the Rangpur district of northern Bengal. The tobacco is grown partly under irrigation.

FIGURE 80.—Tobacco acreage in the Philippine Islands. The most important area is a strip 5 to 10 miles wide bordering the Cagayan River and its tributaries. During the rainy season the river overflows and deposits a layer of silt, upon which the best tobacco is raised. The lands of the lower flood plain are wearing out and new lands are being developed where they lie within the economic limit set by accessibility of transportation facilities. The home consumption of tobacco is large. Most of the exports go to Europe.

FIGURE 81.—Tobacco production in Cuba. The most famous district is the Vuelto Abajo in western Pinar del Rio Province, and scarcely less famous is the Partidos district in eastern Pinar del Rio. The Cuban tobacco is mostly high-grade cigar leaf.

64505—9°

POTATOES

THE POTATO, at present, has a geographie distribution whieh shows its preference for regions of relatively eool and uniform temperature with moderate rainfall. The plant grows best on light friable soils with a eonsiderable humus eontent and free underdrainage. On soils of this type the potato will endure more than moderate rainfall. Because of potato diseases, regions or years of heavy rainfall (over 50 inehes) are not favorable, espeeially when aeeompanied by continued high temperatures.

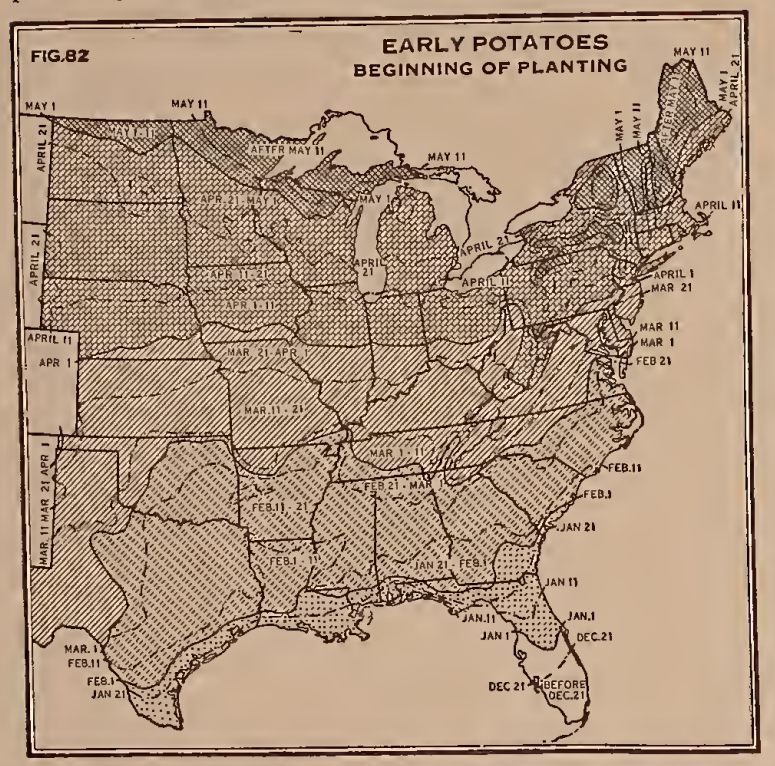


FIGURE 82.—The planting of early potatoes begins in southern Florida the latter part of November and lasts for two months, in central Florida planting begins about January 1, around Charleston February 1, in the Norfolk region March 1, and in the region around New York City about April 1. Early potatoes are not a commercial crop north of New York City, but a few are planted for home use. In northern Maine and northern Minnesota this planting begins after May 11, and practically coincides with the planting of the late potato crop, which is the commercial crop in the Northern States. This map also shows perhaps better than a temperature map, the progress of the season northward in the United States.

The potato, American in origin, was adopted into European agrieulture with sueh success that the produetion of the Amerieas has long been overshadowed. Over 90 per eent of the world's produetion is grown in Europe, the potato erop of that eontinent vastly exeeeding in volume and almost equaling in value the wheat erop of the world. The potato oeeupies in northern Europe much the same preeminent position as that of riee in the Orient and of eorn in the corn belt of the United States. Although the United States is one of the world's large potato produeers, four European eountries now outrank it both in aereage and production, while the eombined produetion of all European eountries is more than ten times as great as that of the United States. In proportion of eropped land in potatoes the United States is below every important European country; in yield per aere and per capita, however, Italy falls behind the United States.

The introduction of potatoes into northern Europe praetieally revolutionized the agrieulture of those countries and made possible a great inerease in population. Potatoes produee a greater amount of food per acre than other staple erops exeept eorn, 100 bushels of potatoes (an average yield per aere in the United States) having a fuel value of 2,310,000 calories, as eompared with 2,340,000 for 27 bushels of eorn (an average yield), and 1,430,000 for 16 bushels of wheat. In protein, however, potatoes are defieient, produeing only about half as mueh per aere as eorn or two-thirds as mueh as wheat, and must be balanced by the use of meat, fish, or leguminous foods. (See map of swine in Europe, fig. 191.)

In the temperate portions of the Southern Hemisphere the populations are relatively sparse, and the interest of the people is still mainly in the development of the pastoral industries and agrieulture of an extensive type. The amount of labor available is insuffieient for the produetion of a large commereial potato erop. Moreover, only relatively small areas in the Southern Hemisphere have the requisite uniformly eool temperature, with the rainfall distribution best suited to potato growing.

EUROPE (fig. 88).—In the great potato regions of Europe the bulk of the erop is grown to supply loeal demand. In eertain areas favored by loeation or elimate small quantities are raised to supply the early market of the great cities. Beeause of the ability of the potato to thrive in regions of eool summers, high humidity, and relatively poor soil there is a notieeable resemblanee between the distribution in Europe of potatoes and of rye (fig. 31), and for the same reasons very little wheat (fig. 20) or eorn (fig. 37) is grown in the important potato regions.

The German Empire, with an average yield of 190 bushels per aere, leads Europe and the world in potato produetion, although in acreage Russia, beeause of its large area, holds first plaee. The average potato aereage in Germany is more than twiee as great as that of the United States, and the production over four times as great. Nearly 14 per eent of the eropped land in Germany is in potatoes as eompared with 1.2 per cent in the United States. The large crop amounts to over 24 bushels per capita (as compared with less than 4 bushels in the United States), of which only about one-third (7.3 bushels) is used for human consumption. The largest use of potatoes in Germany is for stock feed. About 40 per eent of the crop is fed, mainly to swine, together with barley and dairy by-produets (see fig. 179). The industrial uses, i. e., the manufaeture of potato flakes, flour, and alcohol, take but one-tenth of the crop.

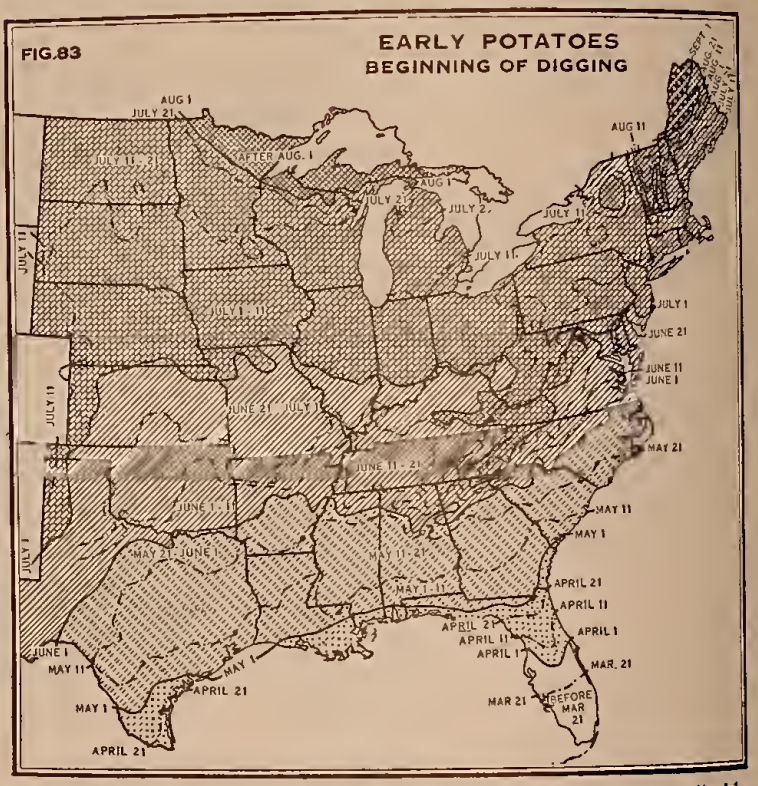


FIGURE 83.—The digging of early potatoes begins in southern Florida about March 1, in the Hastings, Fla., district usually about April 11, and by May 1 has reached Charleston, S. C. It is in progress in the Norfolk, Va., district usually by June 1, and begins on Long Island about July 1. Since Charleston is located nearer the northern markets and has cheaper transportation rates than Hastings, when shipments begin from Charleston, those from Hastings dwindle rapidly; and likewise when the Norfolk shipments begin, the Charleston season soon ends. On Long Island, if prices are high, the crop is dug during July and sold as early potatoes, but if prices are low, the potatoes are not dug until fall.

The region of greatest potato produetion in Germany lies in eastern Prussia and extends into Russian Poland and Galieia. In this region the summers are neither so wet nor so warm as in the potato distriets of the North Central United States. The annual rainfall is about 22 inches, the mean summer (June, July, and August) temperature about 63°.

Potatoes are an important crop in other north European countries. Intensive cultivation gives a very high yield per acre in Belgium and the Netherlands. The traditional importance of Ireland as a potato country does not appear justified, but the United Kingdom as a whole has a large acreage. In France the potato, largely because of economic reasons, is grown upon the highlands of Brittany and the Auvergne, where the cool climate, considerable moisture, and poorer soils are not favorable for wheat. The production in France is somewhat larger than in the United States, and the yield per acre is slightly higher.

Certain limited regions are engaged in the production of early potatoes. Of these, some of the more important are the Algerian coast, the island of Jersey, the region about St. Malo, and the peninsula of Cornwall. In Algeria the

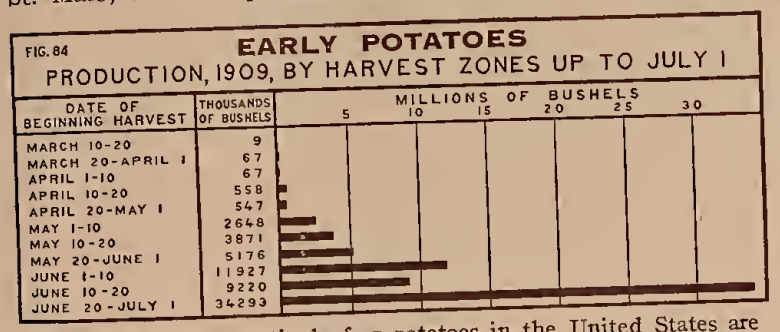


FIGURE 84.—Comparatively few potatoes in the United States are dug before June 1.

high winter temperatures and a large amount of sunlight permit the crop to be planted in November and December and dug from January to May. The crop goes to English, German, and French markets. The mild winter temperature enables the Jersey potatoes to reach the London market several weeks before the potatoes of eastern England. The Jersey potato is followed by those from Cornwall, then from Ireland. Ayrshire, Lancashire, and the eastern counties.

Potatoes in the United States, 1839–1909.

Year.	Production.		Acreage.	Value.	
	Total (bushels).	Per capita (bushels).		Total.	Per cent of all crops.
1839	108,298,060	6.3	Not reported.	Not reported.	Not reported.
1849	65,797,896	2.8	do	do	Do.
1859	111,148,867	3.5	do	do	Do.
1869	143,337,473	3.7	do	do	Do.
1879	169,458,539	3.4	[a] 911,325	do	Do.
1889	217,546,362	3.5	2,600,750	do	Do.
1899	273,318,167	3.6	2,938,778	$98,380,110	3.3
1909	389,194,965	4.2	3,668,855	166,423,910	3.0

[a] Reports incomplete.

UNITED STATES (fig. 87).—Potatoes rank sixth among the crops of the United States in value and seventh in acreage. Until the blight reached the United States in the early forties, the potato crop probably was relatively more important than it has been at any time since.

The potato is the most widely distributed crop in the United States, being reported by the census from every county except one at the southern tip of Florida, two above the limit of profitable argiculture in Colorado, and several in the semi-arid section of Texas. This wide distribution is due to several factors, among which may be mentioned:

(1) It is a hardy, short-season crop, maturing farther north and at higher altitudes in the West than any other crop except barley and timothy; in fact, the potato can be successfully grown only where the temperature at the time the plants are producing tubers is reasonably low.

(2) The potato can be grown in the South during the late winter and early spring months, and being marketed early in the season finds a somewhat limited outlet at fancy prices in the large northern cities. The high prices permit transportation of the early crop greater distances than the late crop can bear, which is sold at decidedly lower prices.

(3) Owing to the bulky nature of the crop and the lower price per unit of weight than most other food crops, the major portion of the potato crop must be grown within comparatively short distance of the markets. In other words, under normal conditions the West can not supply the eastern potato market, as it does the wheat market, and potato production must in general be widespread like the population.

(4) With an intelligent selection of varieties and proper time of planting, the potato may be grown with more or less success on almost any type of soil, provided it contains the necessary food elements in an available form, is well drained, and at the same time possesses sufficient moisture to maintain growth.

(5) It is more universally used as a table food than any other crop except wheat. This naturally tends to encourage its culture wherever it is possible to grow it. Hence, it is commonly grown in the farm gardens, even though it may not be grown as a commercial crop.

(6) While its food value is relatively low as compared with wheat, its greater yield per acre makes it a valuable crop to grow.

Although the potato is the most widespread of the crops, its commercial production is exceptionally concentrated. Aroostook County (Maine), Long Island, southern New Jersey, southern Pennsylvania, the eastern shore of Maryland and Virginia, western New York, northeastern Ohio, the southern peninsula of Michigan, central Wisconsin, the Anoka and Clay County areas in Minnesota, the Greeley district in Colorado, and the delta islands west of Stockton in California produce about 40 per cent of the potato crop of the United States. The location of these centers appears due in large measure to three geographic factors:

(1) Climatic adaptation: The potato can be grown in a cooler climate than other intertilled crops, particularly corn. The centers of potato production, it will be noted, lie along the northern and western margin of the corn belt. Corn is a very productive crop and where it can be grown it tends to exclude other intertilled crops, especially those which, like potatoes, require a large amount of labor at the same time of the year. The potato also yields better in the cool northern and western States than in the corn belt.

(2) Soil adaptation: The potato can be grown in sandier soils than most other crops, and if adequately fertilized by means of artificial fertilizer, barnyard manure, or rotation

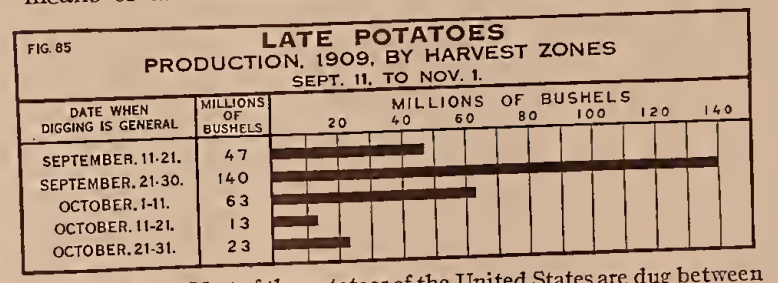


FIGURE 85.—Most of the potatoes of the United States are dug between the middle of September and the latter part of October.

with clover, yields even better on light than on heavy soils and is much easier to cultivate. Many of the important potato centers are in regions of light soils—Aroostook County (Maine), Long Island, southern New Jersey, the eastern peninsula of Maryland and Virginia, western Michigan, central Wisconsin, and the Anoka (Minnesota), district.

(3) Distance from market: The bulk of the potato crop must be produced near the markets because of its commonly low price per unit of weight. Most of the large cities are in the northeastern section of the United States, slightly to the south of the potato belt. Many of these cities can be approximately located by the greater density of potato acreage shown on the map—New York, Philadelphia, Syracuse, Rochester, Buffalo, Detroit, Cincinnati, Louisville, St. Louis, Kansas City, Minneapolis and St. Paul, Denver, and San Francisco. The principal exceptions to this correlation of heavy potato production with dense population are the eastern counties of Virginia, which have both cheap water and excellent railroad transportation to Baltimore, Washington, Philadelphia, and New York; western Michigan, which has cheap lake transportation to Chicago; the central Wisconsin region which supplies Milwaukee, Chicago, and the industrial cities of Wisconsin and northern Illinois; and the Aroostook, (Maine), district, which supplies Boston and New England. These two latter districts are distant from their markets 200 to 500 miles.

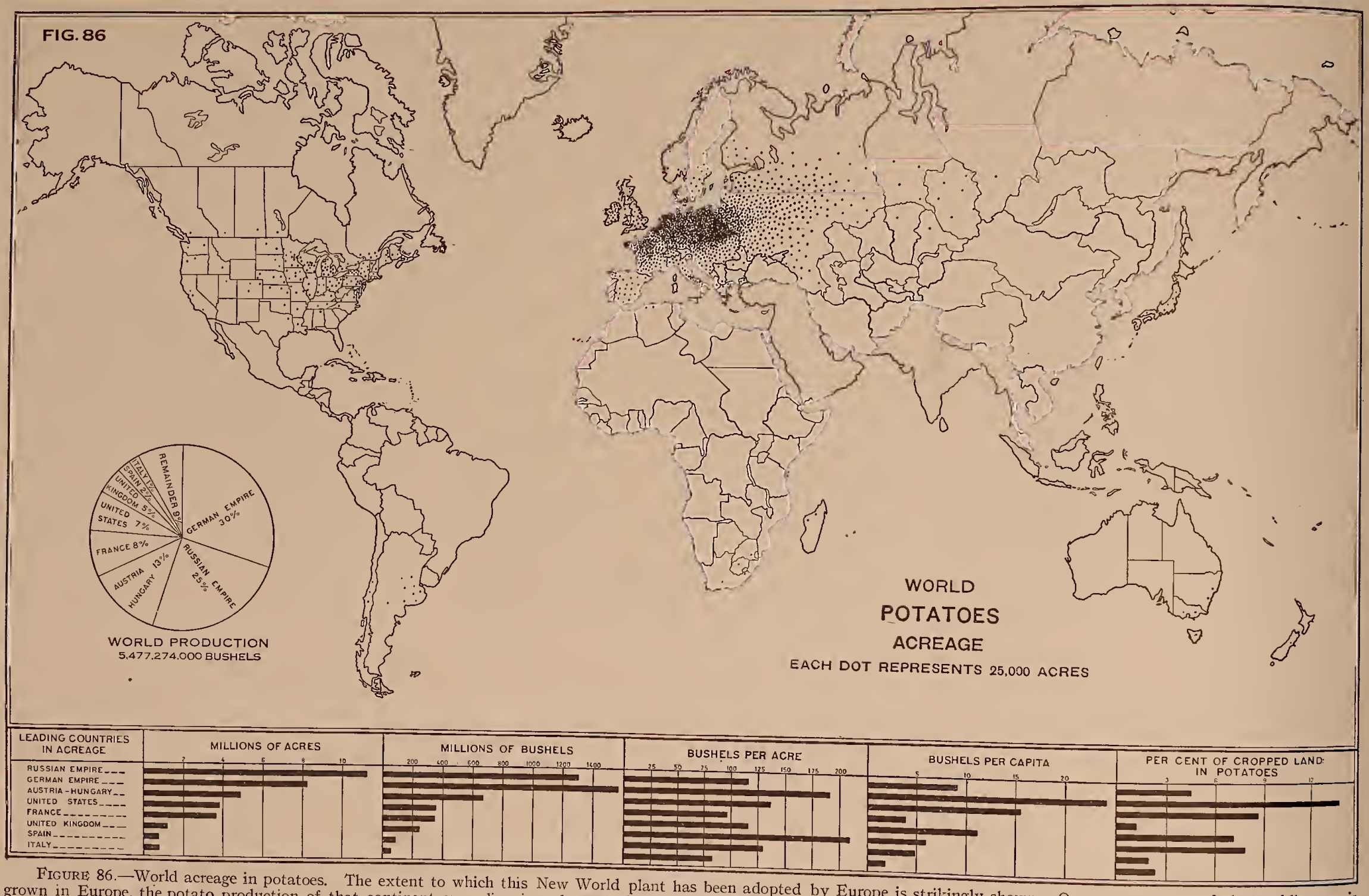


FIGURE 86.—World acreage in potatoes. The extent to which this New World plant has been adopted by Europe is strikingly shown. Over 90 per cent of the world's crop is grown in Europe, the potato production of that continent exceeding in volume and almost equaling in value the wheat crop of the world. Germany alone has an average potato acreage twice as great and a production over four times as great as that of the United States. Nearly 14 per cent of the cropped land in Germany is in potatoes, as compared with 1.2 per cent in the United States. Russia and Austria-Hungary also each have a greater acreage and yield of potatoes than the United States. The Southern Hemisphere with sparse population and large areas of unfavorable climate has no important potato-raising centers.

FIG. 87

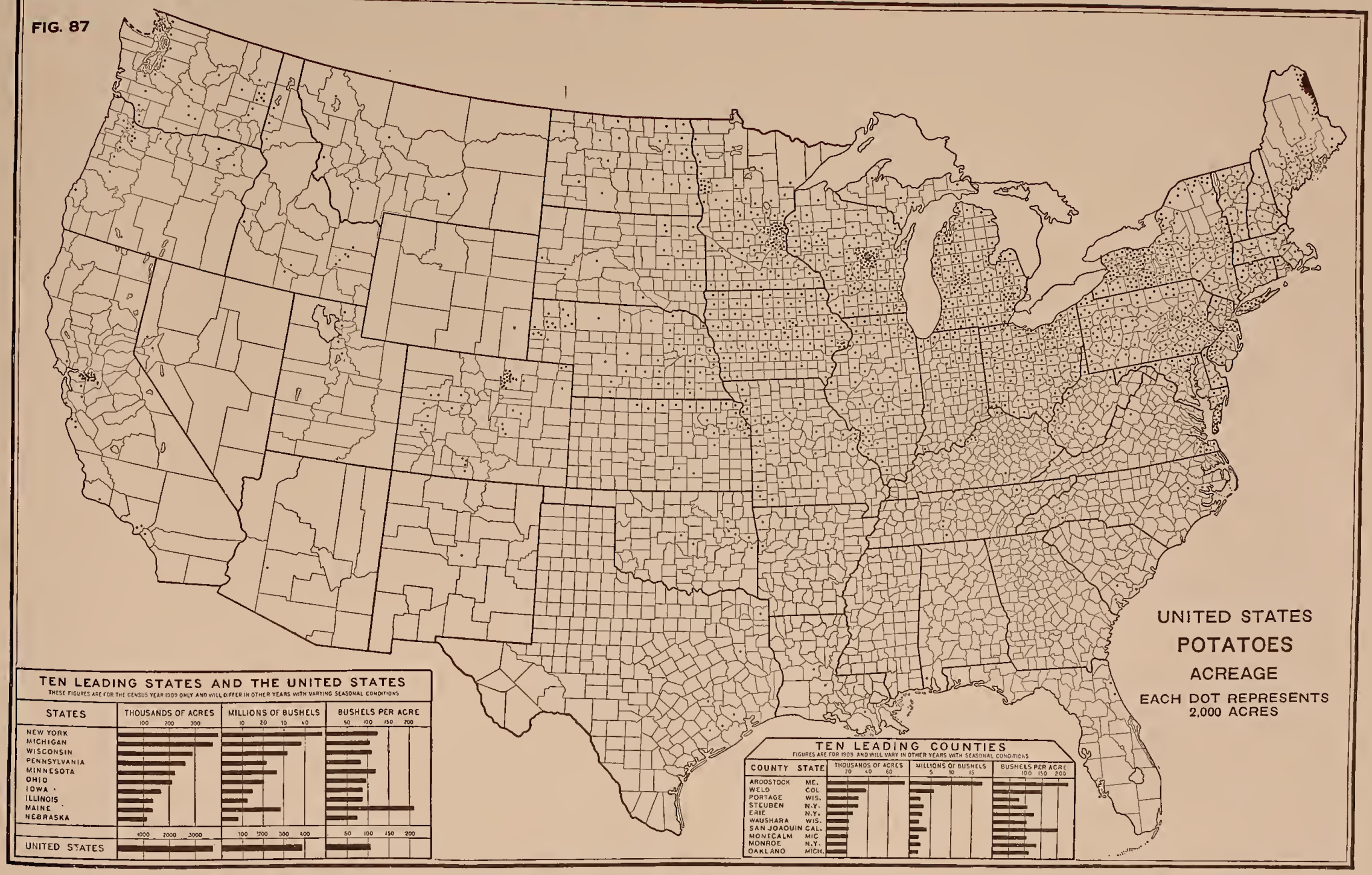


FIGURE 87.—Potato acreage in the United States. The regions of heaviest production lie to the north of the corn belt. This is partly due to the fact that the quality and yield of potatoes are better in regions of cool climate, and partly to the fact that corn, which requires labor at the same time, is very productive and gives a greater return. Many of the large centers of potato production are in regions of sandy or loamy soils—Aroostook County (Maine), Long Island, southern New Jersey and eastern Virginia, western Michigan, central Wisconsin, and eastern Minnesota. Many of the centers of production are located near large cities—New York, Philadelphia, Rochester, Buffalo, Cleveland, Detroit, Cincinnati, Louisville, Kansas City, Minneapolis, Denver, and San Francisco. This is due to the fact that potatoes are a bulky crop and can be sold at a profit by local gardeners and farmers in competition with the crop from the large production centers, which must bear the cost of transportation

POTATOES

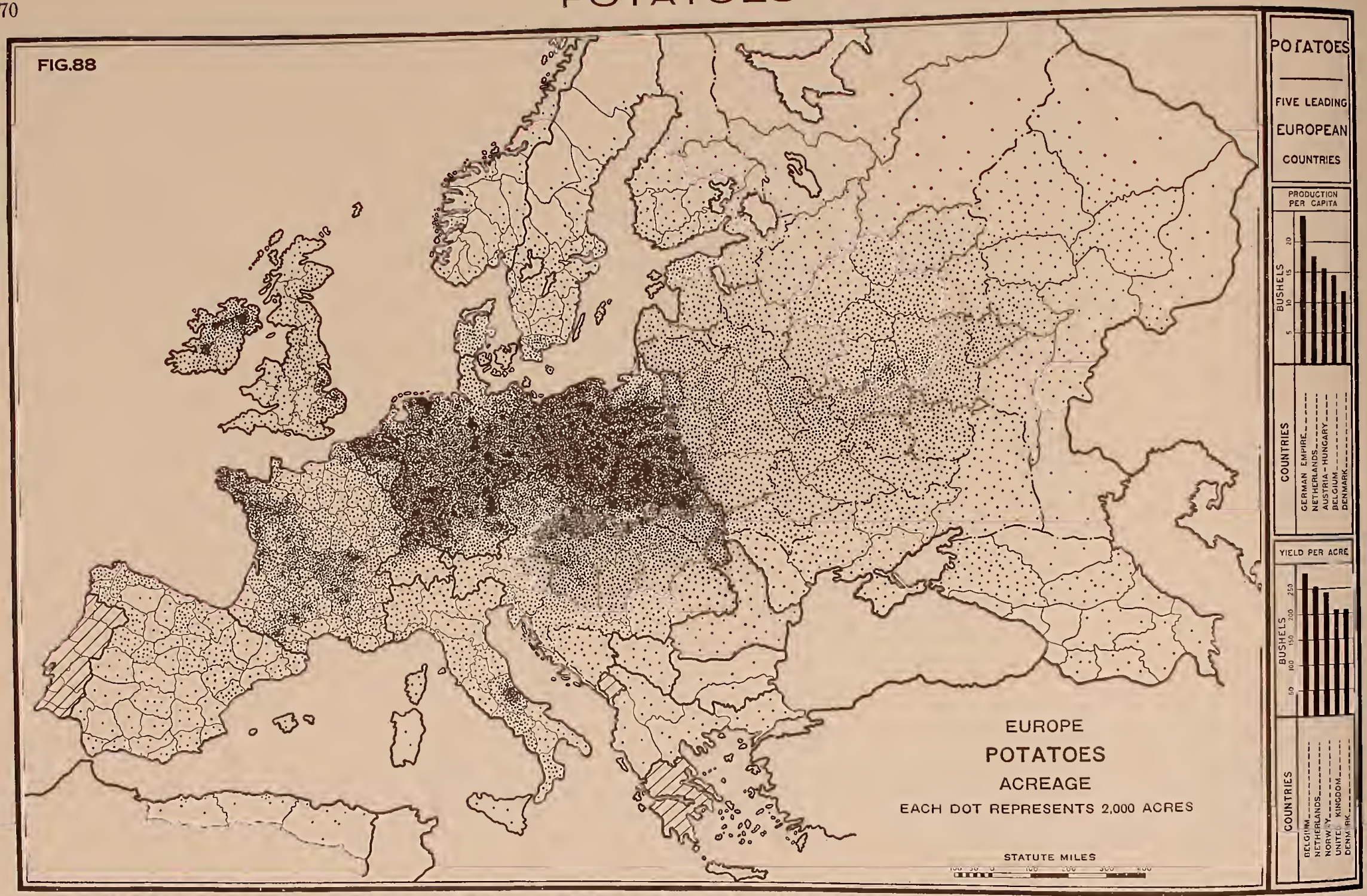


FIGURE 88.—Potato acreage in Europe. Comparison with figure 31 will show something of a similarity of distribution between potatoes and rye in western Europe. In France, the Central Plateau and Brittany are strongly marked in each map. In acreage of potatoes Russia leads; in total production and in per capita production Germany has first rank. The largest yield per acre (253 bushels) is found in the Netherlands. Germany produces about one-third, and Germany, Russia, and Austria-Hungary combined fully three-fourths of the potato crop of the world.

THE SUGAR supply of the world is derived principally from sugar cane and from sugar beets, and the production, formerly practically confined to the Tropics, is now, in normal years, nearly as great in the north temperate zone.

The cultivation of the sugar beet, though a relatively new industry, is developed in nearly every European country, and also in the United States and Canada. The relation of the beet-producing area to that of cane sugar is shown in a general way in figure 91. Within its zone of cultivation the sugar-beet crop is strongly localized by influences of topography, climate, and soil, and the availability of labor.

The sugar beet gives best returns on a deep, fertile loam, which is well drained and aerated. Heavy clays or thin stony soils do not permit proper root development. A considerable lime content and an abundance of available plant food are necessary. The climatic range of the beet is wide, but the regions where it possesses high sugar content and is of large commercial importance lie in those areas where the average temperature during the three summer months ranges from about 63° to 73° F., and, except where irrigation is supplied, in regions of moderate rainfall well distributed throughout the growing season from April to September. The optimum temperature is somewhat lower than that for corn. It will be noted from a comparison of figures 92 and 93 with figures 36 and 37 that there is little overlapping of acreage between sugar beets and corn.

EUROPE (fig. 93).—In sugar-beet production Europe is much more important than the United States, the crop of Germany alone under normal conditions being nearly four times the American crop. In acreage Russia leads, but poor methods of cultivation and of manufacturing reduce the output. The chief Russian beet area lies in the southwest, in the provinces of Kiev and Podolia. The soil of this region is a clay loam with an abundance of lime. A serious climatic disadvantage is insufficient rainfall. This is partially overcome by crop rotations and methods of tillage. A considerable beet area will also be noted in Poland. It can not be doubted that Russia is capable, with better methods, of producing a much larger amount of sugar than at present.

Germany has two large centers of sugar production, the Breslau region and that of Magdeburg, the latter being more important. The crop is, however, grown in nearly all parts of the country except the extreme southern and western highlands. The important centers lie within the area of glaciation, where a great variety of soil is found. Depth and free underdrainage are advantages possessed by many of the glacial soils. The suitability of the soils for beet culture is in some measure improved by the use of chemical fertilizers and by crop rotations.

In France the chalky plains of the north and the coastal lowlands which extend through Belgium into the Netherlands are the most important sugar-beet areas. The temperatures of this coastal region are more uniform than in Russia and Germany, the summers are cool and humid, and the maximum rainfall comes in the autumn.

In none of these regions are the natural conditions for the production of the beet ideal in all respects, nor are they equally favorable from year to year. Because of these irregularities some advantage is gained by growing the crop

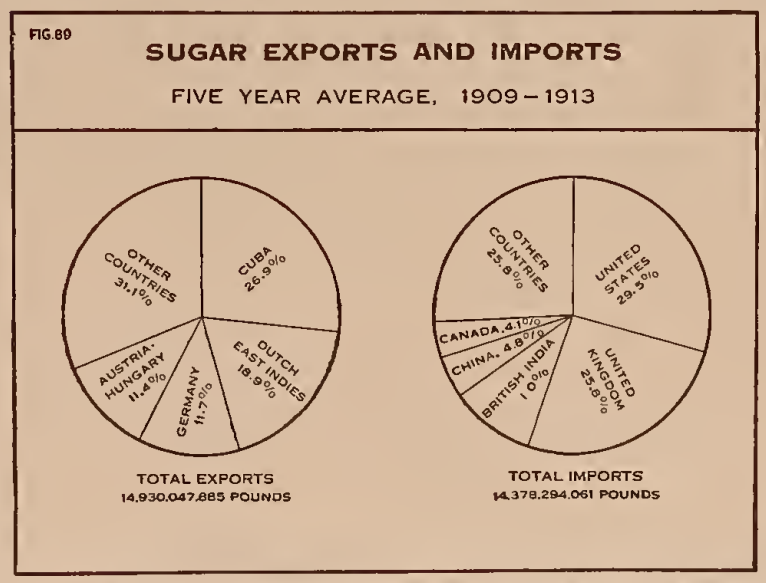


FIGURE 89.—Nearly three-fourths of the world's exports of sugar come from Cuba, Java, Germany, and Austria-Hungary; while nearly three-fourths of the world's imports is consumed in the United States, the United Kingdom, India, China, and Canada.

under irrigation. Such is the situation in Spain, where, despite the higher temperatures, the sugar-beet acreage has been increasing steadily since the loss of Cuba and the Philippines. In southern Spain both beet and cane sugar are raised to some extent, and the zones of cultivation are contiguous.

UNITED STATES (fig. 92).—Sugar in the United States is made from both the beet and cane, the beet-sugar production of continental United States being about double that of cane sugar. Hawaii and Porto Rico, however, produce as much cane sugar as the total production of continental United States, both beet and cane. In addition to these two principal sources of sugar, large quantities of sirup and also some sugar, are made locally by farmers in the northeastern States by boiling down the spring flow of sap of maple trees, and in the South Central and Southern States sirup is made from the sweet sorghums by home processes of manufacture; while probably an even greater amount of sirup is made from corn, cornstalks, and other substances in the glucose factories which center in Chicago and adjacent territory.

The sugar beet in the United States is grown along the northern margin of the corn belt in Michigan, Wisconsin, and Minnesota, and in the Western States, principally in Colorado, Utah, Idaho, and California. Owing to the cool summer weather, corn is not extensively grown in these regions, and the sugar beet meets very well the need for an intertilled crop, especially in the West, where the high price of land and cost of irrigation require a crop having a comparatively high value per acre. Sugar beets are grown mostly in small fields or plots, in rotation with other crops, the labor supplied principally by the farmer and his family with occasional help during the harvest period, and both the crop and system of agriculture are characteristic of the north temperate zone. The beets are hauled either by wagon or railroad to the sugar factory, located usually in a nearby town.

Until recently the United States imported practically all its sugar-beet seed from Europe, but now is producing from one-fourth to one-half of its needs.

The production of cane sugar in the United States is practically confined to the lower delta of the Mississippi River in Louisiana, where the cane is grown on large plantations principally by negro labor and constitutes practically the sole source of income of the plantation. Both the crop and the system of agriculture are characteristic of the Tropics. Many of the plantations are so large as to have their own mills for the manufacture of the sugar.

Sugar cane is propagated by planting the mature stalks or portions thereof. It is a perennial, springing up from the rootstock after cutting, but because of diseases, inferior tillage, and other causes, the best yields are obtained by replanting annually or biennially, especially in subtropical districts, like Louisiana, where winter frosts damage the stubble. In the Tropics the full twelve months or more are usually allowed to mature a crop, but in Louisiana varieties must be chosen that will mature in as few as seven or eight months. A uniform high temperature, strong sunlight, and frequent showers during the growing season are very desirable to keep the cane growing rapidly Cool or cloudy weather and drought are likely to stunt growth, making short joints in the cane, which results not alone in a reduced

tonnage but also in a higher fiber content with a consequent reduction in the sugar content. The moisture requirement of cane is large, equivalent to from 50 to 65 inches of rain annually, and even higher in some of the drier tropical countries, like Hawaii, where maximum crops are produced by supplementary irrigation.

Sugar cane requires a fertile soil, maintained thus by a suitable rotation and by natural or artificial, especially nitrogenous, manures. Because of its high moisture and plant-food requirements, it thrives best on silt loam or clay loam soils, well supplied with humus. The crop requires good drainage and tillage. In the alluvial bottoms along the lower Mississippi and its bayous the lighter silty-clay loams on the higher levels near these water courses are well adapted to its culture, but not the poorly drained, stiff clay soils farther back.

CUBA (fig. 95) ranks second to India in sugar production, but, having a small population, is the world's largest sugar exporter. Its position on the northern margin of the trade-wind belt gives the island a maximum summer rainfall, while the winters are relatively cool and dry and favorable to the maturing and harvesting of the crops. Scarcity of labor makes it necessary to cultivate the crop in an extensive manner. Five to ten crops are usually obtained from one planting. Methods of fertilization or of intensive tillage are not employed, but new lands are opened as the old are abandoned. Large areas of new land in eastern Cuba are suitable for the crop. More recently the tendency on the best managed plantations has been toward more frequent replanting, better tillage, and a rotation of crops. The cane may be planted either in the spring before the rainy season or in the autumn while the ground is still wet. Delay in the spring rains may make a second planting necessary. The time for cutting the cane is determined not so much by the condition of the crop as by the season. Poor roads make it necessary to move the crop largely in carts, and this is possible only after the ground has become firm after the rains. Cane which matures late in the winter and is ready to cut with the coming of spring rains must, therefore, sometimes be left standing until the following winter. Moreover, scarcity of labor sometimes makes it necessary to leave the cut canes in the field for some time. It is practicable to do this only in the winter, as the high summer temperatures and humidity induce rapid fermentation.

The chief climatic disadvantages in cane cultivation in Cuba are irregularity in the period of rain recurrence, occasional droughts, and the occurrence of hurricanes.

Formerly the crop was ground in a large number of small mills. The present tendency is to centralize the industry and to enlarge both the plantation and the factory units.

PORTO RICO (fig. 96) ranks fifth as a producer of cane sugar. The seasonal distribution of rainfall on this island is similar to that of Cuba. However, the island is more mountainous and the northeast trade winds bring little moisture to the southern slopes. The cane grows without irrigation on the northern lowland, but in the south irrigation is required. The crop is usually planted in the autumn and cut in the dry season a year later.

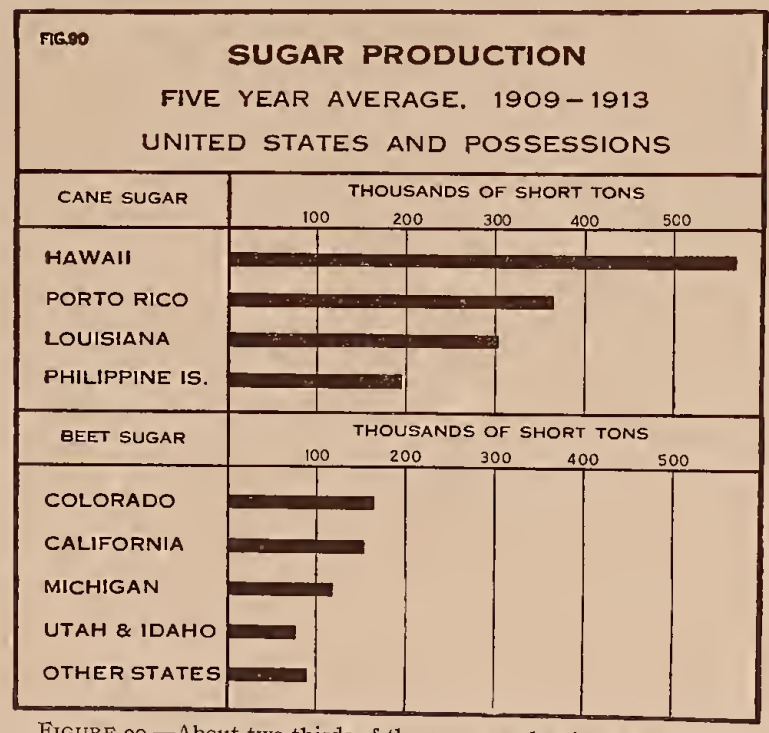


FIGURE 90.—About two-thirds of the sugar production of the United States and possessions is cane sugar, produced in Hawaii, Porto Rico, Louisiana, and the Philippines, while about one-third is beet sugar manufactured mostly in Colorado, California, Michigan, Utah, and Idaho.

Sugar is raised also on nearly all other West Indian islands. The conditions are perhaps most interesting in the Barbados, a very small island which has been devoted to sugar production for two centuries. The surface is level, the soil largely of coral origin, the temperature uniform, and the rain plentiful. About 60 per cent of the entire surface is planted to sugar cane.

THE HAWAIIAN ISLANDS (fig. 97), which rank fourth in cane-sugar production, lie, like Cuba, in the region of northeast trade winds. The heaviest rainfall is therefore on the northern and eastern coasts and mountain slopes, while the leeward slopes are dry. Sugar, however, is grown on both the eastern and western slopes. The latter, representing about half the total acreage, is under irrigation and yields somewhat better than the area watered by rain only. The available lands are found mainly along the coasts, where the soil is chiefly alluvial, derived from basaltic lavas with an admixture of coral lime, and, therefore, very fertile.

INDIA (fig. 94), the earliest cultivator of sugar cane, is still the largest producer. While statistics are incomplete, they are sufficient to show that the chief region of production is the central and upper Ganges Valley, where supplementary irrigation is sometimes practiced, especially in the Punjab. The methods of cultivation are most painstaking. The ground is carefully tilled and fertilized and the cane usually treated as an annual. The planting is done during the dry season, February to April. Irrigation of the fields is then necessary until the coming of the monsoon rains. Harvest takes place between January and April of the following year. The cane is crushed in primitive mills and the juice boiled down to a soft, brown sugar called "gur." The product is consumed mainly in the producing region and entirely within India, there being an increasing import of sugar and no export. The crop is almost entirely produced on small plots or gardens and a considerable portion of the cane is eaten raw.

JAVA (fig. 98) ranks next after India and Cuba as a cane-sugar producer. The island is tropical, and the western and southern sections are more rainy than the northern and eastern plains, although the latter have a precipitation of from 50 to over 100 inches per year, with a January maximum. July, August, and September are relatively and at some stations actually dry. The cane is raised under supplementary irrigation, chiefly on the northern plains of the eastern half of the island, on the plain to the southeast of the central mountains, and in the valleys and highlands of the east. The soil of the sugar regions is largely alluvial, derived from volcanic muds. The crop is grown as an annual at great expense of labor on highly tilled land which does not as a rule belong to the cultivator. The very dense population of Java supplies abundant labor and produces a different economic situation from that found in Cuba.

In the Southern Hemisphere (see fig. 91) considerable sugar is produced on the humid coasts of Queensland, in southeast Africa, and in Brazil, and also in northern Argentina, where the small state of Tucumán has, with supplementary irrigation, produced sugar for more than two centuries. The commercial importance of sugar in Tucumán is recent. The soil is light, labor is scarce, and the yields are relatively small, so that the crop is insufficient for the local demand. In the irrigated coastal valleys of Peru also there is grown a small amount of sugar cane.

FIG. 91

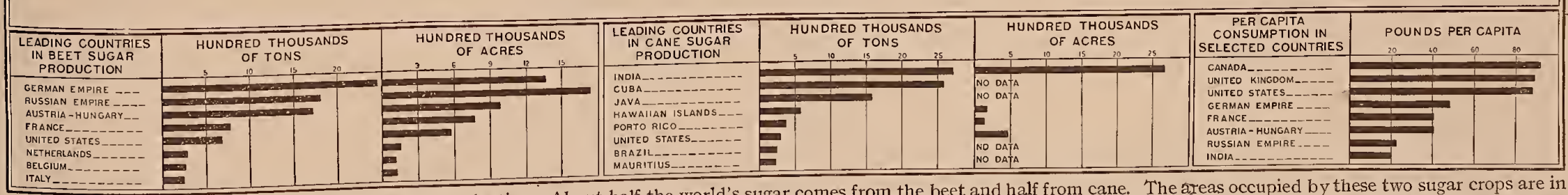


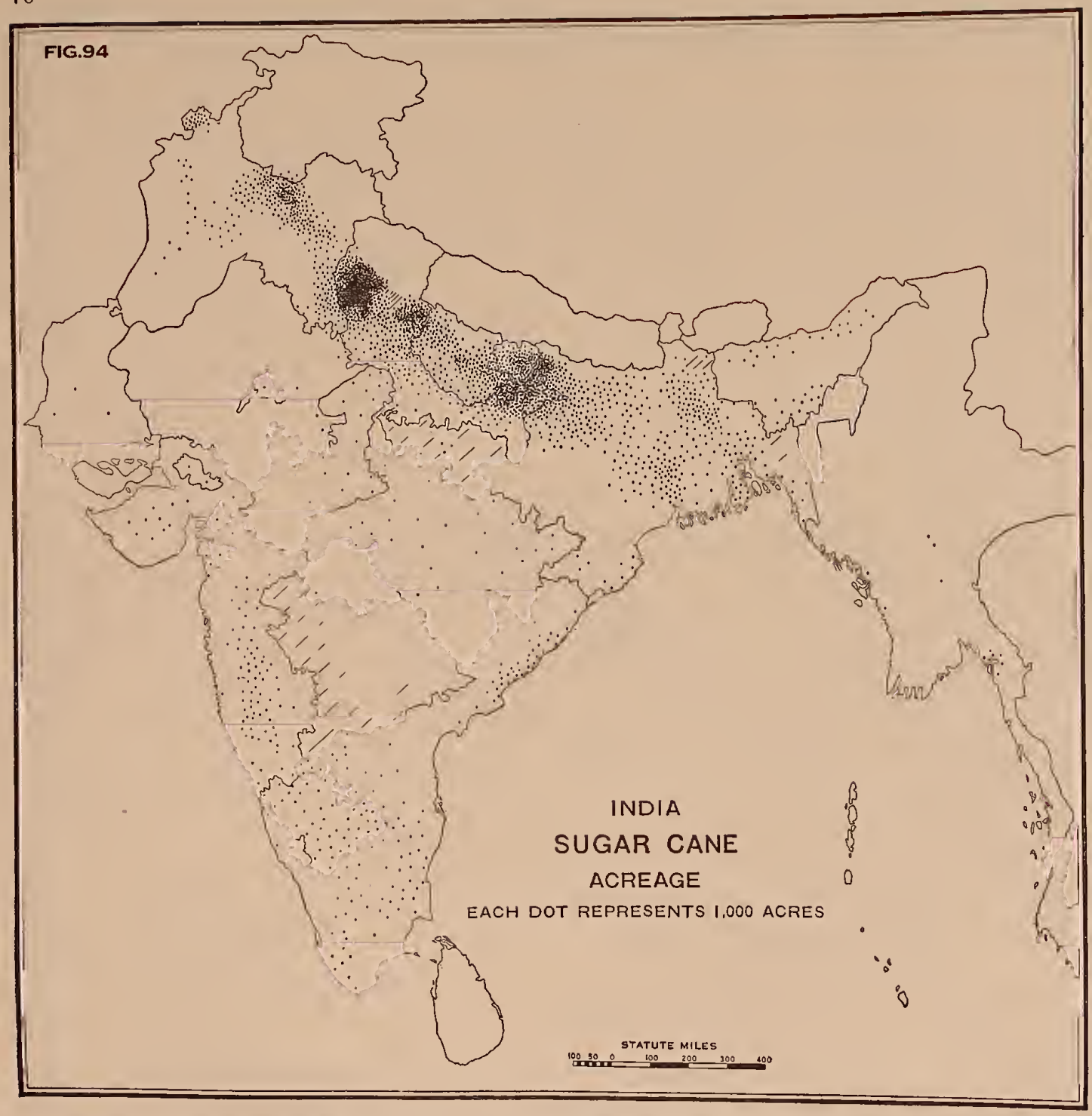
FIGURE 91.—Distribution of the world's sugar production. About half the world's sugar comes from the beet and half from cane. The areas occupied by these two sugar crops are in general very distinct, the only place where they overlap being in southern Spain. Only recently, however, a sugar factory in southwestern Arizona has been remodeled for the purpose of extracting sugar from sugar cane and from sugar beets. The centers of beet-sugar production are southwestern Russia, Austria, central Germany, northern France and southern Belgium, Michigan, Colorado, Utah, and California. The centers of cane-sugar production are the Ganges Valley in India, Java, Hawaii, Cuba, Porto Rico, and Louisiana. The course of the dividing line on the map through Asia is merely conventional since there is no beet-sugar production to the north of the line. Beet sugar is not produced in the Southern Hemisphere, the sugar crops of Argentina, South Africa, and Australia being entirely cane.

64505—10°

FIG. 92

FIGURE 92.—Distribution of acreage of sugar crops in the United States. The two more important commercial sugar crops are cane and beet. The acreage of sorghum cane is about as great as that of sugar cane or sugar beets, but the sirup is mostly made from the sorghum on the farm and does not enter into commerce. Sugar beets do not in general show a sufficiently high sugar content to be manufactured profitably where the summer temperature is over 72°, and the beet must also then compete with corn for the farmer's labor. Sugar cane is not grown commercially for sugar outside of the almost frostless lower Mississippi Delta of Louisiana. The broad belt between these two areas is occupied by a thin and scattered acreage of sorghum cane.

FIGURE 93.—Sugar-beet acreage in Europe. In its marked concentration this crop is comparable to tobacco (fig. 78). The regions of concentration are, however, not the same. The areas of sugar production are distributed in response to conditions of soil, climate, available labor supply, and the competition of other crops for the time of the farmer. Russia has the largest acreage, but Germany the largest production. However, the most important sugar-beet region is in southern Belgium and northeastern France.



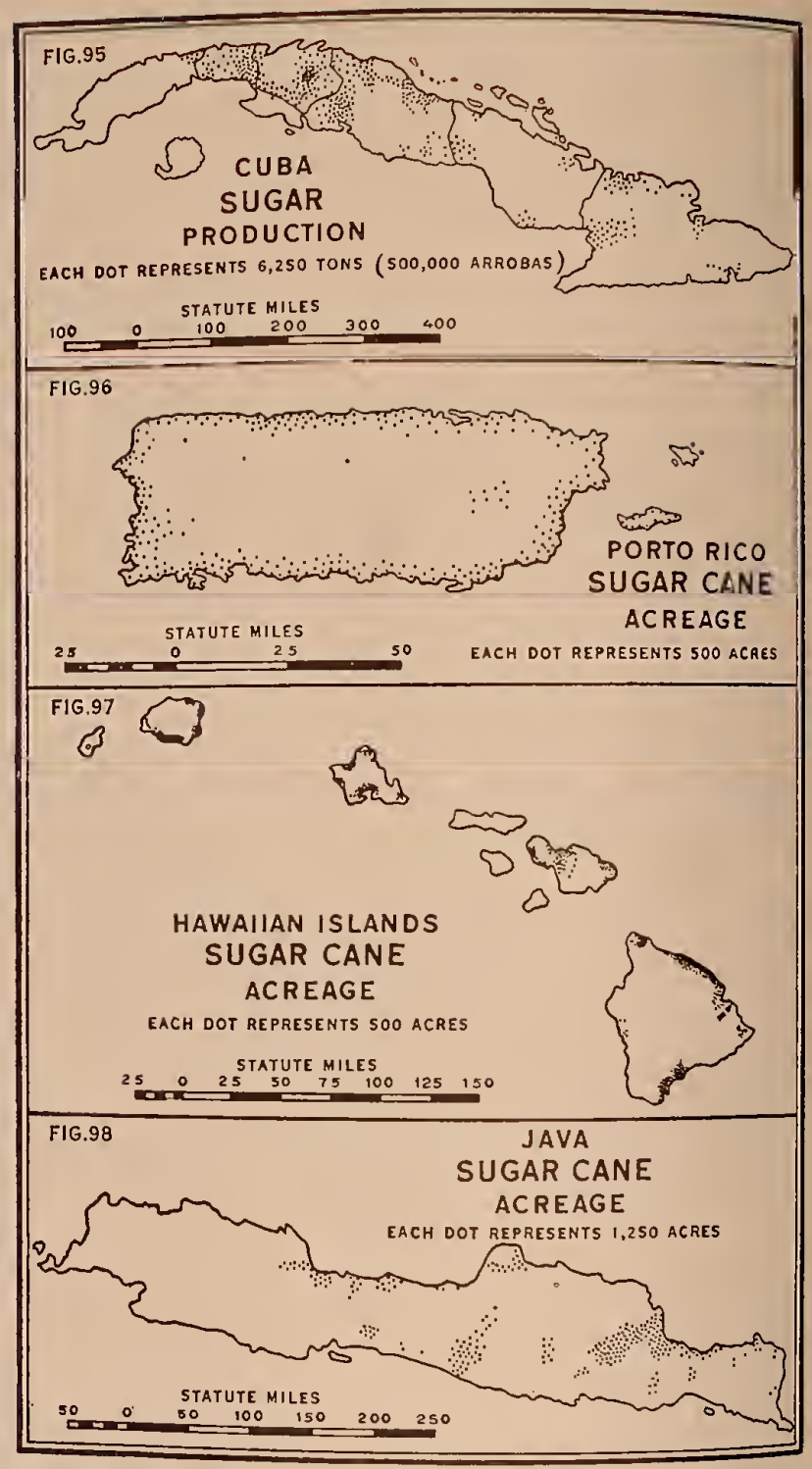


FIGURE 94.—Sugar-cane acreage in India. The cane is mainly grown under irrigation, since it stands on the ground for twelve or more months and demands a water supply throughout this period. The acreage is concentrated in the Ganges Valley.

FIGURES 95–98.—Sugar acreage or production in important island areas. Absence of statistics of area in Cuba makes it necessary to show the cut of cane as weighed at the mill before grinding. The distribution of the Cuban crop is therefore accurately shown, but the dot scale is not comparable with the other maps. Estimates indicate that 500,000 arrobas (6,250 tons) is the approximate average yield of cane from 300 acres. The acreage in Hawaii and Porto Rico is largely confined to the coastal plains, the interior of these islands being mountainous. In Java the cane is grown in the eastern and central sections of the island.

THE APPLE is one of the most widely distributed of tree fruits. It is grown in all the countries of northern Europe, in southeastern Canada, and in that part of the eastern United States where the mean summer temperature is less than 80°. In western North America apple production is practically confined to the irrigated districts and to the valleys of the Pacific Coast States and of British Columbia. Very few apples are produced in the Orient, in southern Europe, or in South America, in fact, the geographic distribution of apples corresponds more or less with that of the Teutonic and Anglo-Saxon races.

UNITED STATES (figs. 101–103).—The apple crop of the United States is many times greater than that of any other country, yet apples contribute only between 1 and 2 per cent of the value of all crops in the United States. The apples produced in 1909 were worth about one-half as much as the potatoes, one-third as much as the vegetables, and one-tenth as much as the cotton or the hay crops. The approximate area occupied by the 227,000,000 apple trees of all ages was about 4,200,000 acres, or slightly over 1 per cent of the total acreage of all crops. The trees of bearing age occupied about 3,000,000 acres.

The apple, although thus of minor importance compared with the staple crops, is by far the leading fruit grown in the United States. Apples constituted 56 per cent of the acreage of all fruits and nuts in 1909 and the value of the apple crop was greater than that of peaches, pears, plums, prunes, cherries, and the citrus fruits combined (see fig. 99).

The production of apples (fig. 101) in commercial quantities does not extend much to the south of the line of 79° mean summer (June, July, and August) temperature, only a few trees, planted mostly for home consumption, being found below this line. The northward distribution ends approximately at the mean winter (December, January, and February) isotherm of 13°, and the acreage is thin beyond the winter isotherm of 20°, except in Vermont, New Hampshire, and Maine, where the moister weather lessens the injury of the dry winter winds. The effect of the cold, desiccating northwestern winds is apparent on the map as far south as central Illinois and northwestern Indiana, while the influence of Lake Michigan in raising both the temperature and moisture content of the air is evident not only on the Michigan but also in lesser degree upon the Wisconsin shore. Very few apples are grown in the Great Plains area beyond the line of 18 inches rainfall during the six growing months, April to September, inclusive, except where irrigation is practiced.

With the exception of the Ontario shore counties of New York and of the southern peninsula of Michigan, in both of which localities the lake influence produces peculiarly favorable conditions, the development of the apple industry in the East has taken place principally in regions of rolling to hilly topography. The land in such regions is generally less adapted to field crops and is cheaper, while the topography provides excellent air drainage, and therefore greater freedom from frosts.

Although certain varieties of apples, such as the Yellow Newtown, are especially adapted to certain soils and locations, the apple, as a species, is less restricted in its soil preferences than many of the staple crops. Whereas wheat prefers silty, limestone soils and corn rich, warm loams, the apple appears to thrive as well upon the granitic soils of New England and eastern New York as upon the limestone soils of northwestern New York, the Shenandoah Valley, or the Ozarks.

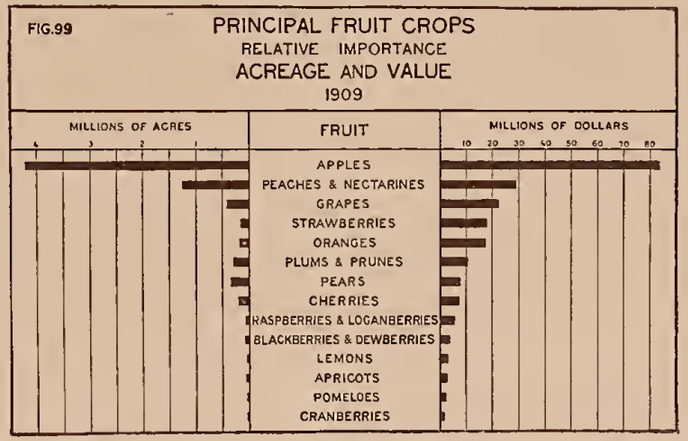


FIGURE 99.—The fruit crops of the United States in 1909 constituted about 2 per cent of the acreage of all crops and about 4 per cent of the value. The apple is by far the leading fruit, the acreage of the crop in 1909 being greater than that of all other fruits combined.

The apple, as represented in its numerous varieties, has a climatic and soil range as wide as those of the staple crops (compare fig. 101 with that of winter wheat, fig. 16) and one-sixth of the land area, or one-third of the agricultural area of the United States, is adapted to its production. This area is fully fifty times as great as that needed to meet the demand for the fruit. The geographic limits of the apple industry, therefore, are not primarily climatic but economic; not determined by possibility of production, but by probability of consumption. Deficiency in transportation facilities in particular is a limiting factor in many regions otherwise well suited to apple growing.

CANADA (fig. 112) has four centers of apple production—the Annapolis Valley in Nova Scotia, the region near Montreal, the shores of Lakes Ontario and Erie, especially the Niagara Peninsula, and the mountain valleys of British Columbia. In the Annapolis Valley a belt of sandstone soil about 100 miles long and 6 to 10 miles wide produces apples under the protection of a northern mountain range. The protecting influence of water is evident in the apple regions of peninsular Ontario. In the dry mountain valleys of Britisb Columbia, such as the Okanagan, supplementary irrigation makes possible the production of large, highly colored fruit. The rapidity with which the apple possibilities of this region are being exploited is indicated by the large number of trees not of bearing age (fig. 109).

EUROPE.—The commercial apple regions of Europe are mainly in the northwest, where fertile soil, undulating topography, mild winters, moderately warm summers, and abundant moisture are combined with proximity to large urban markets.

The commercial apple crop of the United Kingdom (fig. 116) is confined to southern England, because of the low summer temperature in Scotland and Ireland. There are three important apple regions in England, viz., Kent, Herefordshire, and the southwestern peninsula. In Kent the apple is but one of a number of fruits of a very high grade grown in a region of commercial orchards. Both climate and soil in Kent conduce to the production of fruit rather than of large trees. The product of this region is mainly table fruit. In Herefordshire, on the contrary, the industry centers upon the production of cider apples, for which this county is famed.

The apple industry of France (fig. 114) centers along the English Channel. In France as a whole the apple has not the importance that it enjoys in England and Germany. The northern section of France is, however, beyond the limits of vine culture and cider is the traditional beverage of Normandy and Brittany. The absence of apples in southern France is partly the result of the competition of the vine and partly of the Mediterranean type of climate which is not favorable to the apple.

In Germany (fig. 115) the relative importance of the apple is greatest in the more mild and moist western section, particularly Rhenish Prussia and Wurttemberg.

In Spain (fig. 117) apple production is most important on the north coast, which, with its higher rainfall, is least Mediterranean in climatic characteristics. In Italy the importance of the apple relative to other fruit is so small that it is not enumerated separately in Italian statistics.

There is considerable production of apples in Russia, and Australia and Tasmania raise apples on a commercial scale.

PEACHES.

UNITED STATES (fig. 104).—Unlike apples the acreage of peaches in the Southern States is relatively more important than in the Northern States. Peaches will not endure such severe winter temperatures as apples, the northern limit of extensive production being approximately the mean winter-temperature line of 25°, which extends from Chicago through Omaha to Cheyenne. West of the Rocky Mountains peaches are grown in the lower, warmer valleys as far north as the Canadian boundary and beyond.

The dense peach acreage on the east side of Lake Michigan, and the absence of the fruit from the opposite Wisconsin shore, is an excellent example of the moderating climatic influence of large bodies of water. The critical temperature of 15 to 20 degrees below zero, which usually kills the fruit buds, is experienced almost every winter on the Wisconsin side of the lake, but very seldom on the leeward Michigan shore. This freedom from severe winter temperatures, and also from injurious spring frosts, combined with a sandy loam soil, and with proximity to large markets in Chicago, and the cities of the Northwest, has resulted in the development of one of the largest peach belts in the United States.

The most important peach producing region in the United States centers around Fresno, Cal. Fresno County produced more peaches in 1909 than any State other than California. California-grown peaches are largely used for canning and drying, this State contributing in 1909 over 80 per cent of the canned peaches and practically all of the dried peaches of the country. The climatic conditions are quite different from those in the East, being similar to the Mediterranean region of Europe. Most of the California peaches are grown under irrigation.

EUROPE (figs. 113 and 117).—In Europe peaches are most abundant in the sections of France and Spain having warm and dry summers. Winter temperatures are not the limiting factors in their distribution in these countries, as the Lyon peach district has the severest winter temperatures of any part of France. The summers of northwestern Europe are too cool and cloudy properly to ripen this fruit.

PLUMS AND PRUNES.

UNITED STATES (fig. 105).—In this map the dots east of the Rocky Mountains represent mostly plums, west of the mountains mostly prunes. The greatest center of production in the United States is Santa Clara County, Cal. This county has over 3,000,000 trees and produced nearly 4,000,000 bushels of prunes and plums in 1909, which was over one-fourth of the total production of the United States. Other important centers of prune production are in Solano, Sonoma, Napa, and Tulare Counties, Cal., in Marion, Douglas, and Yamhill Counties, Oreg., and in Clarke County, Wash.

PEARS.

UNITED STATES (fig. 106).—The important centers of the production of pears in the United States are in central California, the Rogue River Valley of Oregon, the Yakima Valley of Washington, the southern Michigan shore of Lake Michigan, the Ontario shore in New York, the upper Hudson Valley, and in eastern Maryland, Delaware, and southern New Jersey. Nearly half of the trees of the United States are in the five States of California, New York, Michigan, Oregon, and New Jersey. The northern limit of pears across the States of Wisconsin and Iowa follows more or less closely the winter-temperature line of 20°.

FIG. 100 APPLE TREES OF BEARING AGE AND TREES NOT OF BEARING AGE

STATES	THOUSANDS OF TREES OF BEARING AGE	THOUSANDS OF TREES NOT OF BEARING AGE
MISSOURI	14 360	3 625
NEW YORK	11 248	2 829
ILLINOIS	9 901	2 548
ARKANSAS	7 650	3 940
OHIO	8 505	2 438
PENNSYLVANIA	8 000	2 501
VIRGINIA	7 005	3 436
MICHIGAN	7 534	2 253
KANSAS	6 930	1 116
WASHINGTON	3 009	4 863
IOWA	5 847	1 914
INDIANA	5 765	1 962
KENTUCKY	5 538	2 106
WEST VIRGINIA	4 571	2 772
TENNESSEE	4 839	2 117
NORTH CAROLINA	4 910	1 835
OKLAHOMA	2 956	2 060
MAINE	3 477	1 045
OREGON	2 030	2 241
NEBRASKA	2 937	967
WISCONSIN	2 430	1 409
COLORADO	1 688	1 973
CALIFORNIA	2 483	1 054
MINNESOTA	1 380	1 572
GEORGIA	1 878	822

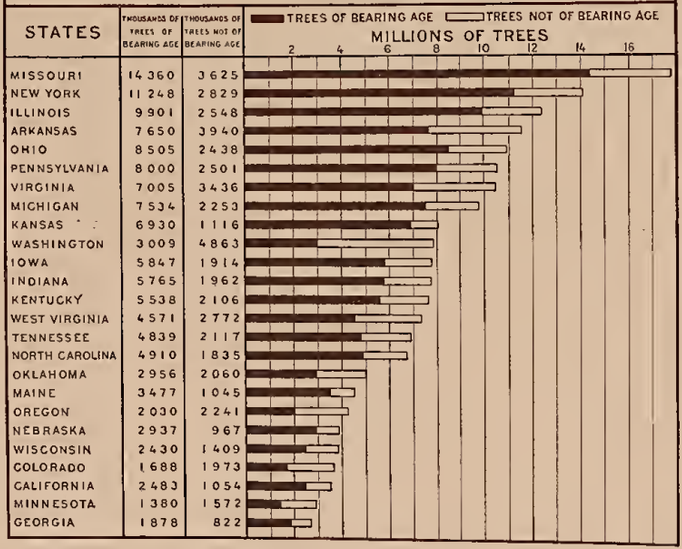


FIGURE 100.—The leading State in number of apple trees is Missouri. In number of trees not of bearing age, however, it was exceeded in 1910 by both Washington and Arkansas. Nearly half of the apple trees of the Nation were found in the eight leading eastern States—Missouri, New York, Illinois, Arkansas, Ohio, Pennsylvania, Virginia, and Michigan.

CHERRIES.

UNITED STATES (fig. 107).—The centers of production in the far West, where the sweet cherry is almost exclusively grown, are the valleys around San Francisco Bay, the San Joaquin Valley, the Willamette Valley, the districts around Cove and Milton in northeastern Oregon, and the Bitterroot Valley in Montana. Sour or "pie" cherries are grown extensively in the region around Denver and in the Arkansas River Valley of Colorado. Sour cherries are much more important commercially in the East than the sweet varieties. They are grown extensively along the Michigan shore of Lake Michigan, in Door County, Wis., along Lake Ontario in New York, and are scattered, largely in farmers' orchards, throughout the Central and Eastern States from Oklahoma to New York. The commercial production of sweet cherries is largely confined to the Hudson Valley, western New York, and western Michigan. Cherries extend considerably farther northwestward in Wisconsin and Iowa than pears or peaches, being limited by a mean winter temperature of about 16°, but are largely absent from the Southern States.

STRAWBERRIES.

UNITED STATES (fig. 108).—The principal centers of commercial production are in the vicinity of the large cities of the Northern States; in southern New Jersey, Delaware, eastern Maryland, and eastern Virginia; in southeastern North Carolina; around Starke and Plant City, Fla.; about Castlebury, Cullman, and York, Ala.; in Tangipahoa Parish, La.; near Houston, Tex.; from Chattanooga to Knoxville in eastern Tennessee; around Dyer, Sharon, and Humboldt in western Tennessee; in Warren County and near Louisville, Ky.; around Judsonia in central Arkansas; in the western Ozarks; in southern Illinois, Berrien County, Mich., Doniphan County, Kans.; around Los Angeles, Watsonville, San Juan, Santa Clara, and Sacramento, Cal., and Hood River, Oreg. Less intensive production is found throughout the Central and Eastern States for home use and local market.

BUSH FRUITS.

UNITED STATES (fig. 109).—The principal centers of commercial production are located in the vicinity of Marlboro, in the Hudson Valley, and along Lake Ontario, Lake Erie, and the Finger Lakes in New York; in southern New Jersey; south central North Carolina; along the eastern shore of Lake Michigan; around Philadelphia, Cincinnati, Detriot, Louisville, St. Louis, and St. Joseph, Mo.; Los Angeles, San Francisco, and Sebastopol, Cal.; Salem and Portland, Oreg., and Puyallup, Wash. Raspberries and blackberries are more perishable than most of the commercial varieties of strawberries, hence the centers of production are closer to the centers of consumption.

FIG. 101

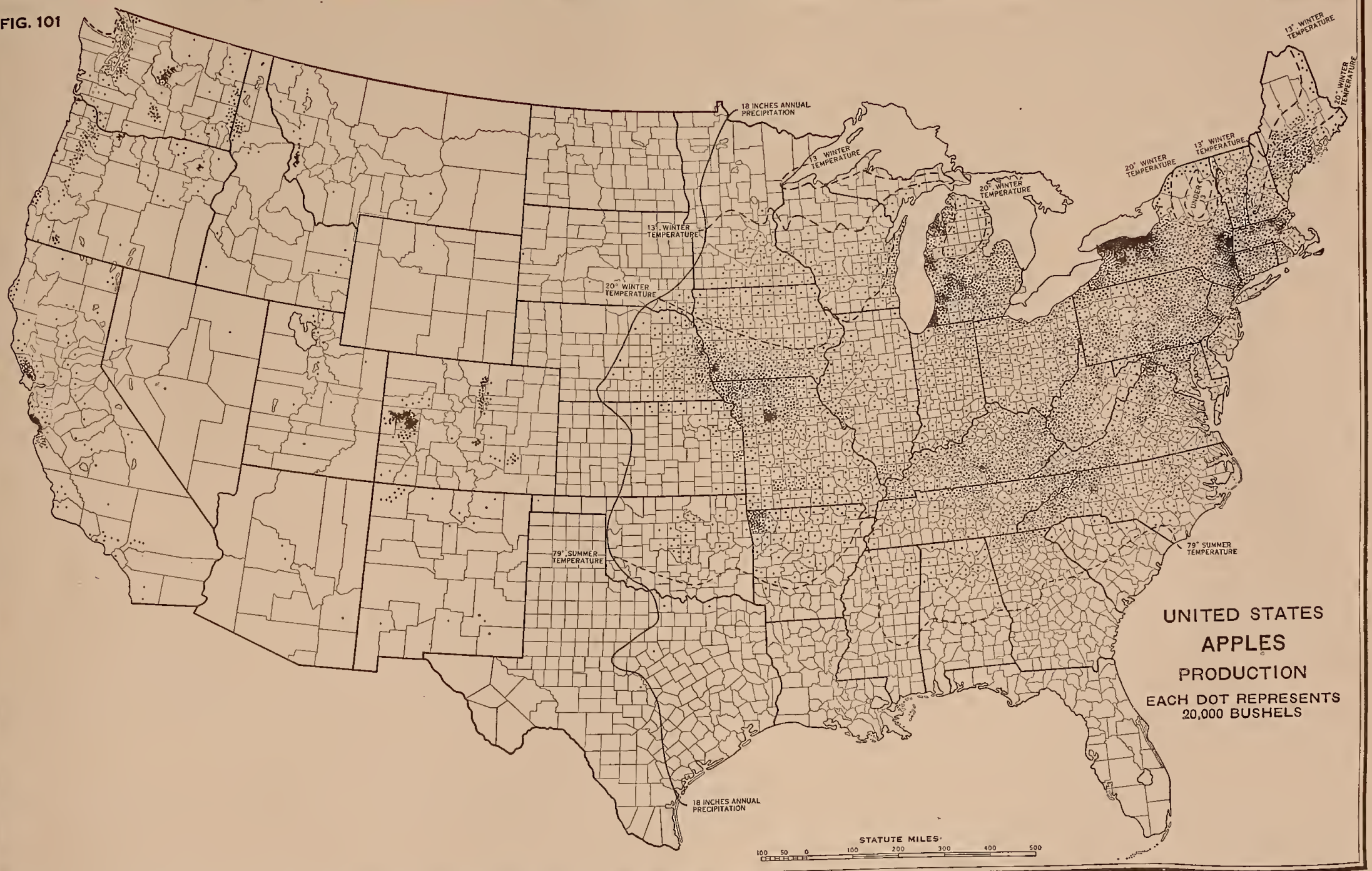
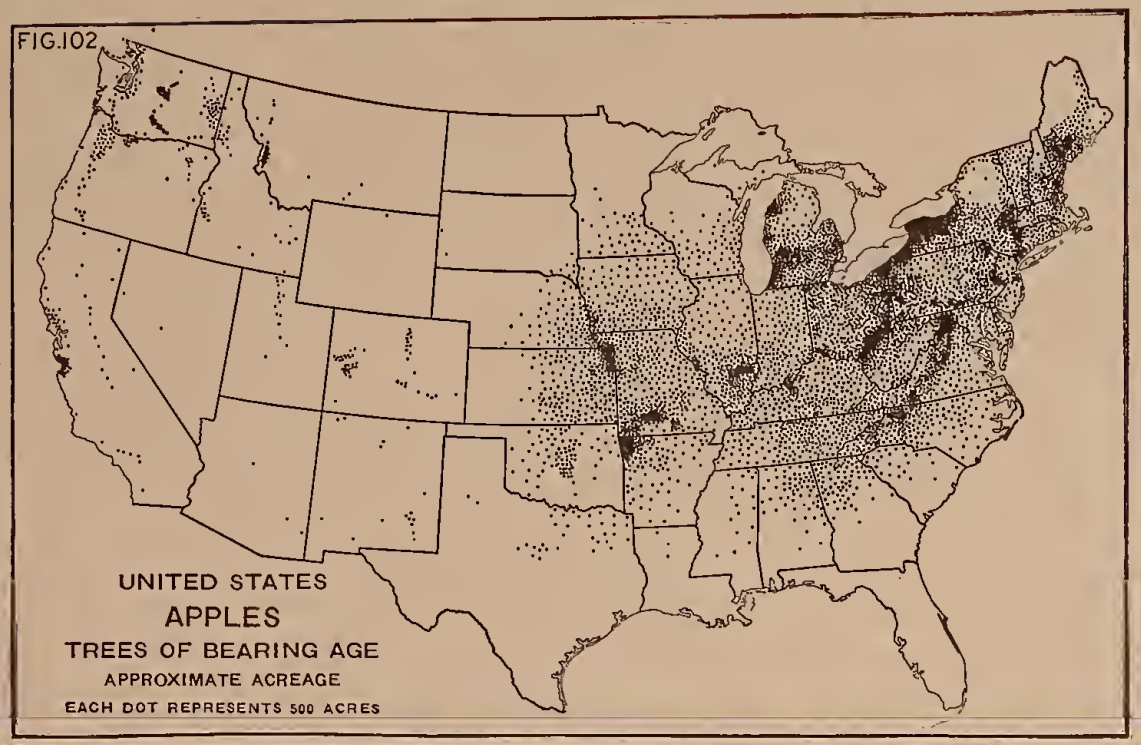
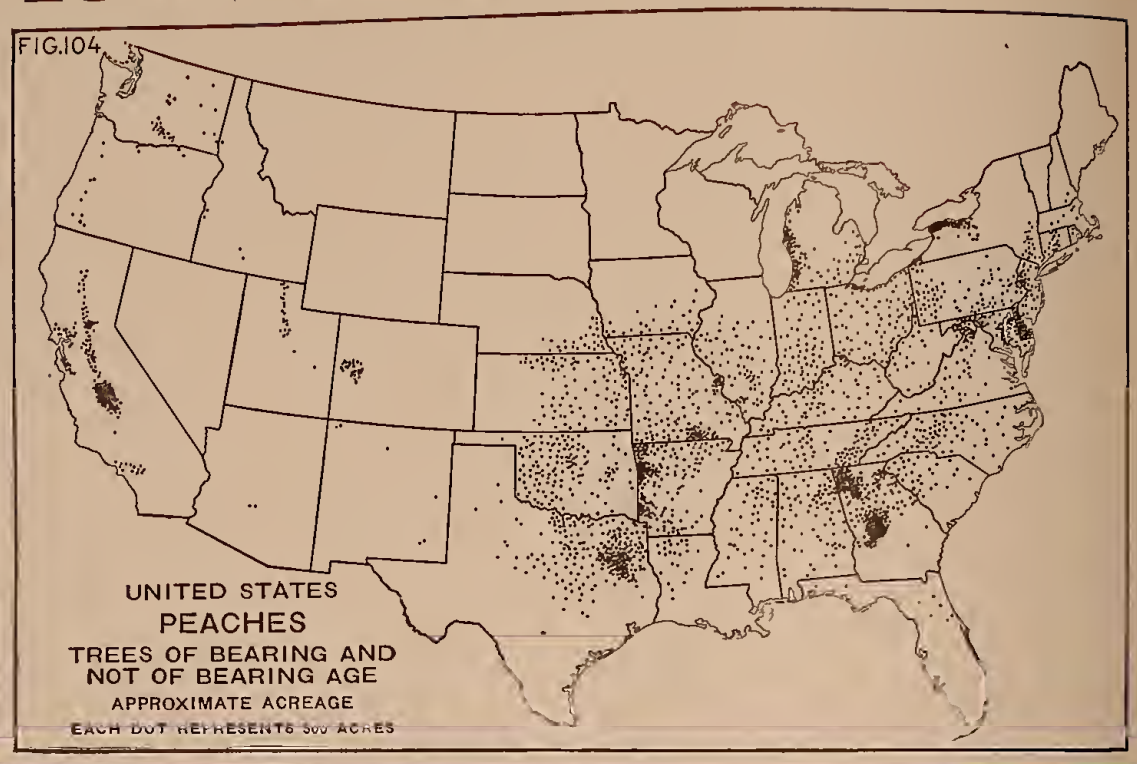
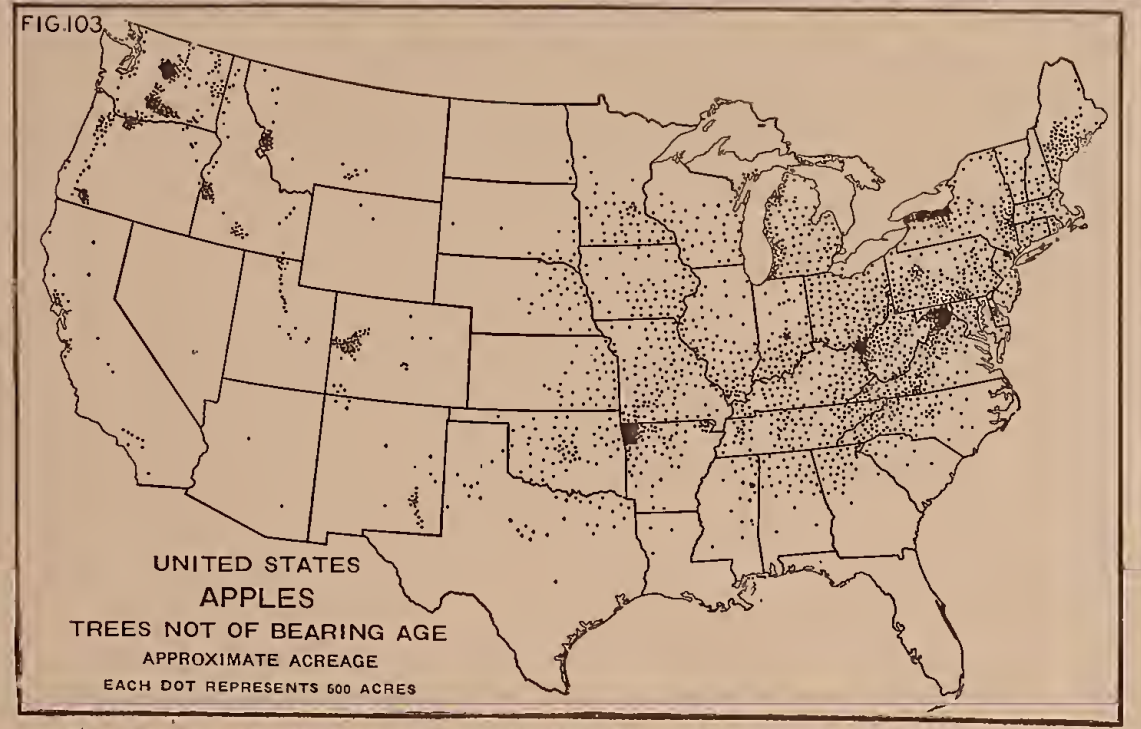


FIGURE 101.—Distribution of apple production in the United States. The map is based on the census statistics for 1909, which make no distinction between the production of farm orchards and that of commercial orchards. New York is by far the most important State, followed by Michigan, Pennsylvania, and Missouri. The most concentrated apple areas in the eastern portion of the United States are located in the Ontario shore counties of New York, the Hudson Valley, the Shenandoah Valley and along the Blue Ridge, the region along the Ohio River above the Kanawha, the Ozark region of Missouri and Arkansas, with a smaller center along the Missouri River above Kansas City. The outer boundaries of extensive apple production in the eastern portion of the United States are, on the south, the mean summer temperature of 79°, on the west, 18 inches annual precipitation, and on the north, 13° mean winter temperature. In the Western States, owing to the necessity of irrigation in most regions, the distribution of apple production is more localized. The eleven Western States contributed only about 10 per cent of the production of 146,000,000 bushels in the United States in 1909. In 1916 the eleven Western States produced 11 per cent of the total crop of 233,000,000 bushels.







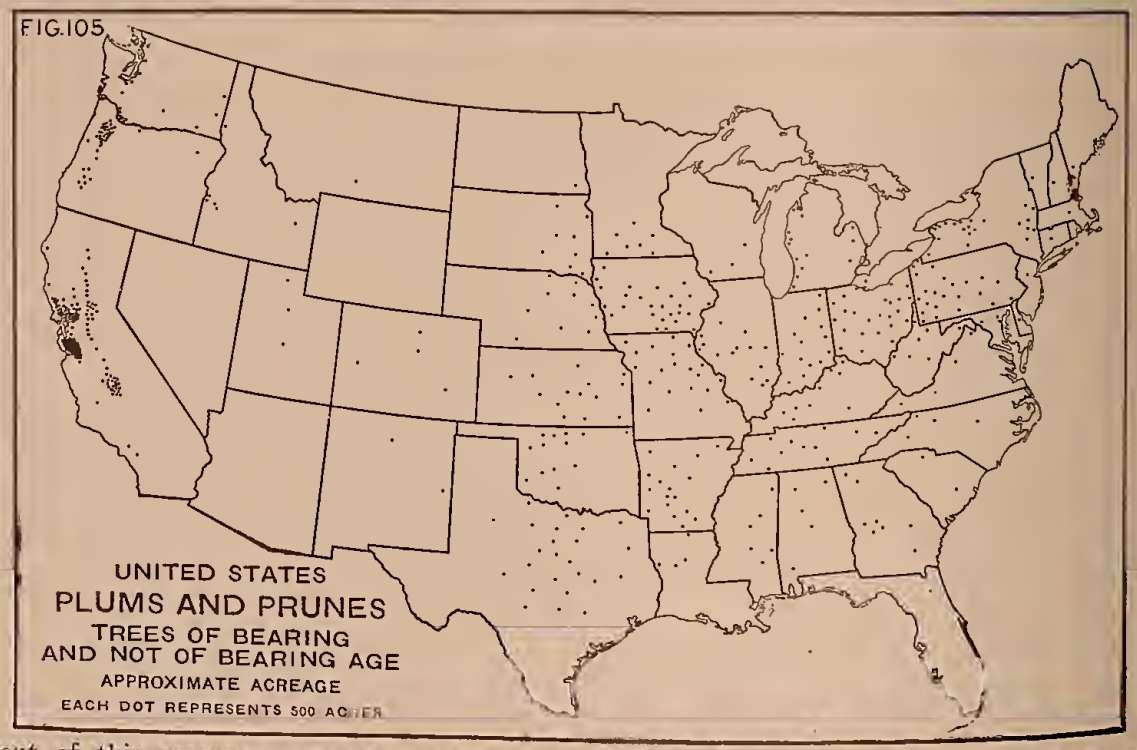
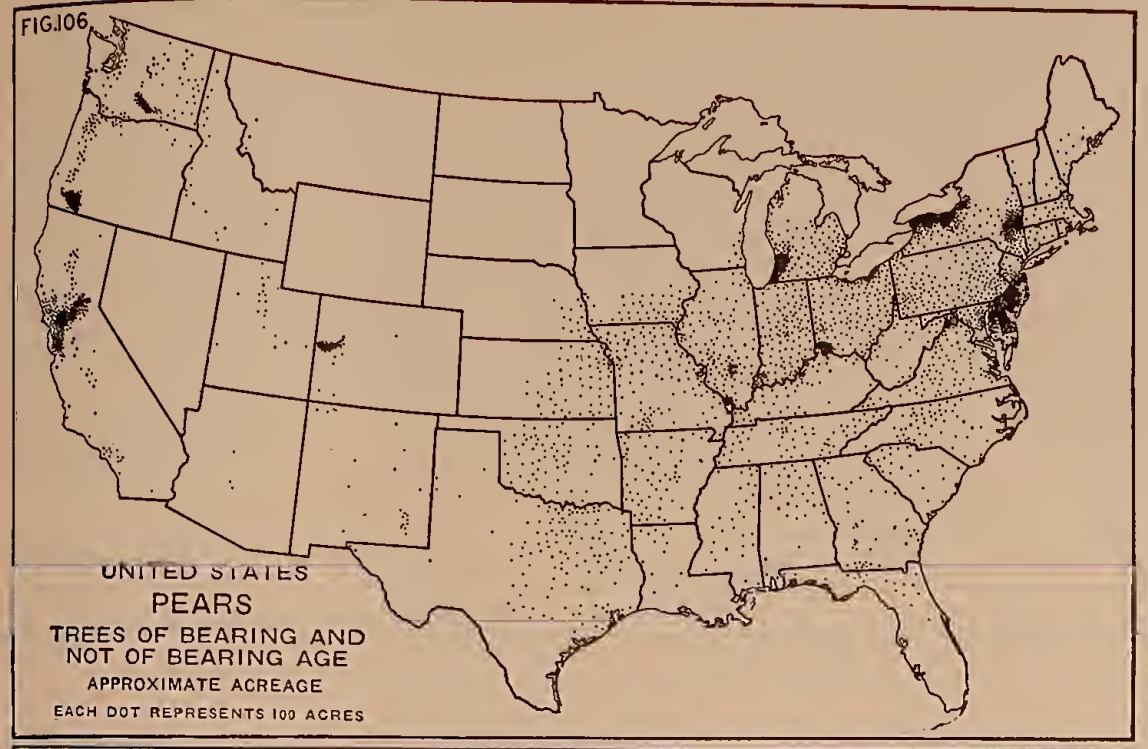


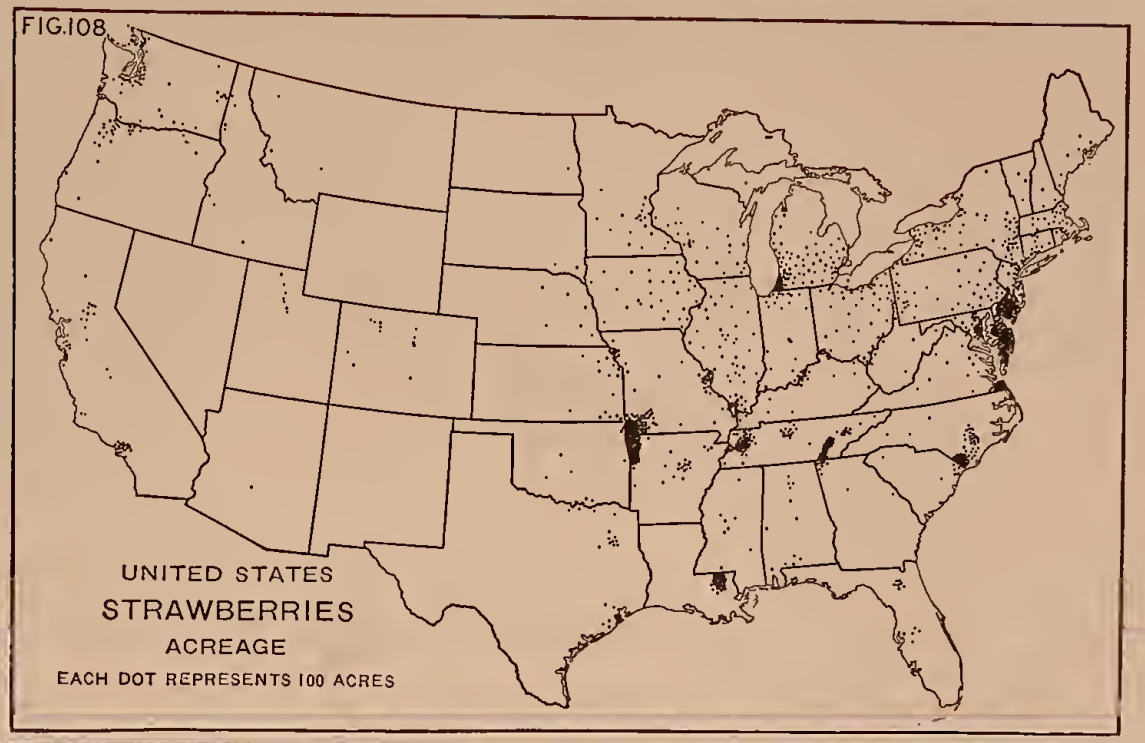
FIGURE 102.—Apple trees of bearing age, approximate acreage, 1910. Over 93 per cent of this acreage was in the eastern portion of the United States, the acreage in any one of the five leading States—New York, Ohio, Pennsylvania, Michigan, or Missouri—exceeding that of the entire western half of the United States.

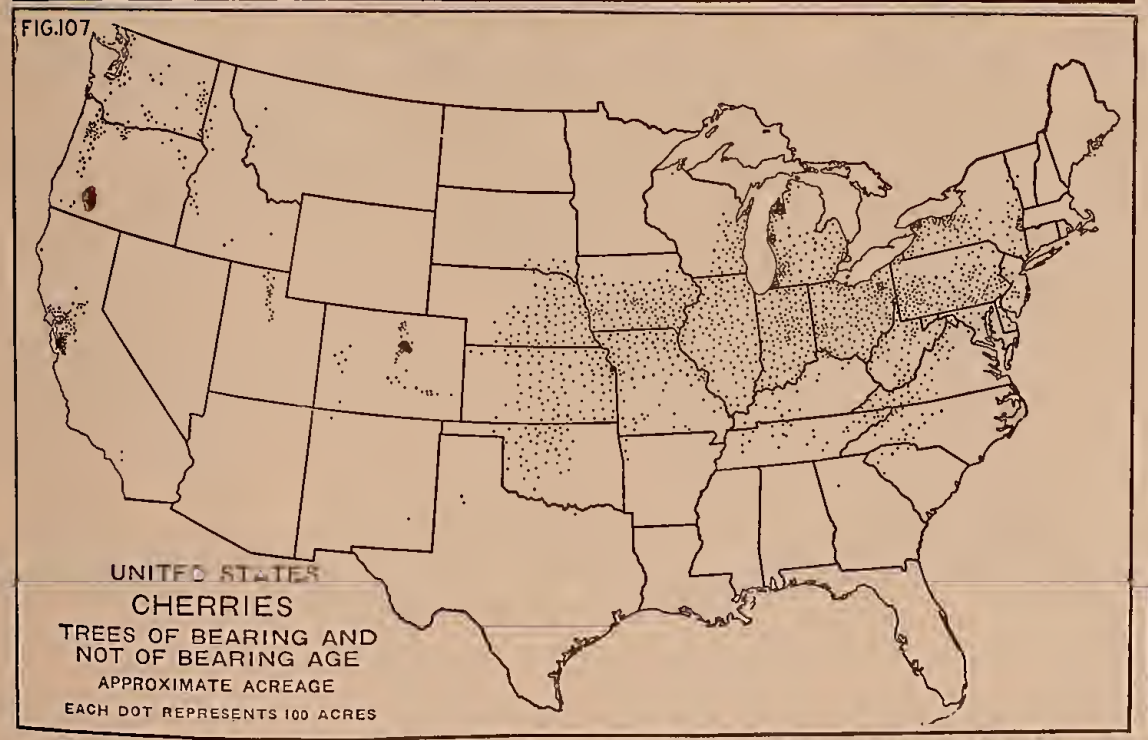
FIGURE 103.—Apple trees not of bearing age, approximate acreage, 1910. Eighty per cent of the trees not of bearing age were in the eastern portion of the United States. Washington led the States, however, in acreage of trees not of bearing age, owing principally to extensive planting in two counties—Yakima and Chelan.

FIGURE 104.—About three-fourths of the peach trees are south of the Ohio and Missouri Rivers and in California. Low winter and spring temperatures occur so frequently north of a line from Chicago to Cheyenne that the production of peaches becomes unprofitable. The climate is milder along the leeward shores of Lakes Michigan, Erie, and Ontario.

FIGURE 105.—About one-third of the acreage of plums and prunes is in California, centering in the Santa Clara, Napa, and Sonoma Valleys. A considerable acreage extends from Fresno northward along the foothills to Redding, and the Willamette Valley in Oregon is an important center of production. In the Pacific States most of the acreage is prunes.







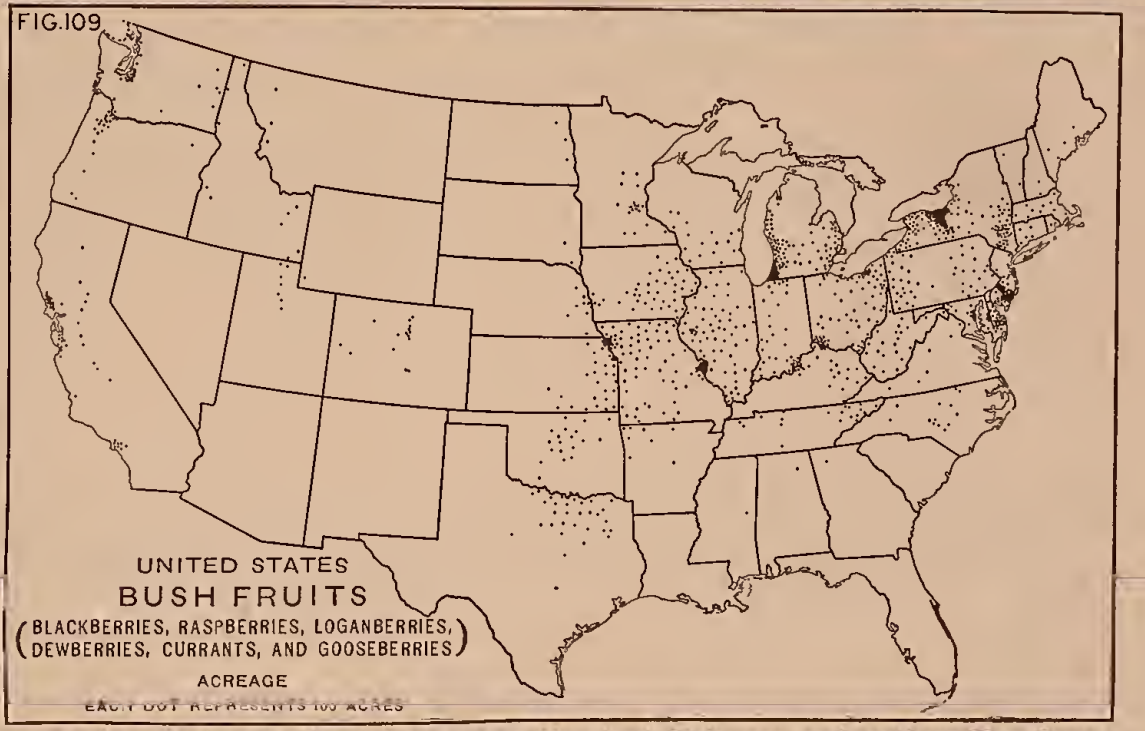


FIGURE 106.—Approximate acreage of pear trees in the United States. The largest centers of production are located in eastern Maryland, Delaware, and southern New Jersey, in western New York, southern Michigan, in the Sacramento and Santa Clara Valleys, Cal., the Rogue River Valley, Oreg., the Yakima Valley, Wash., and the Grand Valley, Colo.

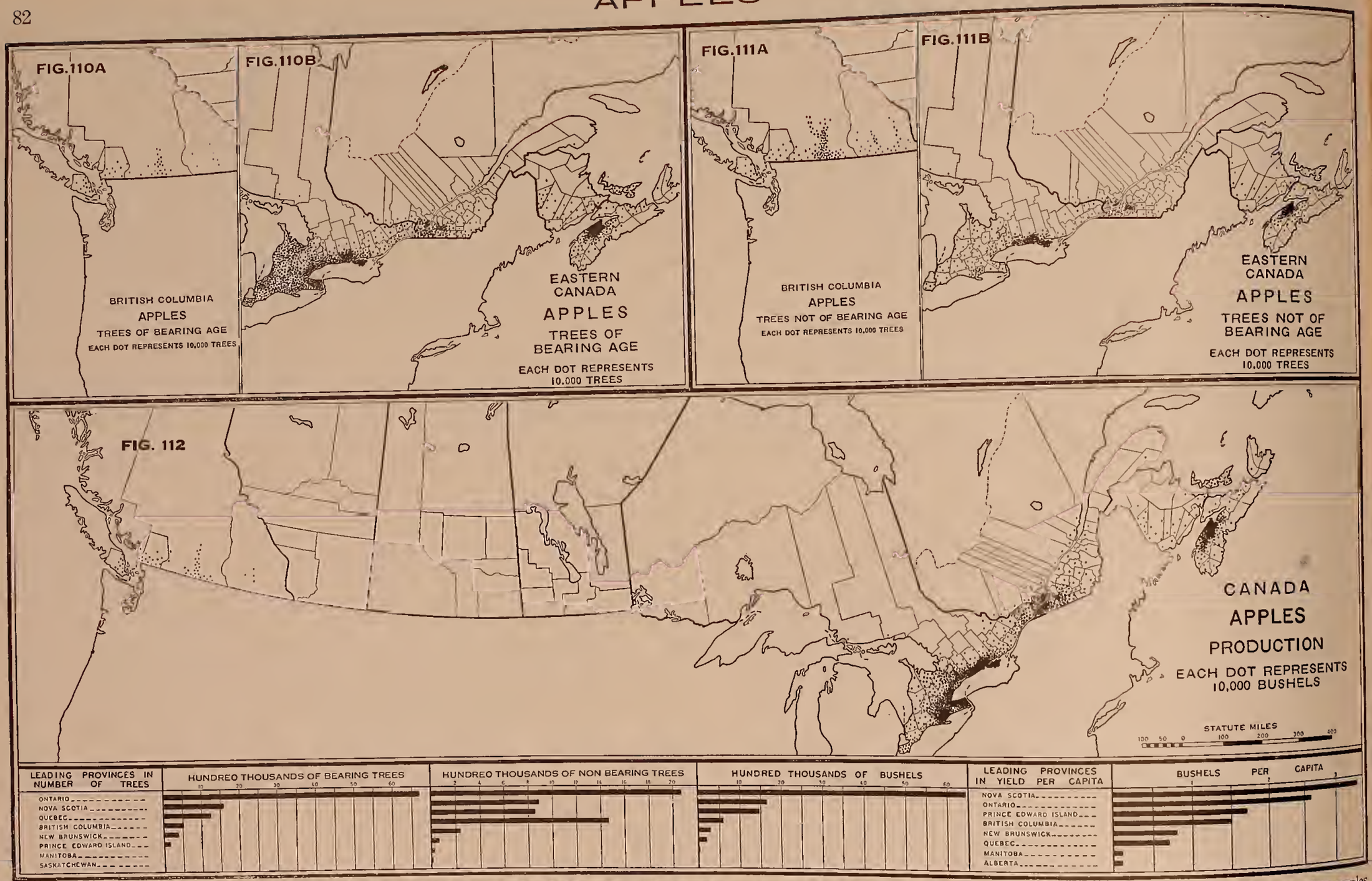
FIGURE 107.—Approximate acreage of cherry trees in the United States. California, Oregon, Michigan, New York, Pennsylvania, Ohio, and Wisconsin are the leading States in the production of cherries. The centers of commercial production are located in the Lake States and the valleys of the West. Very few cherry trees are found in the Southern States.

FIGURE 108.—Strawberry acreage in the United States. Strawberries are intensively cultivated for shipment largely to northern markets in several localities along the Atlantic Coast and in the lower Mississippi Valley. Important centers of production are also located in the Pacific Coast States (see text).

FIGURE 109.—Acreage of bush fruits in the United States. The acreage is mostly in the Northeastern States, especially along the eastern shore of Lake Michigan and in the Lake Ontario and Finger Lakes regions of New York. Smaller but intensive centers of production are located in Sonoma County, Cal., around Salem, Oreg., and Puyallup, Wash.

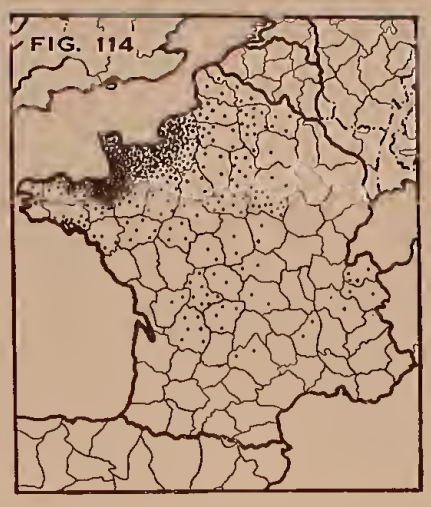
64505—11°

APPLES

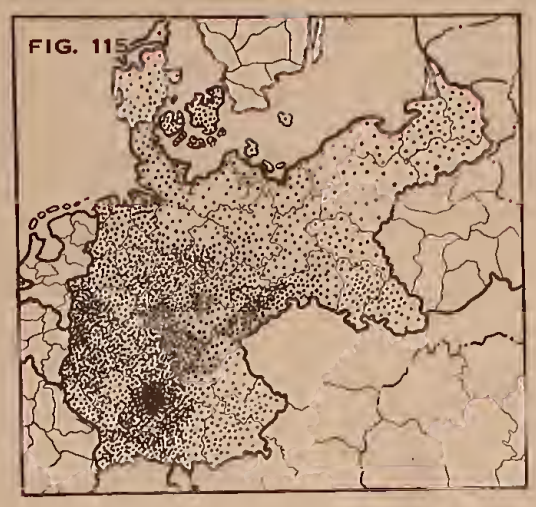


FIGURES 110–112.—Distribution of apple trees and apple production in Canada. The prairie provinces with their severe winter temperatures and short summers have so few apples that they are omitted in the maps showing number of trees. The great centers of commercial apple production are the Niagara Peninsula of Ontario, the north shore of Lake Ontario, and the famous Annapolis Valley of Nova Scotia. The orchards of the western Ontario Peninsula apparently do not yield so well as those of the Niagara region. The centers of apple planting in British Columbia and elsewhere are indicated by the number of trees not of bearing age in these regions.

FRANCE
PEACHES
PRODUCTION
DOT REPRESENTS 100 METRIC TONS



FRANCE
APPLES
PRODUCTION
EACH DOT REPRESENTS 5,000 METRIC TONS



GERMANY AND DENMARK
APPLES
NUMBER OF TREES
EACH DOT REPRESENTS 25,000 TREES

UNITED KINGDOM
APPLES
ACREAGE
EACH DOT REPRESENTS 500 ACRES

SPAIN
PEACHES
ACREAGE
EACH DOT REPRESENTS 100 ACRES

SPAIN
APPLES
ACREAGE
EACH DOT REPRESENTS 250 ACRES

ITALY
APPLES, PEARS, QUINCES, AND POMEGRANATES
PRODUCTION
EACH DOT REPRESENTS 1,000 METRIC TONS

EUROPEAN COUNTRIES
SELECTED FRUITS
ACREAGE AND PRODUCTION

GURES 113–119.—Distribution of apples and peaehes in eertain eountries of Europe. Owing to wide differenees among European eountries in the method of reeording fruit
cs, the map of eaeh eountry should be considered separately, and no fair eomparison between the maps is possible. In France apples are grown mostly along the northern eoast, in
d mostly in the milder southwestern seetion, and in Germany also in the southwest, espeeially in Baden and Wurttemberg. Peaehes are praetieally eonfined to the southern half
nce, the important center of produetion being in the Rhone Valley near Lyon.

GRAPES

THE GRAPE and its products have been known throughout historical times. Native to Asia Minor and southern Europe, the grape supplied food and drink to the early peoples of the eastern Mediterranean region and followed the lead of the nations westward to the Atlantic.

Although grown in other sections of Europe, the vinifera grape is especially adapted to the Mediterranean region. The root system of some of the varieties penetrates to great depths, enabling the plants to secure moisture during the long drought which characterizes the summer months in that region. Unlike the citrus fruits, the grape does not ripen in the winter or at the end of the rainy period, but must grow and come to maturity during the summer and fall. This necessity for heat greatly limits the geographic range of the vinifera species. The summers of northwestern Europe are not sufficiently warm to mature the crop except under glass. The northern limit of the vineyard region extends from the southern coast of Brittany northeast to include the valleys of the Moselle, the upper Rhine, and thence southeasterly through Austria and Hungary to the Sea of Azof and the Caucasus. In the northeastern section of the area thus bounded, the summers, though warm, are short and the winters severe, and the vine does not occupy as important a place in the agriculture as it does in the Iberian Peninsula, France, Italy, and Greece.

EUROPE (figs. 121 and 123).—France produces more wine than any other European country. The reported acreage in vines is not so great as that of Italy, but the more intensive cultivation gives a larger average yield per acre (about 2.4 tons of grapes per acre in France and 1.6 in Italy).

The grape is a very important crop in France; despite the large yield per acre and the fact that much of northern France does not produce wine, about 7.5 per cent of the cultivated land or 3.1 per cent of the total area is devoted to the vine. This area comprises four large districts and numerous small districts, some of them noted for the quality rather than the quantity of their product. The more important regions are the valley of the Loire, the Bordeaux region of southwestern France, Burgundy (chiefly the Saône Valley), and the Midi in the southeast. Within these regions are districts, sometimes adjacent, which produce wines of different degrees of excellence. The wines of the Loire Valley are mainly a very ordinary sort. They are raised on the slopes bordering the river and its tributaries. The vineyards of Bordeaux occupy the banks of the Gironde, the Garonne, and the Dordogne. This region is divided into seven districts, each producing a particular wine, of which those of the Medoc are most famous. This wine comes from the south bank of the Gironde and Garonne. The best Bordeaux wines are produced on a series of knolls covered with a soil composed of large quartz pebbles mixed with a variable proportion of sand and clay.

That French vineyards are not situated on the river bottoms is best shown by the conditions in Burgundy. The region of the Côte-d'Or, from which come the most famous wines, lies along the western slope of the Saône Valley, at this point more than 25 miles wide. The plain is given over to cereals and forests. The vineyards occupy only a portion of the slope about 12 miles from the river. They form a narrow strip little more than a mile in width and rise part way up the slope (to 900 feet) toward the forested plateau surface. In this region the seasonal variations of temperature are much more marked than at Bordeaux and the springs are earlier and more subject to frost. For this reason the vines are grown on the slope, where air drainage affords frost protection. The rainfall is about 28 inches, with a winter maximum. The summer rainfall is abundant, and a dry autumn is favorable to the grape harvest. The valley slope is covered with a deep stony soil, kept moist by seepage from the forested surface above.

The vineyards of the Champagne, hardly distinguishable in figure 121, are restricted to less than 35,000 acres and lie at the northern limit of vine culture in France. The vineyards are on the lower slopes of the irregular escarpment facing the southeast. Most of the vineyards have a southerly exposure and rest upon a chalk subsoil, the surface soil being greatly modified by cultivation.

The vineyards of the Midi are the most extensive of France and produce an abundance of light wines. A very large acreage is found on the alluvial plains of Roussillon and about Montpellier, where the deep soil permits extensive root development and produces a high yield. The vineyards of the slopes are classified as "half-mountain" and "mountain." These vineyards produce heavier and more highly colored wines than those of the plains, but yield somewhat less. In this region of Mediterranean climate summer drought sometimes causes serious damage to the crop.

In Italian vineyards, as is the case with citrus fruits and olives, other crops are grown, except in the south and in Sicily, where the area of mixed vineyards is small. Legumes (peas, beans, and vetches) are used for cover crops in certain regions. The importance of hill slopes in Italian vine culture is indicated by the fact that only 14 per cent of the crop is raised on land classed as plain, while 58 per cent is grown on the hills and 28 per cent in the mounains.

The dry climate of extreme southern Spain and of Greece favors the production and drying of raisin grapes. In Spain the crops of Malaga and in Greece those of the Corinth are best known. During the period of shortage of grapes in France, due to the ravages of the phylloxera, large quantities of Greek grapes were obtained for wine making. These regions also produce table grapes for foreign markets. The largest exports are from Almeria in Spain.

UNITED STATES (fig. 120).—In the United States both the vinifera and native varieties of grapes are grown. California has nearly two-thirds of the acreage in the United States, practically all vinifera varieties, owing to its Mediterranean type of climate. The grapes are grown for wine, for table use, and for raisins, the San Joaquin Valley producing nearly all the raisins used in the United States. In the other Western States the grapes are principally of the native varieties, and in the moister and cooler climate of the Eastern States only the native varieties can be successfully grown. The most important center of production in the East extends in a narrow belt along the southern shore of Lake Erie, and there are minor centers in the Finger Lakes region of New York and along the southeastern shore of Lake Michigan. These native grapes are also used for wine, but the quality is generally esteemed not equal to that made from the vinifera varieties. The native varieties are preferred, however, by many people for table use, and the greatly increased consumption of grape juice has opened a new market for the crop. The muscadine group of native grapes is of increasing importance in the South Atlantic and other Southern States.

ARGENTINA, URUGUAY, AND CHILE (fig. 125.)—In Chile, where conditions of topography and climate are much like those of California, a similar grape industry is established. Most of the vineyards of the arid northern section are irrigated, while the nonirrigated type prevails in the south. Across the Cordilleras, in Argentina, the grape is also largely cultivated, mainly where water is available for irrigation. In both Argentina and Chile the population is largely of south European origin, and the quantity of wine produced, much of it poor in quality, does not satisfy the local demand. In Uruguay there is a small acreage near the city of Montevideo.

AUSTRALIA (fig. 124).—In the Mediterranean climate of South Australia an important grape, wine, and raisin industry has developed. The local demand for wine, while rapidly increasing, is as yet somewhat limited, and foreign markets are hard to secure.

The vine is not important in the humid tropics because of fungous diseases.

FIG. 120

FIGURE 120.—Acreage of grapevines in the United States. Nearly two-thirds of the acreage is in California, consisting almost entirely of the vinifera (European) varieties. In the Sonoma, Napa, Santa Clara, and Sacramento valleys, and in southern California, the grapes are grown largely for wine and table use, while the Fresno district produces raisins. In the East the grapes are all of the native varieties—Concord, Catawba, Niagara, Delaware, etc., in the Northeastern States, and the muscadine group in the South Atlantic and Gulf States. The most important region extends along Lake Erie from Toledo to Buffalo, in a belt seldom more than 2 or 3 miles wide, attaining its greatest density in Chautauqua County, N. Y. Other centers of production have developed in the Finger Lakes region of New York and along the southeastern shore of Lake Michigan. There is a small commercial production of grapes in the Hudson Valley, in southern New Jersey, in the mountains of western North Carolina, along the Missouri River in Missouri, Iowa, Kansas, and Nebraska, and in several of the valleys of Oregon and Washington.

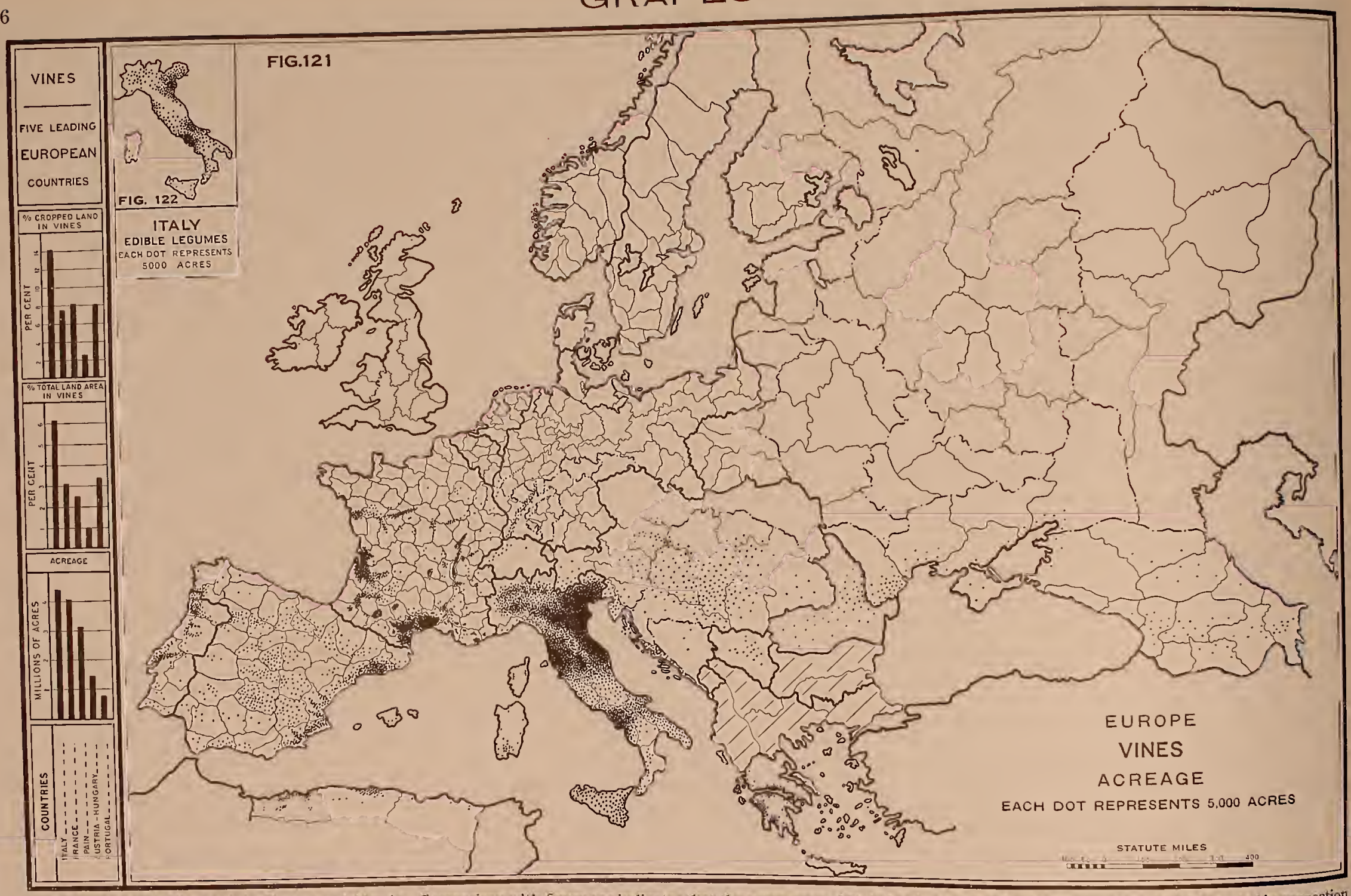


FIGURE 121.—Vineyards in Europe and Algeria. Comparison with figure 123 indicates that the supremacy of Italy in vine growing is only apparent. As will be noted in connection with citrus fruits and olives, the Italian practice of intermingled cultivation of grapes with other crops greatly augments the reported vine acreage. The highly localized distribution of vines in France is noticeable. No statistics are available for European Turkey and Bulgaria.

FIGURE 122.—The insert map shows the distribution in Italy of peas, beans, and other edible legumes, crops commonly grown among the vines and orchard trees.

FIGURE 123.—Distribution of the products of the vine in Europe and Algeria so far as figures are available. The leading rank of France in grape production will be noted. The greatest production of wine in France is along the Mediterranean coast near Montpellier. The better known wines, however, come from the Bordeaux region on the Garonne River, from the banks of the Rhone, and from the province of Champagne. The principal centers of wine production in Italy are near Naples and along the slopes of the Apennines in northern Italy.

FIGURE 124.—Vineyards in Australia. The coincidence of the vine regions with those of wheat (fig. 26) will be noted. The three important centers of production are around Adelaide and to the northward in south Australia, in the semiarid northwestern section of Victoria, and in the upper Murray River Valley. The small scale used in preparing the map emphasizes the small size of the Australian industry as compared with that of other countries.

FIGURE 125.—Vineyards in Argentina, Chile, and Uruguay. The important centers are the Great Valley of Chile and the arid eastern foothill slopes of the Cordilleras in Argentina.

THE CITRUS FRUITS of commerce comprise chiefly the orange, the lemon, the pomelo or grapefruit, and the lime. It is probable that citrus fruits were first cultivated in southeastern Asia. These fruits do not extend into regions of severe frost, the zone of orange cultivation reaching its northern limit at about the 45th parallel in France and Italy. At no other point in either hemisphere does it reach so far northward as 40°. Throughout the Tropics oranges are grown in large but unknown quantities, consisting mostly of seedling fruit. Of these tropical varieties some are doubtless valuable, but many are sour, bitter, dry, or otherwise undesirable. The regions of large commercial importance all lie upon the poleward margin of the region of possible production.

Citrus fruits, like many other crops, grow on a wide variety of soils. The physical condition of the soil is perhaps more often a limiting factor in citrus-fruit production than is its chemical composition. In general, citrus-fruit lands must be so situated topographically and be of such texture as to afford ready underdrainage. To this requirement the coarse alluvium of piedmont slopes, such as are found in the valleys of southern California and on the plateau border of eastern Spain, is most admirably suited.

UNITED STATES (figs. 127–129).—The citrus-fruit industry started in Florida, where climatic conditions are not unlike those of southern China, to which citrus fruits are indigenous. The United States production at present forms about one-third of the world crop.

The citrus orchards in California are located mostly along the western and southern slopes of the foothills of the Coast Range in Orange, Riverside, San Bernardino, and Los Angeles Counties. There is considerable commercial production also in San Diego, Ventura, and Santa Barbara Counties, in southern California, and along the foothills of the Sierras in central California, especially around Porterville and Lindsay, and in Butte County in the northern part of the State. In Arizona there is an important development in the Salt River Valley. In Florida the citrus belt lies to the southeast of a line drawn from St. Augustine to Tampa and extends southward along both coasts. An extensive acreage of oranges, mostly of the Satsuma variety, has been planted along the Gulf Coast from Florida to Texas, while in southeastern Louisiana, below New Orleans, round oranges are being grown on a commercial scale, and in the lower Rio Grande Valley in southern Texas a citrus-fruit industry, mostly round oranges and pomeloes, is being developed.

EUROPE (fig. 131).—In the production of oranges the Valencia region of Spain exceeds any other in Europe. This small region, watered by the River Jucar and other short streams (see fig. 126), produces about as much fruit as is grown in the citrus regions of the United States. The oranges are of several varieties. Half the exports go to the United Kingdom. Other important buyers of Spanish oranges are Germany, France, the Netherlands, and Belgium.

Italian citrus fruits are grown in three somewhat separated regions. The most northerly, on the Gulf of Genoa, has little commercial significance, but is interesting geographically because of its high latitude, 44° N. Heat reflected from the Gulf to the Ligurian slopes is an important factor in the creation of a climate suitable to oranges. The largest Italian citrus region is in Sicily, where lemon growing is the dominant form of the industry. The Sicilian groves are located near the shore or in the valleys, chiefly on the northern and

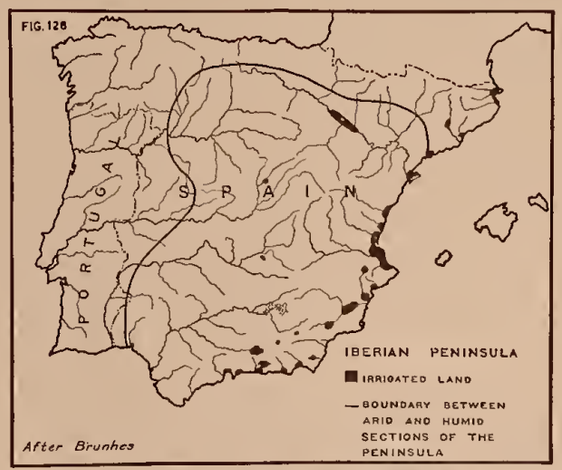


FIGURE 126.—The irrigated land in Spain is mostly along the Mediterranean coast, the water being diverted from rivers fed by mountain streams.

eastern sides of the island. The region of largest importance is the "Horn of Gold," a small, triangular plain upon which the city of Palermo is situated. The fruit ripens at nearly all seasons of the year, but chiefly during the winter. Sicily supplies lemons to all of Europe and competes in the United States with the American industry. The large citrus acreage of Italy as compared with that of Spain is due to the large figures for the Campania region, where the reported area includes citrus trees scattered among other trees and other crops as well as land devoted exclusively to citrus groves.

Of the other citrus regions on the Mediterranean, Algeria and Syria are the most important. The crop of Syria is taken largely by Great Britain and Russia.

The citrus production of Japan and India is chiefly for home consumption. The principal centers of production in the latter country lie in the Khasi Hills and about Nagpur, from which there is some trade with the surrounding regions.

The Tropics as a whole do not figure largely in citrus-fruit trade. In certain of the West Indies, however, chiefly Haiti and Montserrat, a considerable industry has developed in the production of limes. This fruit is used in the manufacture of citrate of lime, lime juice, etc.

In the Southern Hemisphere, particularly in northern Argentina, South Africa, and Australia, there are large areas suitable to citrus-fruit production, but since their fruit ripens in July and August it must be sold in the limited market of the Southern Hemisphere or compete with the various fruits ripening at that time in North America and Europe. As a result there is little encouragement for the expansion of the industry in these regions.

Citrus fruits are also raised in varying quantities in the following countries: Brazil, China, Cuba, Greece, Mexico, Palestine, Paraguay, Porto Rico, Portugal, and South Africa. Authoritative statistics of production in these countries are unavailable, hence no attempt has been made to show graphically the citrus-producing areas.

THE OLIVE, more than any other fruit crop, is adapted to regions of small summer rainfall having the Mediterranean type of climate. The distribution of this crop is determined by the inability of the tree to withstand severe freezing, together with its marked ability to thrive in regions of low rainfall and to endure prolonged drought. The drought resistance of the olive is due in part to the surface root development which enables the tree to collect moisture after a light rainfall, and also to the character of the leaves, which tend to reduce evaporation.

The olive is almost universally grown in the Mediterranean countries. In some districts it has large commercial importance, as on the dry slopes of Andalusia, where the olive forms the chief agricultural crop. Other important regions are southern Italy, particularly Apulia and Calabria, and southeastern Tunis. In the latter country the olive is not important in the northwest, where the rainfall is highest, but occupies the drier eastern coast lands. The olive crop is gathered and the oil expressed in the late autumn. Olive oil is of great importance in this region, which, owing to lack of summer pasture, is not able to produce butter.

The olive is also grown to a considerable extent in California, where oil of a high quality is produced. The orchards are located mostly along the foothills in southern California west of the Coast Range, along the eastern side of the San Joaquin Valley, and in the valleys opening into San Francisco Bay. There is also a small production of olives in the Salt River Valley of Arizona.

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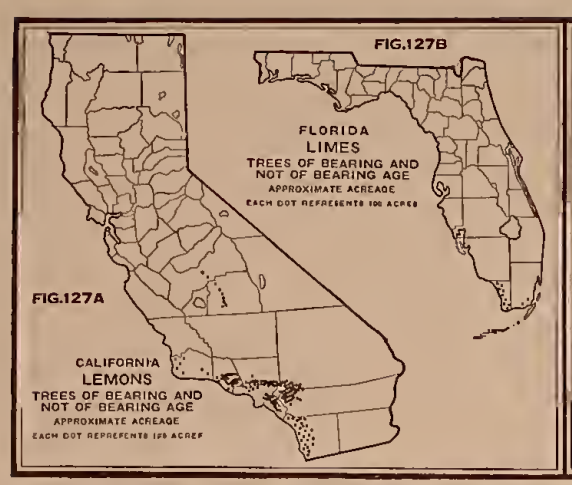
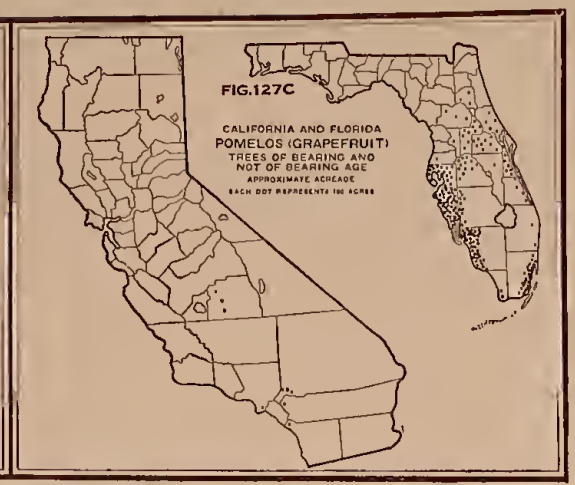
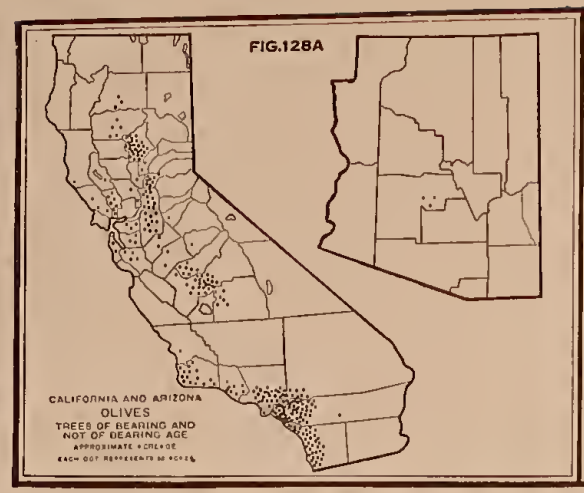
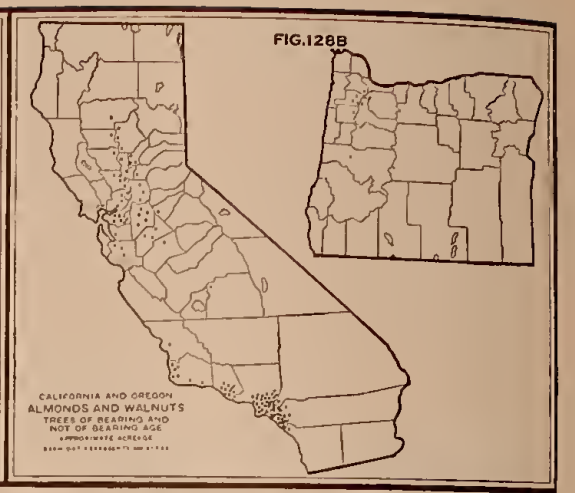








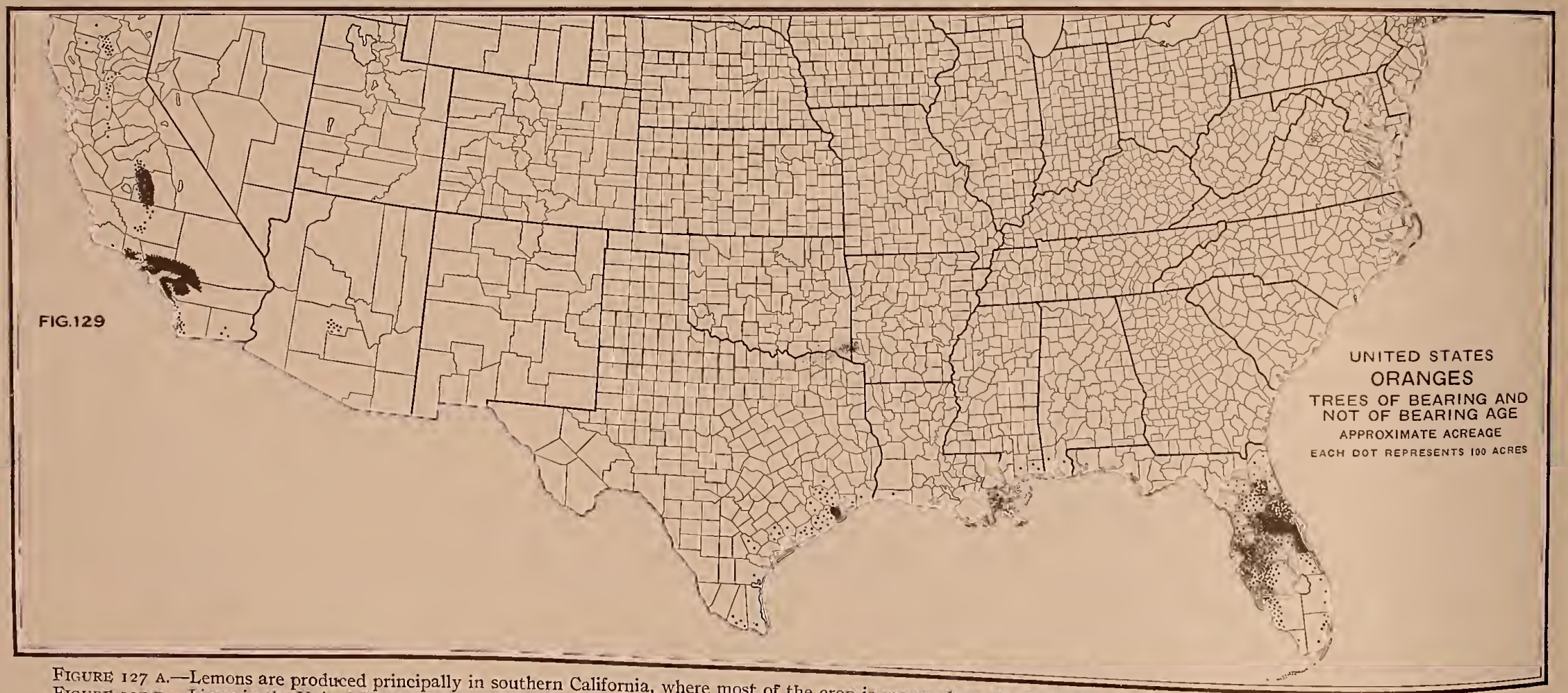


FIGURE 127 A.—Lemons are produced principally in southern California, where most of the crop is grown along the foothills on the western side of the Coast Range.

FIGURE 127 B.—Limes in the United States are grown commercially only in the southern tip of Florida and adjoining islands and keys.

FIGURE 127 C.—Grapefruit (pomelo) is grown mostly in Florida, where the fruit attains excellent flavor. The industry is of increasing importance in California.

FIGURE 128 A.—Olives are grown mostly in southern California, west of the Coast Range, in the Great Valley, and in the valleys opening into San Francisco Bay.

FIGURE 128 B.—The commercial production of Persian (English) walnuts in the United States is practically confined as yet to California and western Oregon. The production of almonds centers in Contra Costa County, Cal., and extends up both the Sacramento and San Joaquin Valleys.

FIGURE 129.—The commercial orange crop of the United States is practically confined to California and Florida. California has nearly two-thirds of the trees and produced in 1909 about three-fourths of the crop. There are a number of long-established orange orchards in the lower Mississippi delta in Louisiana and in Arizona.

FIGURE 130.—Citrus-fruit acreage in Europe and Algeria. Three important centers of acreage appear in the Mediterranean region—the Valencia district of Spain, the Campania region of Italy, and the northern and eastern coasts of Sicily. Because of the Italian custom of growing fruits in mixed orchards and in combination with other crops, the citrus-fruit acreage of Campania appears of disproportionate importance in the map.

FIGURE 131.—Citrus-fruit production in Europe. On the basis of production the Valencia region of Spain is the most important in the Mediterranean region, while the Campania region is relatively unimportant. France and the Adriatic coast of Austria have small citrus-fruit crops, but they do not show on the scale of this map. The size and distribution of the Albanian and Greek crops are not known.

OLIVES

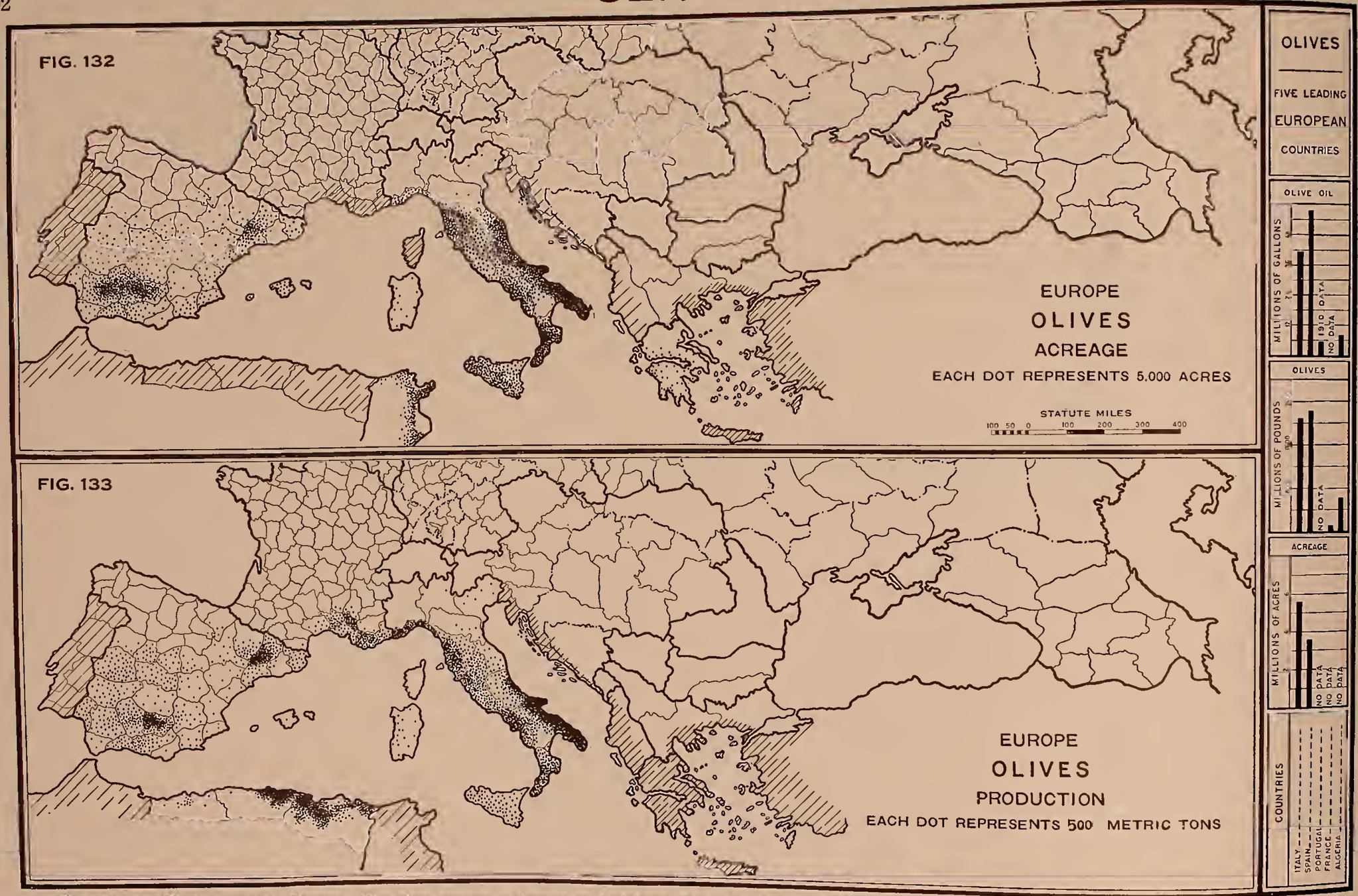


FIGURE 132.—Olive acreage in Europe. The olive acreage is densest in Andalusia, Sieily, Calabria, and along the Adriatie Coast of Italy. As in the case of citrus fruits the greater density of the acreage than of the produetion in parts of Italy is due to the eustom of intermingling other erops with olive trees, and of planting extensively orchards whieh reeeive little care, like the typieal farmers' apple orchards in the United States.

FIGURE 133.—Production of olives in Europe and Algeria. The yield varies greatly from year to year, that of Spain and Corsiea for 1912 being very low. Spain is normally the greatest produeer of olives and of oil (see graph on the side of the map, which shows the average produetion of 1910–1912).

THE ARABIAN COFFEE tree is indigenous to and probably derived from the province of Kaffa in Abyssinia, where, at an altitude of 6,000 feet, the climate is mild and relatively moist, the rainfall being about 45 inches, most of which falls in the summer. These conditions are more or less typical of those regions to which the tree has been transplanted (fig. 135). Other varieties, more recently discovered, differ somewhat in their requirements.

Coffee was early introduced into Arabia, where the dry, terraced slopes of Yemen still produce, under irrigation, the much-prized Mocha. In the seventeenth century the crop was carried by the Dutch to Java, where its success on the humid mountain slopes led to its introduction into southern India and Ceylon. In Ceylon the coffee industry throve until 1870, when a leaf fungus appeared and within 15 years had practically driven it out of existence.

In the seventeenth century also coffee was introduced into the West Indies, whence it eventually spread to Mexico and to Central and South America. Although some of the finest coffees now come from the mountains of Jamaica and Central America, the great expansion of the industry in Brazil gives that country a peculiar interest, as the conditions there are most generally favorable to the crop.

The coffee district, which lies chiefly in the southeastern plateau section of Brazil (fig. 136), extends southwestward from Rio de Janeiro into the state of São Paulo, which contains the greatest plantations. Among the favorable conditions for coffee found here are large areas of residual soil of high iron and potash content, the rolling topography of the plateau surface, which insures free drainage of both air and water, absence of pests, and, above all, a favorable climate.

The average rainfall in the coffee district is from 45 to 60 inches. The region has its heaviest rains during the summer and much less during the winter. The absence of heavy rain in winter is most important in harvesting and drying the crop. Summer temperatures are high, but winter temperatures sometimes go below freezing. Because of the tendency of cold air to collect in low places, the valleys below 2,000 feet are not planted to coffee. The tendency to keep to the uplands between valleys is well shown in figure 136.

Owing to these and other advantages, Brazil produces over 70 per cent of the world's crop. Scarcity of labor induces certain methods in the picking and preparation of the crop which do not give it the highest quality. Arabia and Java and other small areas producing coffee of special quality are thus able to compete with Brazil, which has not been able to occupy the field so long held by the choicer grades from the Old World.

THE TEA plant is native to the mountains of southern China, Indo-China, Burma, and Assam. Tea was used in China probably long before the Christian era, and from China came the tea supply of the world until a comparatively recent date. The plant early spread to Japan, was carried to Taiwan (Formosa) about 100 years ago, to India about 75 years ago, and to Ceylon only after the failure of the coffee industry between 1875 and 1885.

Different environmental conditions have produced several varieties of tea, of which the large-leaved Assam varieties and the small-leaved China varieties are most distinct. Differences in the quality of the product are, however, due much more to conditions of production, picking, and manufacture than to the variety of the plant.

Tea is cultivated on the mountain slopes of Java, Ceylon and India, and at various points northward to the 35th parallel in China, the 38th in Japan, and in the southeastern

FIGURE 134.—The three important countries exporting tea are India, Ceylon, and China, while the three leading importing countries are the United Kingdom, Russia, and the United States.

United States. Extremes of temperatures and lack of rainfall tend to check rapid growth and thus make the crop unprofitable. Since the number of pickings, and therefore the size of the crop, depends upon the rapidity with which new, tender shoots are put forth, it is evident that the longer the warm season and the more evenly distributed and abundant the rainfall the larger will be the crop.

Tea is grown on a wide range of soils and topography. In China poor soils and steep slopes predominate. In Assam virgin forest land on the valley bottoms is preferred. All tea lands must have good drainage, whether it is produced naturally by rough topography or by artificial drainage, as in Assam. The tea plant is very sensitive to stagnant water, not only at the surface, but in the subsoil.

Favorable geographical conditions for the tea plant being easily found, commercial production remains in the Orient because the large amount of cheap labor required can not be had in the New World. Mechanical devices have largely supplanted hand labor in tea manufacture, but no devices for picking the crop have been found satisfactory.

CHINA is the world's largest tea producer. Statistics of acreage and production do not exist, but the known exports, together with the very large home consumption, give China a crop estimated to be about eight times that of India. East central China is the region of greatest production, especially the coastal and interior provinces bordering and immediately south of the Yangtze-Kiang. The severity of the winter climate, together with the none too abundant rainfall, causes the tea to "flush" or produce shoots so slowly that only three or four pickings can be made between April and October.

JAPAN (fig. 138).—The climate of Japan is more mild and uniform than that of China. The tea acreage, however, is not large and the crop not of the highest grade. In the northern end of the province of Taiwan (Formosa) the famous Oolong tea is grown upon the terraced mountain slopes bordering the river Tamsui. Here the winter temperature does not go below 53° F. and the annual rainfall averages 78 inches.

INDIA AND CEYLON (fig. 139).—In India the region of largest importance lies in Assam and Darjiling, in Bengal. Tea is also grown on the western slopes of the Cardamon and Nilgiri hills, in the extreme south. The Assam region includes the lower slopes of the Himalayas and the Khasi Hills. The monsoon rainfall on these slopes is very heavy and the summers are long, hot, and humid; as a result the growth of tea is rapid and twelve to sixteen pickings are obtained during the wet season. In this region of heavy rainfall the problem of soil erosion and drainage is of importance. Removal of the forest from the upper slopes permits the erosion of soil at so rapid a rate that the tea must be grown on terraces, as in Darjiling. Even then the heavy rainfall causes serious landslides unless efficient drainage is provided. Under these conditions the land of the lower slopes or the adjoining plains is found more fertile and easily managed.

Ceylon has an advantage in tea production over both China and Assam. Its southerly position gives it warm winters, and as it receives moisture from the winter as well as the summer monsoon, "flushing" continues throughout the year, except at pruning time. This permits a picking to be made every week or ten days. The tea lands of Ceylon lie chiefly on the mountain slopes up to 6,000 feet elevation.

Most of the tea of India and Ceylon is now raised on large estates with European managers. In Assam and Ceylon the native populations are not large and the requisite labor is supplied, sometimes with difficulty, by temporary help from the more densely settled regions. The small consumption of tea among the natives gives India and Ceylon a relatively high place as exporters when compared with China and Japan.

COFFEE

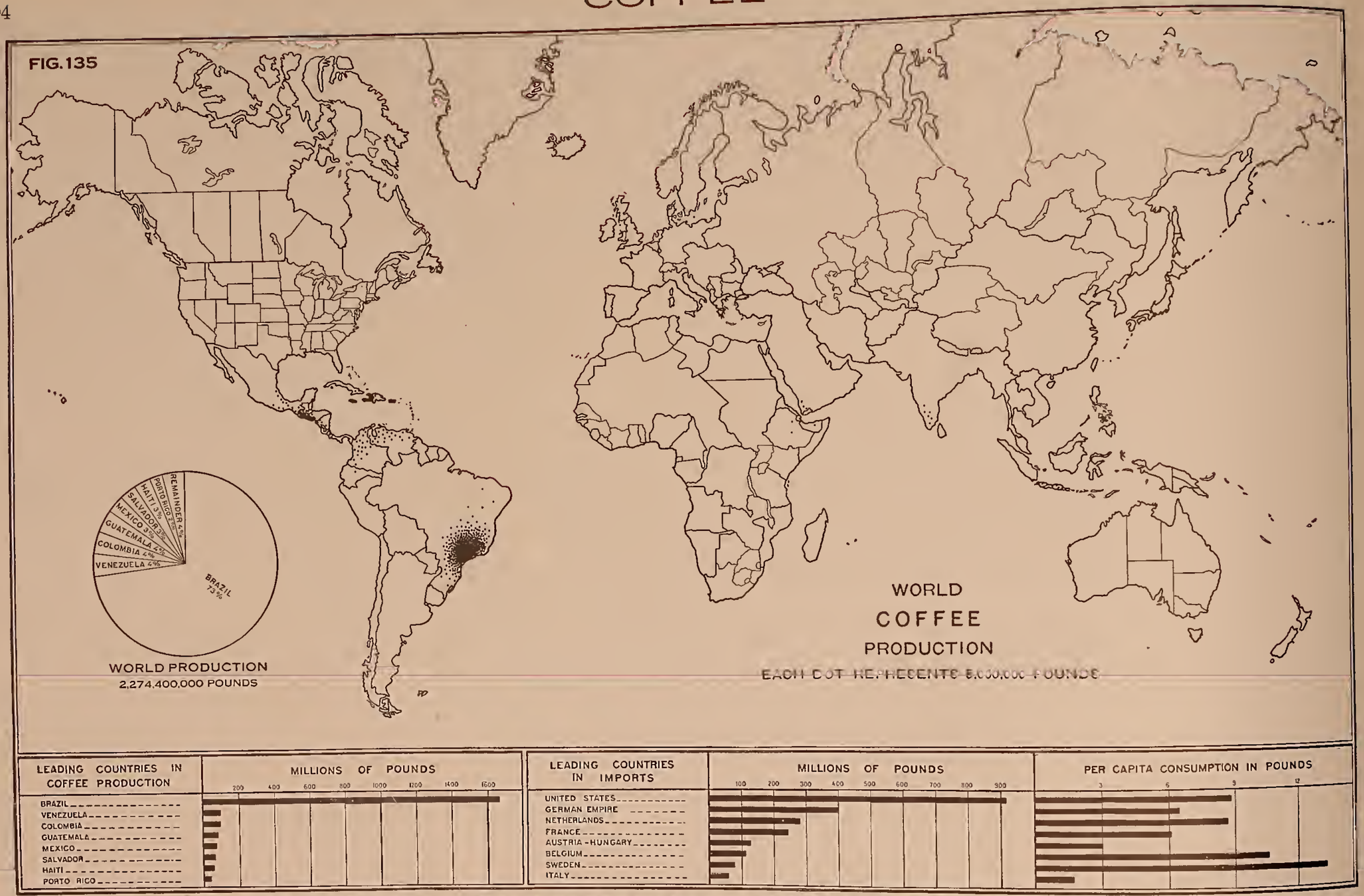


FIGURE 135.—Distribution of the world's coffee crop. Although the coffee tree is a native of the Eastern Hemisphere, 95 per cent of the world's crop is now grown in the New World. The outstanding importance of the Brazilian area serves to distract attention from other noteworthy areas, namely, Venezuela, Colombia, Central America, the West Indian Islands, Abyssinia, southern Arabia, India, and Java. The large production of Brazil (over 70 per cent of the world crop) makes it impossible to restrict properly the dotted area of Brazil in this map and still show the less important producing regions. In the graph at the bottom of the map it will be noted that the United States consumes more coffee than any other two countries, but that the consumption per capita is highest in Sweden.

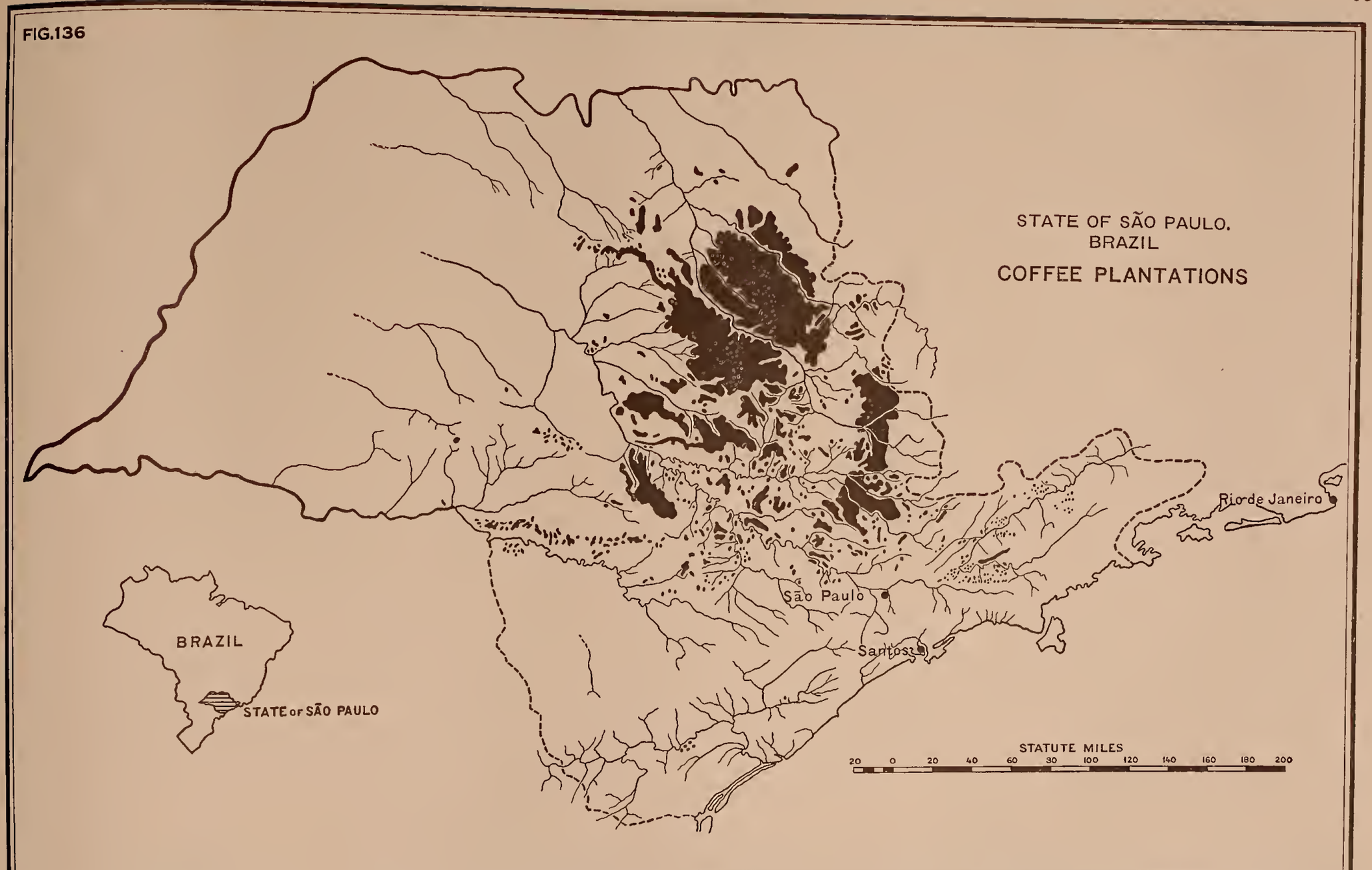


FIGURE 136.—In the absence of statistics of acreage or production of coffee in the minor divisions of Brazil, the above map, showing only the general location of the coffee plantations of São Paulo, has been adapted from a map by F. F. Ramos in "The Valorization of Coffee," second edition (Antwerp, 1907). The coffee plantations are located on the slopes and undulating plateaus between the valleys, and not in the lowlands, where air drainage causes injury from chilling temperatures.

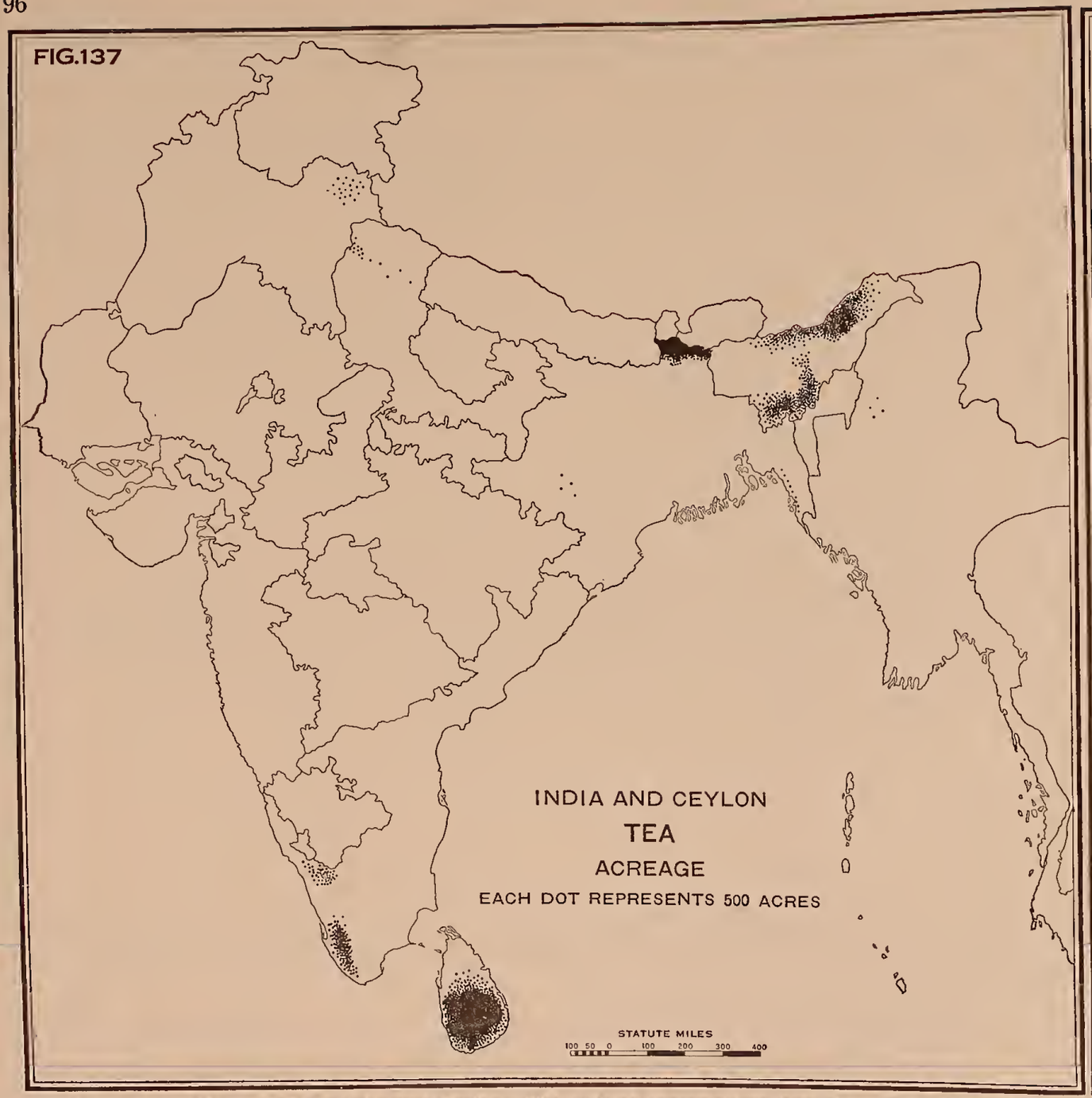


FIGURE 137.—Tea acreage in India and Ceylon. The striking concentration here shown is evidence of highly favorable geographic conditions. The names of these districts are familiar to the tea dealer and in part to the public—Ceylon in the south, Travancore in the southwest on the mainland, Assam in the northeast, and Darjiling to the west of Assam.

FIGURE 138.—Tea acreage in Japan. The crop is produced mainly on the eastern and southern slopes, where the summer rainfall is heavy. The chief center is in the province of Shizuoka, in Hondo.

VEGETABLES are grown in the United States under three different systems of farming, which may be described as truck growing, market gardening, and home gardening. Truck growing, as distinguished from market gardening, consists in the growing of vegetables at such a distance from market that railroad or water transportation is required to reach the market.

Each of these three types of vegetable production may be recognized on the map (fig. 140). Truck-growing centers can be seen in central Florida, southwestern Mississippi, western Tennessee, southeastern Missouri, in eastern Iowa, along both shores of Lake Michigan, in the Norfolk, Va., region, and on both sides of Chesapeake and of Delaware Bays. Much of the vegetable production of Long Island and of western New York is also of the truck-growing type. The market-gardening centers, where the vegetables are carried to the markets in wagons, naturally are found around the large cities. Many of these may be recognized on the map—Boston, New York, Philadelphia, Baltimore, Pittsburgh, Cleveland, Cincinnati, Louisville, Indianapolis, Chicago, St. Louis, Denver, Los Angeles, and San Francisco. The home gardens on farms are represented on the map by the thin but more or less even distribution of dots which covers most of the eastern half of the United States. The places where these dots are very thin or entirely absent are regions of sparse population, such as northern Maine; the Adirondacks; the Allegheny and Cumberland Mountains; southeastern Georgia; southern Florida; northern Michigan, Wisconsin, and Minnesota; and most of the West outside of the irrigated areas.

Truck growing is carried on generally where the land is cheap in price as compared with market-garden land near the cities, and where the transportation facilities are good. In truck growing less intensive methods of culture usually are practiced than in market gardening and fewer kinds of vegetables are grown, but the acreage devoted to a single crop is much larger. In many localities only one or two truck crops are grown, and these frequently become the leading "cash crops" of the region, grown in rotation with staple crops in a system of mixed farming, or else grown in succession on the same land by farmers specializing in this crop.

Referring to the maps of the different vegetables showing acreage on farms reporting 1 acre or more, it may be noted, for instance, that the large production of vegetables (fig. 140) in the region east of San Francisco is made up principally of four truck crops, asparagus (fig. 141), onions (fig. 146), celery (fig. 143), and cabbage (fig. 142). Over one-third of the acreage of asparagus in the United States in 1909 on farms having 1 acre or more was in this delta region of California.

Similarly the commercial production of cabbage is concentrated in a number of small areas, the most important of which is the lowland region of western New York. New York has about one-third of the acreage of cabbage on farms reporting 1 acre or more. The farms growing cabbage are for the most part of moderate size, the cabbage crop occupying a definite place in the rotation. Important centers of cabbage production are also located along the south shore of Lake Erie; near Detroit and Saginaw, Mich.; around Green Bay, Wis.; between Milwaukee and Chicago; in central Florida; southern Texas; the Denver-Greeley district in Colorado; Los Angeles County, Cal.; and in the region around Stockton and Sacramento.

Commercial celery production is even more localized. The famous Kalamazoo, Mich., area stands out on the map with another almost equally prominent area west of Grand Rapids. Other important centers are located in eastern Ohio; in western New York; near Boston, Mass.; near Los Angeles and near Stockton, Cal. The influence of large cities is evident on this map, although practically none of the celery from these centers is carried to the market in wagons. Equally important in determining location is the type of soil, which is also true in the case of asparagus and cabbage. Celery grows best in a muck, or at least a soil very rich in humus. Cabbage thrives in a heavy soil rich in humus, but drier and more solid than muck. Asparagus is native to salt marshes, and hence is grown best on fertile loams, rich in humus.

Another vegetable which requires a fertile, silty, generally level soil, rich in humus, is the onion. The centers of onion production are located in the Connecticut Valley, in Massachusetts; Orange County, N. Y.; Hardin County, Ohio; northern Indiana; Cook County, Ill.; southern Texas, and central California. The onion in several of these districts is the most important cash crop, and many of the growers produce practically nothing else.

The soil and climatic requirements of muskmelons, cantaloupes, and watermelons are quite different from those of asparagus, cabbage, and celery. The acreage of muskmelons and cantaloupes (fig. 144) centers in the warm soils of southern New Jersey and Delaware, of southwestern Indiana, central Florida, the Arkansas Valley of Colorado, and the Imperial Valley of California. The acreage of watermelons (fig. 145) is largely concentrated in the Southern States, with a small northern crop grown principally in New Jersey, Delaware, southern Indiana, and eastern Iowa.

Green peas (fig. 147) and sweet corn (fig. 148), on the other hand, are vegetables grown principally in the northeastern States. New York and Wisconsin have 40 per cent of the acreage of green peas on farms reporting 1 acre or more, and New York, Illinois, and Maryland over 30 per cent of the acreage of sweet corn. It is notable how much farther northward the sweet corn extends in Maine, Wisconsin, and Minnesota than does field corn (fig. 36).

Tomatoes (fig. 149) are grown mostly in the Middle States extending from Missouri to Maryland and New Jersey. There is also a large acreage in southern Florida, which furnishes much of the winter supply. In the West the tomatoes are grown largely near the city markets of Denver, Salt Lake, San Francisco, and Los Angeles.

About one-third of the total acreage of vegetables in the United States is grown on farms reporting 1 acre or more of a single vegetable. Perhaps another third is grown by the market gardeners around the cities, both great and small, while the remaining third represents the home vegetable gardens of the rural population of the country. The statistics of the home vegetable gardens, however, are much less complete than those of the commercial crop.

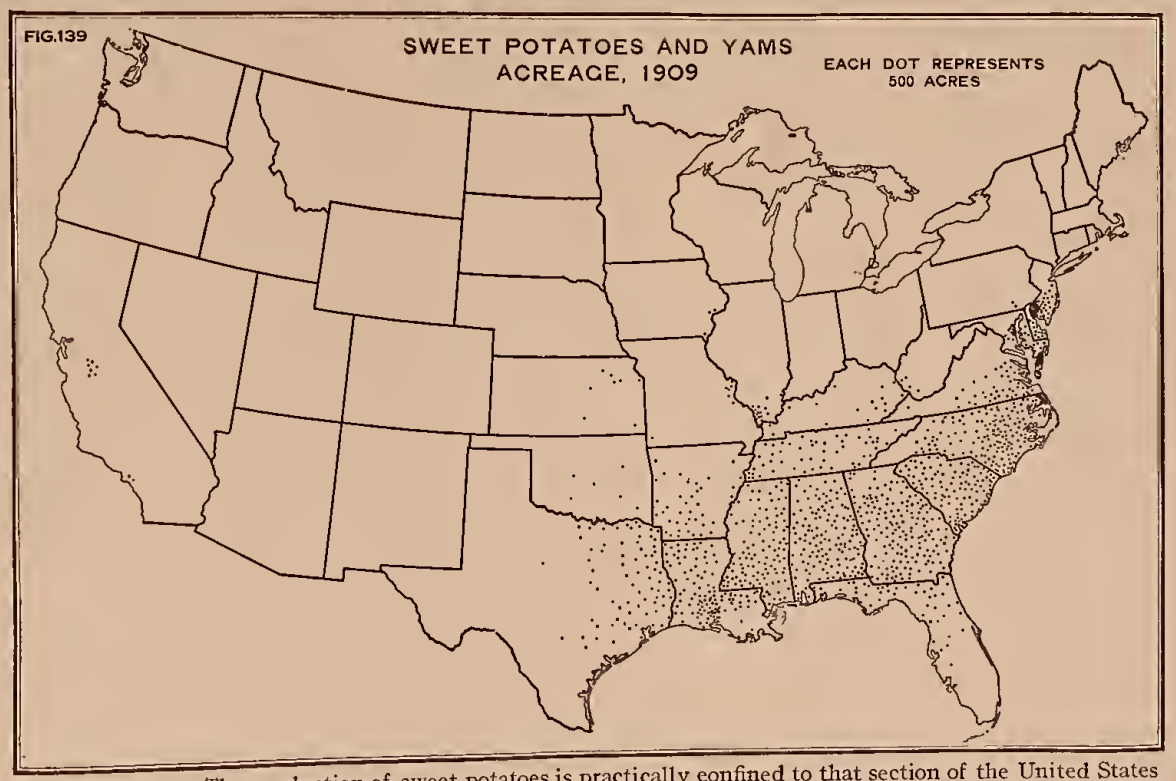


FIGURE 139.—The production of sweet potatoes is practically confined to that section of the United States where the average growing season is over 175 days and the mean summer temperature above 72°. The densest acreage is in southern New Jersey, where sweet potatoes are an important commercial crop, marketed in adjacent cities. Most of the production in the Southern States is consumed locally, replacing Irish potatoes to a large extent (compare with fig. 87).

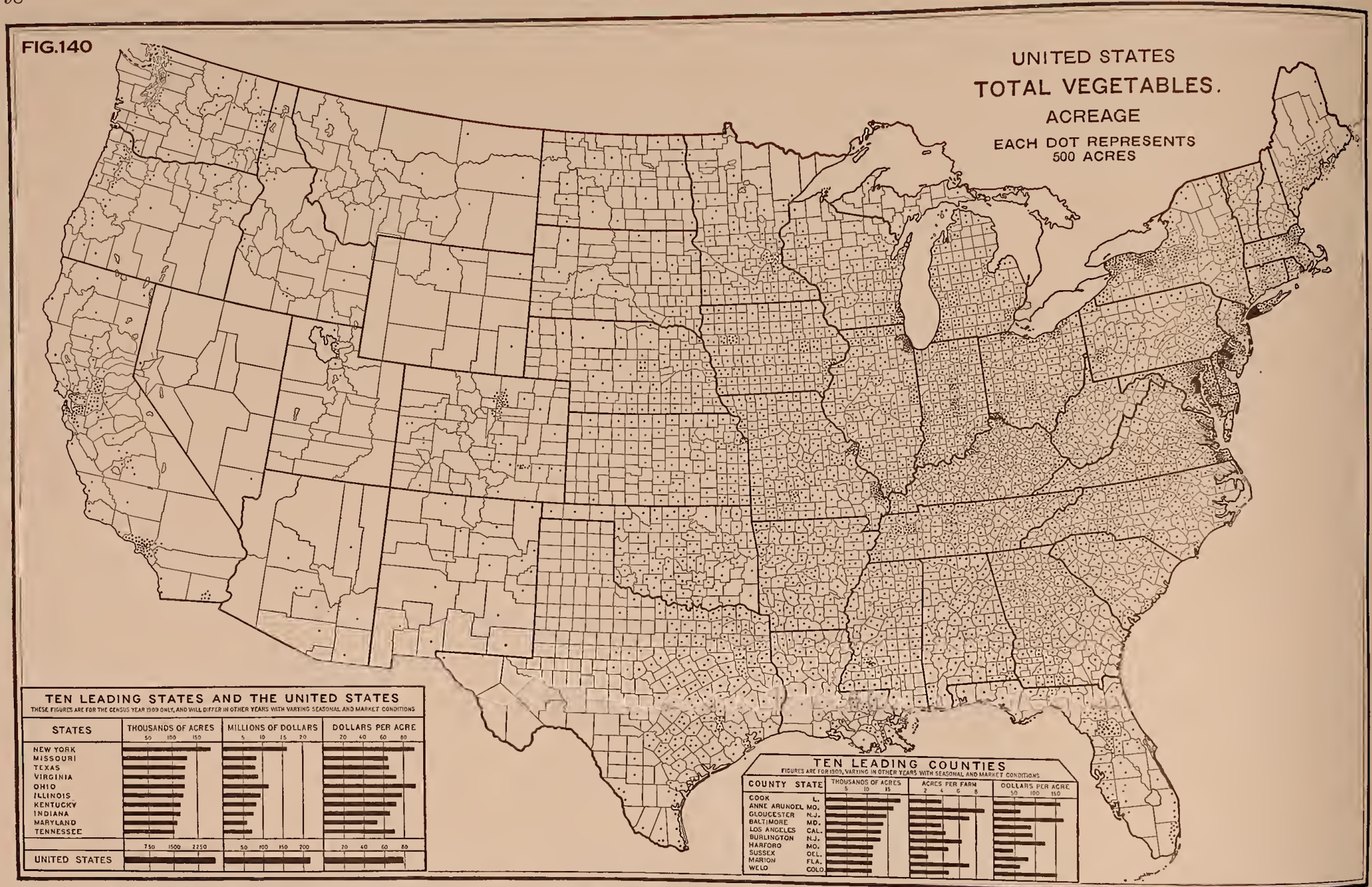
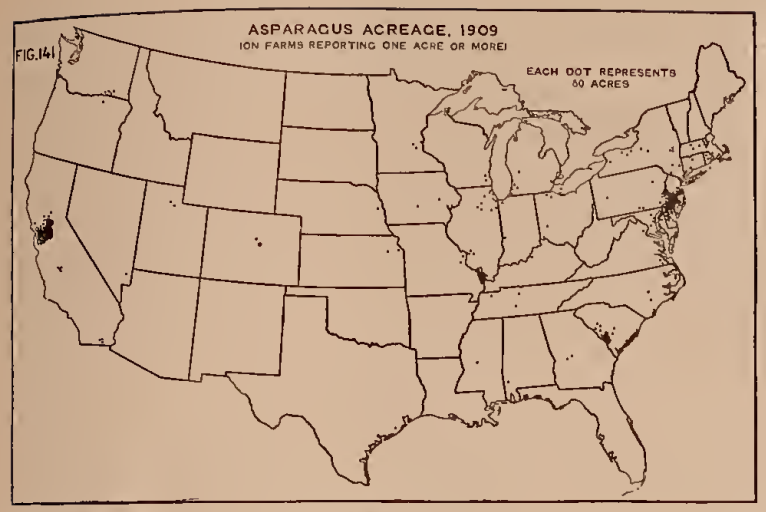
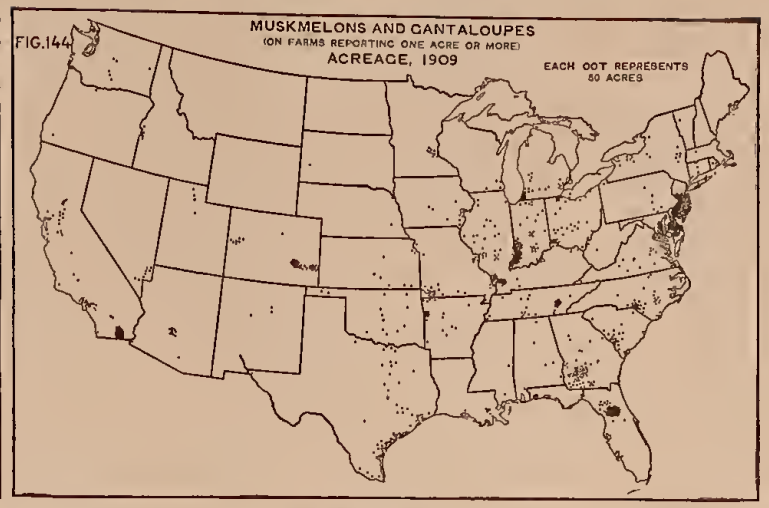
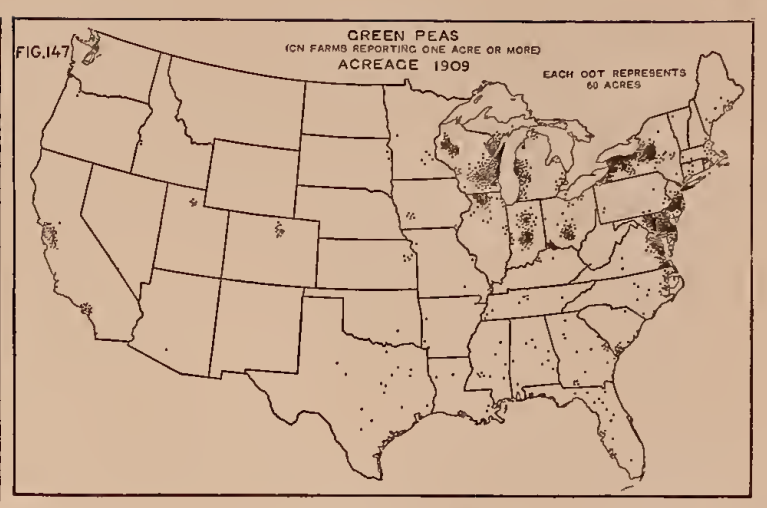
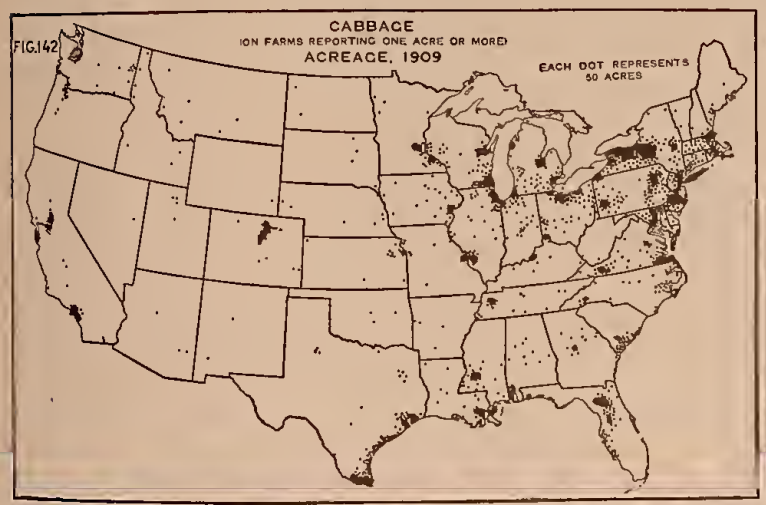


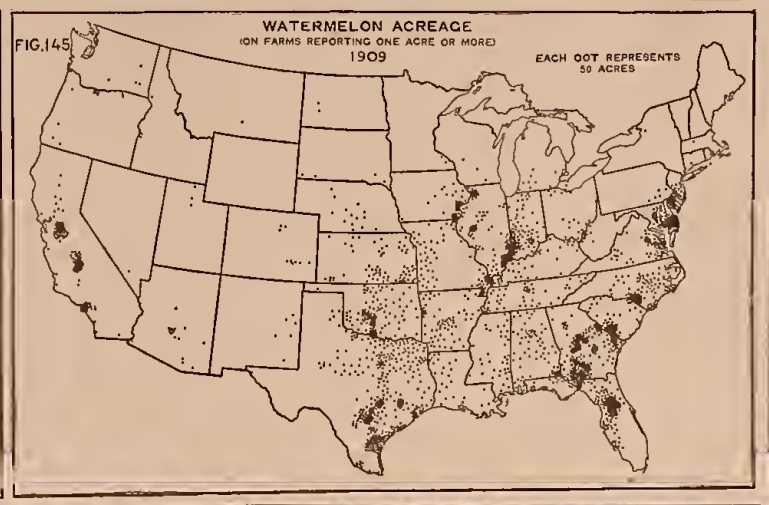
FIGURE 140.—Aereage of vegetables in the United States. The thinly and rather evenly seattered dots represent largely the acreage of farmers' gardens, whose products are consumed mostly on the home farm; while the denser centers represent in a general way the aereage devoted to eommereial produetion. The proximity of many of these centers to the large eities is notieeable. The denser areas are loeated around New York, Philadelphia, Baltimore, and Chieago. Rochester, Buffalo, Cleveland, Cincinnati, Louisville, Indianapolis, St. Louis, Denver, San Franeiseo, and Los Angeles ean also be reeognized on the map. The acreage of the several vegetables on farms reporting 1 acre or more, as shown in figures 141–149, eonstituted over one-third of the 2,763,000 aeres of vegetables in the United States in 1909.

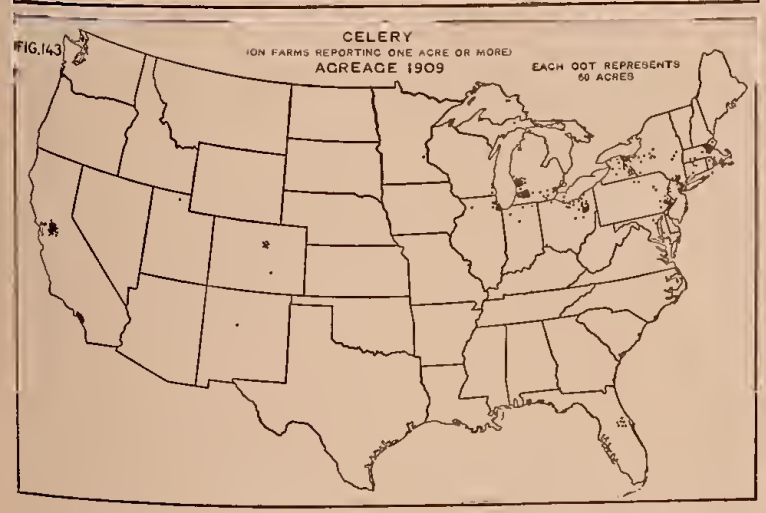












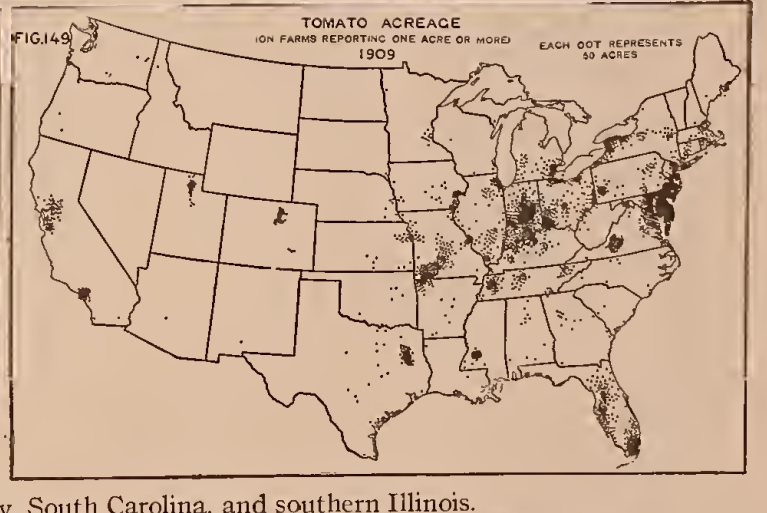


FIGURE 141.—The centers of asparagus production are in the Sacramento-San Joaquin delta of California, in New Jersey, South Carolina, and southern Illinois.
FIGURE 142.—Cabbage acreage centers in the cool Lake States, but large acreages for the early market are also found in South Carolina, Florida, Mississippi, and southern Texas.
FIGURE 143.—The centers of celery production are around Boston, New York, Philadelphia, Rochester, Kalamazoo, Chicago, Denver, Los Angeles, and Stockton.
FIGURE 144.—Muskmelons and canteloupes are grown in New Jersey, Delaware, Florida, Georgia, Indiana, Illinois, the Rocky Ford region, and the Imperial Valley.
FIGURE 145.—Watermelons are primarily a crop of the southern United States, but a large acreage may be noted in eastern Iowa and northern Illinois.
FIGURE 146.—The centers of onion production are in the Connecticut Valley; Orange County, N. Y.; northern Ohio, Indiana, and Illinois; Texas, and California.
FIGURE 147.—Green peas are grown extensively in Maryland, Delaware, New Jersey, western New York, central Indiana, western Michigan, northern Illinois, and Wisconsin.
FIGURE 148.—The sweet-corn crop is produced north of the Ohio and Potomac Rivers, and is most important along the northern and eastern margins of the "corn belt."
FIGURE 149.—The more important centers of tomato production are in Maryland, Delaware, New Jersey, and Indiana. Most of the early crop comes from Florida.

DRY BEANS AND PEANUTS

DRY EDIBLE BEANS (fig. 150) are one of the important minor crops of the United States, having an acreage of 805,000 and a value of $21,491,000 in 1909. The acreage nearly doubled between 1899 and 1909.

Practically all the commercial crop of Lima beans is grown in southern California, in a narrow belt a few miles wide within reach of the ocean fogs. The annual rainfall in this region is only 10 to 15 inches.

The crop of field beans other than Limas in the United States is produced in three regions, each of which grows a distinct type of beans.

The most important region extends from Maine to Washington along our northern border and into the southern Appalachians. It has two large centers of commercial production in central Michigan and western New York. Many varieties are cultivated, but the dominating sorts are white pea and white medium beans, with red kidney next in importance. The climate here is too cool for the most successful production of corn, but is ideal for growing beans.

In the interior valley of California and along the southern coast of that State white beans, known as large and small Californias, are grown. These are interchangeable in the market with the pea and medium beans of the preceding region, but the plants are larger growing and do not succeed well outside of California.

The third region is that centering in New Mexico and Colorado, where colored beans taken over from the aboriginal agriculture of the region are grown. These are known under the general Spanish name of frijoles, and appear in market as pintos, bayos, pinks, and Mexican reds. They are especially suited to the cool semiarid uplands, and are grown both as a dry-land crop and under irrigation. Planting of frijoles has been greatly extended since the date of the accompanying map.

Although beans are grown in gardens throughout the corn belt and even in the cotton States, the insects, especially the weevil, and the diseases, which are more destructive in warmer regions, discourage commercial production outside the regions just discussed.

Beans will grow on a great variety of soils, but do best on strong limestone land, moderately fertile. They are grown in rotation with other crops, usually wheat and clover, replacing corn to a large extent.

The localization of the commercial bean industry in the United States, when considered in connection with the fact that beans are grown in gardens for home use in practically every county in the country, indicates that it is not a direct climatic or soil limitation which restricts commercial production to these small areas, but rather their indirect influence in reducing the ravages of the enemies of the bean, especially the weevil, in favoring the use of machinery for harvesting and in lessening the competition of other crops, especially corn, for the land.

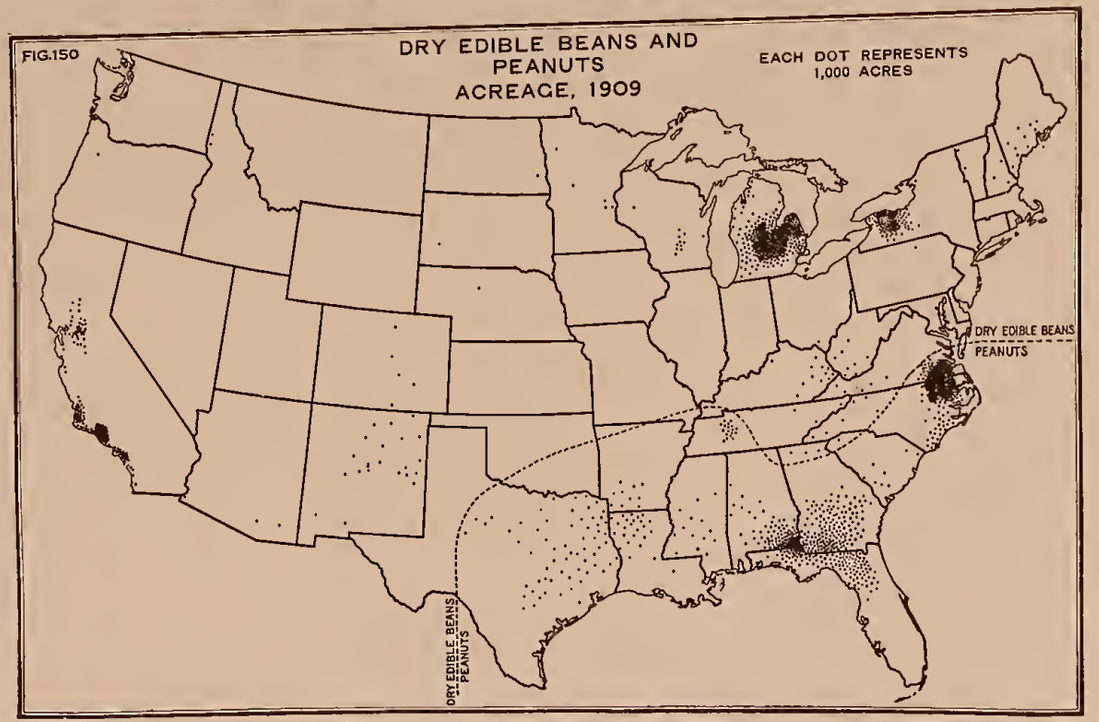


FIGURE 150.—Dry beans in the United States are produced principally in California, Michigan, and New York. There is a small acreage of beans grown for local consumption, however, in almost every county, too small in most States to show on the map. Practically the entire commercial crop of Lima beans is grown in southern California within the reach of the ocean fogs, which seldom extend inland farther than 10 miles from the coast. The production of peanuts, shown to the south of the dashed line, centers in an area of sandy loam soil in southeastern Virginia and northeastern North Carolina. In Alabama, Georgia, Florida, and Texas there is a considerable acreage grown, principally, however, for feeding to stock.

PEANUTS are grown in the Orient, Africa, Mediterranean Europe, and the southern United States. The plant is a legume, and the nuts are underground pods. It is a native of South America, but was introduced into this country with the slaves from Africa. As an important commercial crop in the United States peanuts are of comparatively recent development. In 1909 the value of the crop exceeded $18,000,000, representing the product of 870,000 acres, an increase of 68 per cent over the acreage of 1900. In 1915 the area in peanuts was estimated at 1,220,000 acres.

Peanuts are used for human food and for feeding live stock, while the vine after the nuts have been pulled off, if properly cared for, becomes a valuable hay. Where the crop is grown for feed the nuts generally are not harvested separately, but the entire vine is fed as hay. Frequently hogs are turned into the peanut field to harvest the crop. Experiments have indicated that pork can be produced in the South in this way as cheaply as in the corn belt. Where the peanut vine is cut for hay, the acreage is classified in the census under hay and forage and included under the subhead grains cut green (see fig. 154).

The principal center of commercial production of peanuts is in southeastern Virginia and northeastern North Carolina, Petersburg, Suffolk, and Norfolk being the important markets. Both historic and geographic factors have contributed to this local development. The soil is a sandy loam, free from iron and other ingredients which stain the nuts. The area is also located near the big Eastern cities on the northern edge of the region in which the summers are sufficiently warm and long to permit maturity, and in addition possesses cheap water transportation to these markets. The peanuts produced in this area are grown mostly for human consumption and belong to the "Virginia" and "Spanish" varieties.

The other principal center of peanut production is in southeastern Alabama and northern Florida. The peanuts in this region are grown mostly for stock feed. A smaller center is located in western Tennessee, which produces nuts for shipment to the markets of the Middle West.

The region of peanut production is practically coincident with that of cotton, being limited on the north approximately by the line of 200 days in the average growing season (see fig. 63). Throughout the cotton belt peanuts, being rich in protein and suitable for both man and beast, appear to offer great possibilities as a food to supplement corn.

DRY PEAS (fig. 152) as classified by the census include cowpeas, field peas, and all other peas allowed to mature and harvested for the grain or seed. When cut for hay peas are classified as "grains cut green" under "Hay and Forage" (see fig. 154), and when used for canning or as green vegetables the crop is classified as "green peas" and included under "Vegetables" (see fig. 147). The census does not distinguish between the different kinds of dry peas, but on the map a line has been drawn separating the cowpeas of the South from the field peas grown in the North.

The cowpea, which is more closely related to the bean than to the pea, is a native of India and Persia, where it has been cultivated for 2,000 years. It is an important crop only in India, China, and the southeastern United States. In the Orient cowpeas are used principally for human food, but in the United States as yet both seed and vine are used almost entirely for stock food or the crop is plowed under as green manure. The principal centers of cowpea production for grain in 1909 were in South Carolina, North Carolina, and Georgia, with a scattered production extending westward to Texas and northward to Illinois. Cowpeas have been successfully grown as far north as New York, Massachusetts, and Michigan.

Cowpeas are an important crop only in the cotton belt, where their extensive use is of comparatively recent development, and are particularly valuable to restore the humus and nitrogen in soils more or less exhausted by continuous cropping in cotton or corn. Cowpeas can be grown on practically all types of soil except those that are wet during the summer, and, although thriving best on limestone soils, they will endure a moderate degree of acidity. Near the northern limit of cultivation they are grown usually on sandy or loamy soils in order to hasten maturity and also because clover can not be grown so well on such soils, and are commonly plowed under to improve the soil. Where used for this purpose, unless previously cut for hay or harvested for seed, they probably do not appear in the census statistics.

The field peas of the North are true peas, native to western Asia, and like cowpeas, include numerous varieties. The acreage is concentrated largely in northeastern Wisconsin, especially on the Door Peninsula, and in northern Michigan. In the San Luis Valley of Colorado, at an altitude of about 7,000 feet, where the summers are cool and occasionally frosty, field peas are locally of great importance. A few acres of field peas are found in almost every county in the northern tier of States and in the cooler regions of the West. They are also becoming of considerable importance in western Montana and the Pacific States.

Although field peas thrive under much the same climatic conditions as potatoes, unlike potatoes peas grow best on heavy soils, such as clays and clay loams, especially if well supplied with lime. On sandy and gravelly soils peas make a sickly, yellow growth, while on muck soils, although there is abundant vine, the yield of seed is small. Hence, peas are not grown in commercial potato regions (compare with fig. 87), but on the heavy, red clays of eastern Wisconsin and the lake-bottom clays of the San Luis Valley. On such land they are often plowed under to improve the tilth of the soil. Probably much the greater part of the crop, however, is either harvested for the grain, which is fed to live stock and also used for human food, forming the "split peas" of commerce, or else cut for hay or silage.

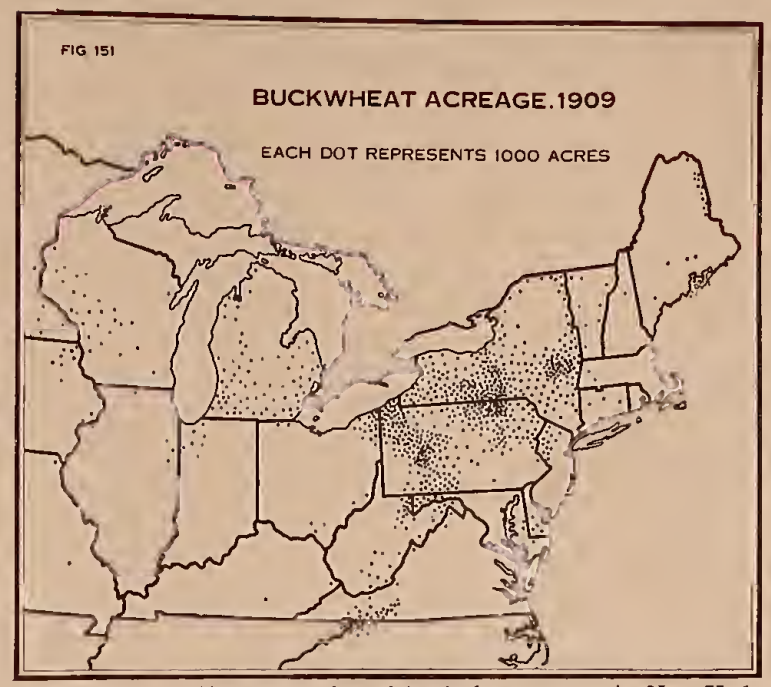


FIGURE 151.—The production of buckwheat centers in New York and Pennsylvania and is practically confined to the North Atlantic and Lake States, with a scattered acreage at the higher altitudes in the southern Appalachians.

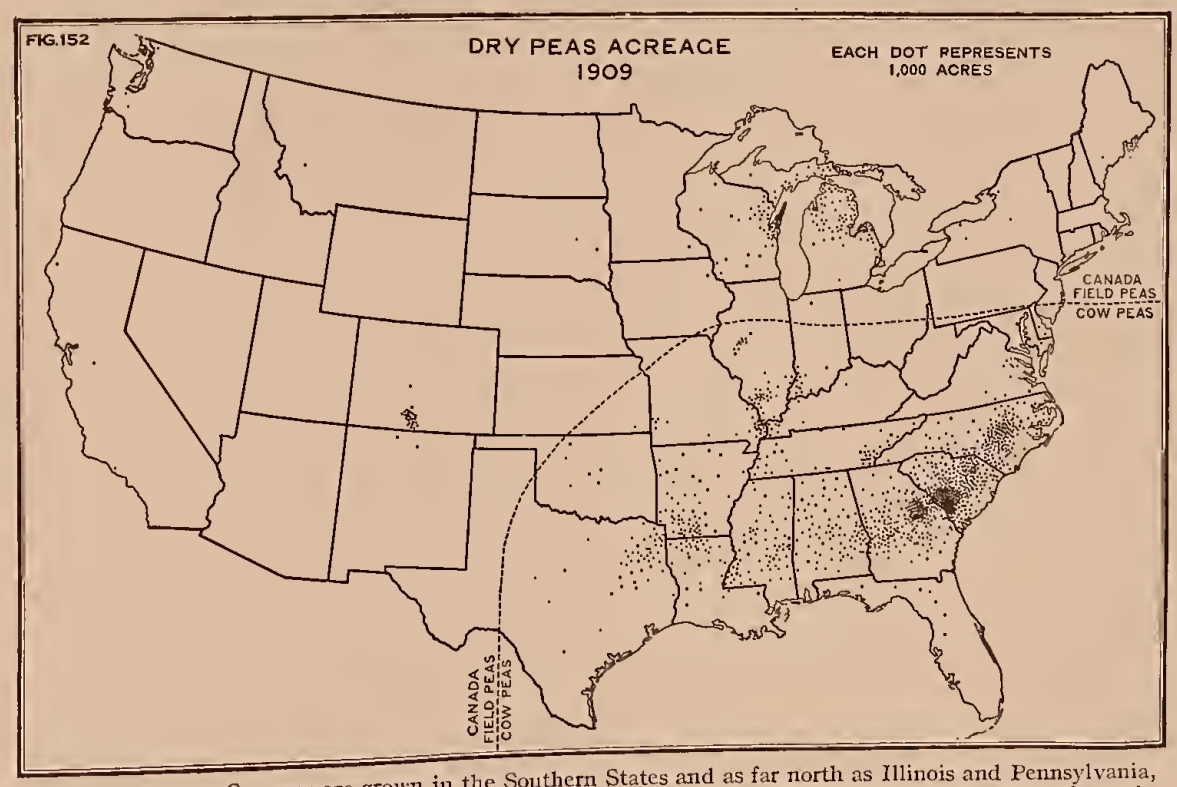


FIGURE 152.—Cowpeas are grown in the Southern States and as far north as Illinois and Pennsylvania, both for hay and grain. The above map shows that the densest acreage in 1909 of cowpeas grown for grain was along the upper Atlantic coastal plain. Canada field peas are grown for grain mostly in northeastern Wisconsin and in Michigan. They are locally very important in the San Luis Valley of Colorado.

BUCKWHEAT (fig. 151) is probably native to China and is extensively grown in that country, in Japan, and in Russia, but as statistics of acreage are for the most part unavailable no maps of its distribution in foreign countries have been prepared. In the United States buckwheat is grown in the northeastern States, two-thirds of the entire acreage being in New York and Pennsylvania. The crop extends westward as far as Minnesota and is also found at the higher elevations along the southern Appalachians. These regions have a cool, moist summer climate, very little buckwheat being raised where the mean summer temperature is over 70° and practically none where it exceeds 75°. High temperature, especially hot sunshine after showers, blasts the flowers. Buckwheat will give profitable yields on soils too poor to produce most other crops. It does best on moderately fertile, loamy, well-drained soils, but on rich soil is likely to lodge more seriously than the cereals. It is grown in the United States largely on poor soil or as a catch crop after another crop has failed, since it may be sown even in the northernmost States as late as July 1 and still mature before frost. The acreage of the crop in the United States is about equal to that of rice, about one-third that of rye, and about one-fiftieth that of wheat.

HOPS AND KAFIR AND MILO

HOPS are grown in northern Europe, Germany, Austria-Hungary, and England leading in production, with an average of about 40 million pounds each. The aggregate production of Europe ranges from 100 to 200 million pounds. The production of the United States, about 50 million pounds, is greater than that of any other country, and constitutes about one-fourth of the world's crop. There is a small production in Australia and in New Zealand.

Hops are grown in the United States at present only in two regions, central New York and the valleys of the Pacific Coast States from Sacramento northward to Seattle. Formerly New York was the leading State, and at one time a considerable quantity of hops were grown in Wisconsin and Michigan, but Oregon is now the leading State. As the crop declines in importance in the East the production increases in the West, due largely to better climatic conditions and cheaper methods of production. The table below shows the geographic shift in production since 1859.

Hops thrive best in a cool, moderately dry climate, warm, moist weather favoring the spread of "black mold," which is nearly always present to some extent and occasionally ruins the crop in a locality. The dry summers on the Pacific Coast retard the development of this and other fungous diseases. Hops are grown on many types of soil, which must, however, be well drained. In New York hops are grown both on the fertile soils of valley bottoms and on poor sandstone hills, but a rich, sandy loam is generally preferred. On heavy soils, especially if rich in nitrogen, the hop fruits are not as likely to have the bright straw color which commands the highest price. A slight elevation to insure air drainage and a slope toward the southeast to secure protection from the north and northwest winds is esteemed best.

Hops are used almost exclusively in the brewing of beer and other malt liquors. The United States exports on the average about 15 million pounds, mostly to England, and imports about half this quantity, mostly from Germany and Austria.

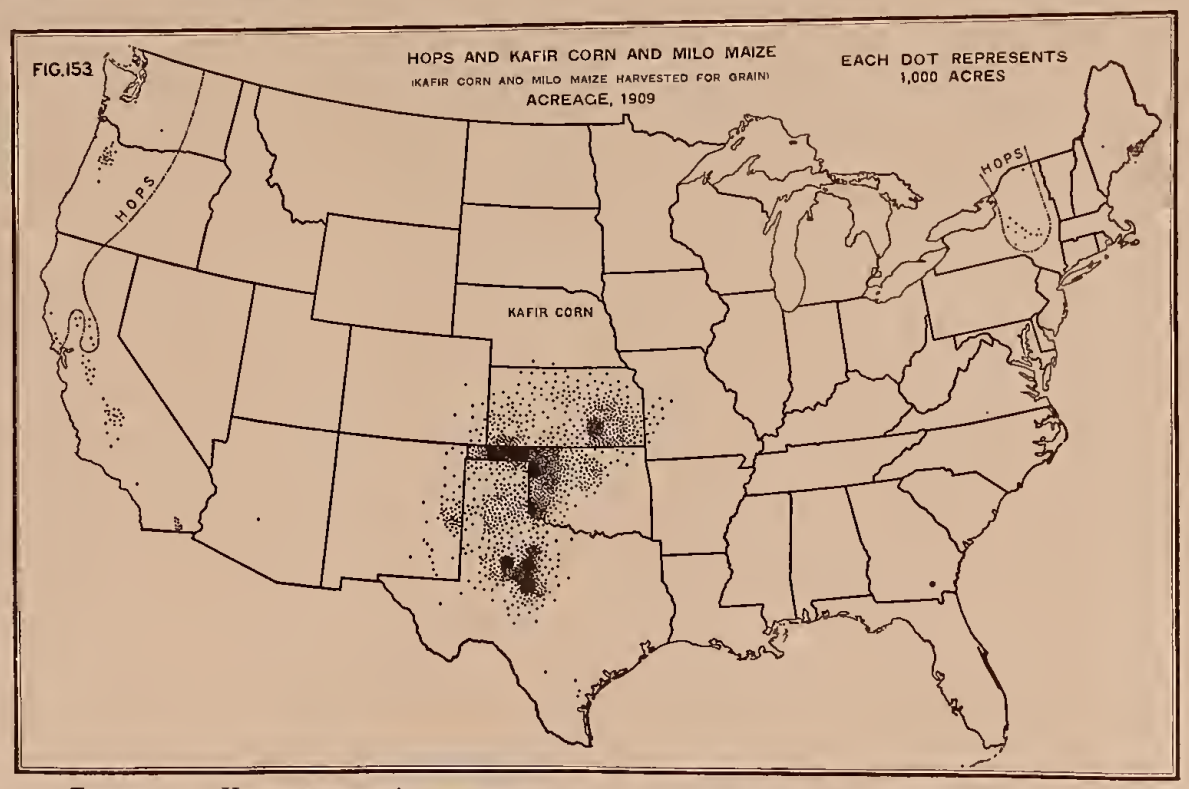


FIGURE 153.—Hops are grown in central New York and along the Sacramento, Willamette, and Puget Sound Valleys. Three-fourths of the production is in the Pacific Coast States. Kafir and milo, in 1909, were practically confined to the Southwestern States, where, owing to their drought-resistant characters, they have become very important crops. The map above shows only the acreage grown for grain. Probably as large an acreage is grown for forage and is classified by the census as "coarse forage" under "Hay and Forage" (see figs. 154 and 156).

Hops in the United States, 1859–1909 (production in pounds).

State.	1909	1899	1889	1879	1869	1859
Oregon	16,582,562	14,675,577	3,613,726	244,371	9,745	493
California	11,994,953	10,124,660	6,547,388	1,444,077	625,064	80
Washington	3,432,504	6,813,830	8,313,280	703,277	6,162	44
New York	8,677,138	17,332,340	20,063,029	21,628,931	17,558,681	9,671,931
Wisconsin	13,290	165,346	428,547	1,966,827	4,630,155	135,587
Michigan	58	3,560	64,815	266,010	828,269	60,602
Other States	18,243	94,391	121,435	292,885	1,798,593	1,123,259
United States	40,718,748	49,209,704	39,152,220	26,546,378	25,456,669	10,991,996

KAFIR, MILO, and other sorghums harvested for grain are grown principally in the Southwestern States owing to their extraordinarily drought-resistant character. These crops were introduced from Africa, the kafir from Natal in 1876, although the seed was not widely disseminated by the Department of Agriculture until about 1890; while the durra was brought from Egypt into California in 1874 under the name Egyptian corn. Milo was introduced into the Southern States, probably from Egypt, at about the same time.

The census of 1900 was the first to collect statistics of kafir and milo, which showed that in 1899 some 266,000 acres had been harvested for the grain. In 1909 the acreage harvested for grain had increased sixfold to 1,635,000 acres, and the value of the crop was nearly $11,000,000. When the grain is not harvested separately, but the entire plant is cut for forage, the crop is classified as "coarse forage" under "Hay and Forage" (see fig. 154). The acreage of kafir and milo cut for forage only is probably equal to that cut for grain.

Three States, Texas, Oklahoma, and Kansas, produce nine-tenths of the kafir and milo grown in the United States both for grain and for forage. The crop extends beyond the western border of these States into New Mexico and Colorado, and in California is of some importance, especially in the Imperial Valley and in the great central valley of the State. Most of the crop is grown where the annual rainfall ranges from 15 to 30 inches, the 30-inch line approximately bounding the crop on the east across Texas and Oklahoma, but in eastern Kansas and western Missouri some kafir is grown where the annual rainfall is as much as 40 inches, of which one-third is received during the three summer months, and in California the crop is grown mostly under irrigation. Both kafir and milo possess the valuable characteristic of being able to cease growth and remain dormant during a drought and when rains come resume growing in a normal manner. A few acres of kafir and milo are grown in almost every State, but in the humid eastern half of the country corn gives a bigger yield of both grain and forage, and even in the Southwest where the annual rainfall exceeds 25 inches the acreage of corn is greater than that of kafir and milo.

The northern or upper limit of kafir is a mean summer temperature of about 75° while that of milo is about 70° and it will mature in about ten days shorter season than kafir. Dwarf milo is grown over 1,000 feet higher than kafir on the plateau in southeastern Colorado, or up to about 5,500 feet, and farther north in Kansas and Nebraska. The early varieties of corn are adapted to much cooler temperatures than milo, however, being grown in southern Colorado up to 8,000 feet. Both kafir and milo grow well on sandy loams, as well as on silty and clay loam soils, and succeed much better on poor soils than most other crops.

HAY, FORAGE, AND PASTURE include a group of crops, mostly grasses and legumes, used chiefly for feeding animals. In the case of pasture, methods of agricultural practice and of compiling statistics vary so greatly in the different foreign countries as to make a map of acreage impracticable. For forage no general map has been attempted, but from the statistics of the northwest European countries such items were selected as would make an approximate map of root forage. International comparisons of hay production or acreage are difficult, owing to differences in classification, hence no world map has been prepared.

EUROPE (fig. 157).—The hay crop is one of the principal crops of Europe, but it is difficult to make a comparable map showing distribution in the different countries owing to the fact that some countries enumerate the acreage of both hay and forage crops together, while in others areas are included which are, at different times, used as pasture or cut for hay. The map (fig. 157) attempts to exclude, so far as possible, all crops not cut for hay. It is, however, not advisable to show this map apart from a list of the statistical groups used in its composition. These groups, for the most important countries, are as follows:

Austria:

Millet and sorghum, clover (red, alfalfa, sainfoin, hay, and aftermath)—*Hirse* and *sorgho*, *Klee* (*Rot*, *Luzerne*, *Eparcette*, *Kleegrass*, *Heu*, and *Grummet*).

Mixed fodder, vetches with other fodder, corn cut green—*Mengfutter*, *Wickfutter*, *Grünmais*.

Meadows (hay and aftermath)—*Wiesen* (*Heu* and *Grummet*).

Alpine hay meadows—*Alpwiesen*, *Heu*.

France:

Sown meadows (clover, alfalfa, sainfoin)—*Prairies artificielles* (*trèfle*, *luzerne*, *sainfoin*).

Temporary meadows (grasses, mixtures of grasses and legumes)—*Prairies temporaires* (*graminées*, *mélanges de graminées et de légumineuses*).

Fodder or forage (annuals cut green, permanent meadows, grassland pasture and grazing land)—*Fourrages* (*fourrage verts annuels*, *prés naturels*, *herbages*, *pâturage et pacages*).

Germany:

Clover, alfalfa, irrigated meadows, other meadows, wild hay—*Klee*, *Luzerne*, *Bewässerungs Wiesen*, *Andere Wiesen*, *Wiesenheu*.

Hungary:

Corn cut green, vetches, autumn peas and rye, spring vetches with cereals for green fodder, clover, alfalfa, Hungarian millet, other millet, sainfoin—*Maïs à fourrage*, *vesce*, *pois et seigle d'automne*, *vesce de printemps tremois*, *trèfle*, *luzerne*, *moha*, *millet*, *sainfoin*.

Russia:

Meadows (only permanent meadows that are harvested)—*Prés* (*les prés naturels exploitées seulement*).

Millet—*millet*.

Great Britain:

Clover, sainfoin, and grasses under rotation. Permanent grasses for hay.

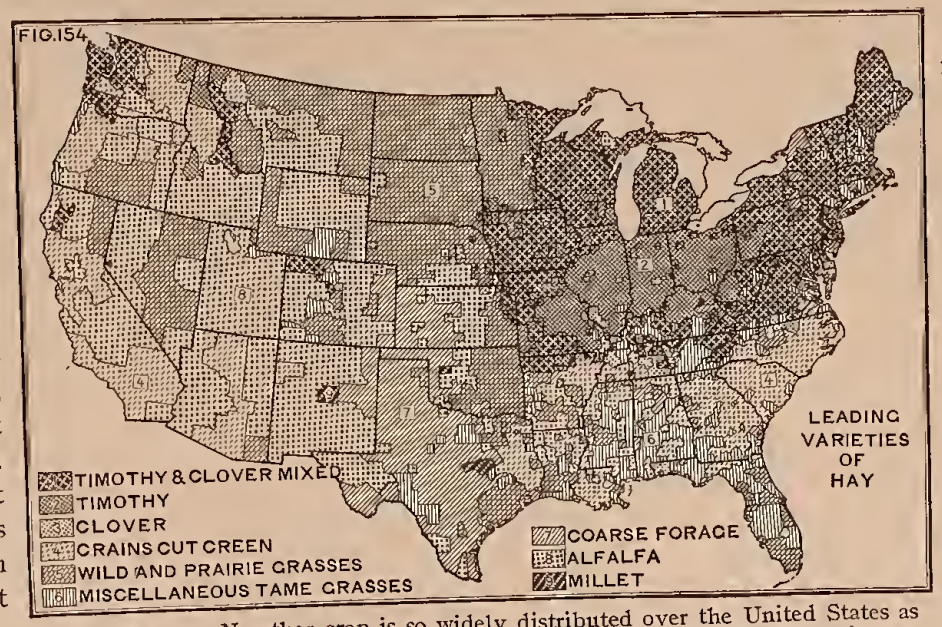


FIGURE 154.—No other crop is so widely distributed over the United States as hay and forage, which consists of different plants adapted to various climatic conditions. This map shows the variety of hay or forage, as classified by the census, of which there were more tons grown in 1909 in the particular counties indicated than of any other variety. In the Lake States timothy and clover, sown separately or mixed, are the principal hay plants; in parts of New England redtop and orchard grass. Corn silage, classed in the census under "coarse forage," is also important in these regions. In the corn belt, east of the Missouri River, timothy and clover are also the leading hay crops, supplemented by large amounts of corn silage and fodder; while west of the Missouri alfalfa is becoming increasingly important. In the cotton States "grains cut green," composed largely of cowpeas, and "coarse forage," mostly corn fodder, are the leading hay crops. In the spring-wheat region and northern portion of the Great Plains wild or prairie grasses constitute the dominant hay crop, replaced in central Nebraska and Kansas by alfalfa, while both give way in western Kansas, western Texas, and New Mexico to "coarse forage," consisting, in this region, mostly of corn fodder, kafir, and other sorghums. In the Rocky Mountain region timothy reappears as an important hay plant in the higher mountains, while wild grasses are cut upon the mountain meadows, and alfalfa occupies the irrigated valleys below. In all the irrigated districts of the arid intermountain region alfalfa is the dominant crop; while in California "grains cut green," chiefly wheat, barley, and oats, are equally important. In western Oregon and Washington "grains cut green" constitute the principal hay crop with a considerable acreage of timothy and clover in certain sections.

The rainy climates of Scotland and northern England make much handling of the hay necessary in order to avoid damage. In Norway special racks are constructed for drying the crop. In drier southern England the grass is seldom raked until it is ready to draw away.

In Italy the permanent Alpine meadows and the grass in rotation in the Po Valley, partly under irrigation, give very large returns, as many as four crops per year near Milan. In the drier portions of the Mediterranean region grasses suffer from summer drought and the scant hay crop is composed largely of wheat, oats, and barley cut green. Such also is the case in Chile and Australia, where the same climatic conditions prevail.

UNITED STATES (fig. 156).—The acreage of hay and forage in the United States is second only to corn, while in value the hay and forage crop competes with cotton for the second place. The relative importance of the hay crop as compared with other crops has changed very little, apparently, since 1840.

Hay in the United States, 1839–1909 (hay and forage since 1889).

Year.	Production.		Acreage.	Value.	
	Total (tons).	Per capita (tons).		Amount.	Per cent of all crops.
1839[a]	10,248,109	0.60	Not reported.	Not reported.	.....
1849[a]	13,838,642	.60	....do.....	....do.....	.....
1859[a]	19,083,896	.61	....do.....	....do.....	.....
1869[a]	27,316,048	.71	....do.....	....do.....	.....
1879[a]	35,150,711	.70	30,631,054	....do.....	.....
1889	66,831,480	1.07	52,948,797	....do.....	.....
1899	79,251,562	1.04	61,691,069	$484,254,703	16.1
1909	97,453,735	1.06	72,280,776	824,004,877	13.0

[a] Not including forage.

The distribution of hay and forage in the United States is a good example of the joint influence of geographic and economic forces in determining the selection of crops. The hay and forage crop, consisting as it does of various plants adapted to the entire climatic range from aridity to humidity and from heat to cold, is obviously not directly restricted in its distribution by geographic conditions. For the study of the distribution of hay and forage the United States may be divided into four parts, the West, the North, the Center, and the South; and in considering each section the general principle should be borne in mind that a crop, such as corn or cotton, which has a more restricted geographic range, especially if it is highly productive and can be used in large quantities, will have first choice of location.

In the West the small acreage of hay and forage is due to the fact that only a comparatively few favorably located regions possess both the arable land and adequate water for the production of crops. The relatively large acreage, 44 per cent of that of all crops, is due to the fact that neither corn nor cotton can be grown successfully except along the southern margin of these Western States; while alfalfa is

admirably adapted to geographic conditions existing in the West, and where alfalfa does not thrive, the native grasses or the small grains can be grown for hay. A further reason for the dominant position of hay and forage among the crops of the West is that it can be converted into beef, butter, and wool, whose concentrated value will bear the cost of long-distance transportation.

The geographic conditions which have made hay the leading crop in the Northern States are: (1) Climate, more especially the cool summer weather, which largely excludes corn and encourages dairying; the favorable distribution of summer rainfall, which, preventing injury by drought, also permits proper curing during the rainless periods; and the heavy winter snowfall that diminishes the damage done by freezing and heaving of the soil; (2) soils, largely glacial clays and silts, often poorly drained, and frequently containing areas of muck or peat, which are not adapted to other farm crops; (3) much hilly land, unsuited to cultivated crops; (4) location in the most densely populated portion of the country, with resultant city demand for milk and hay, neither of which can be shipped long distances.

Three regions of thinner hay acreage occur in these Northern States—the highlands of northern Wisconsin and Michigan, the Adirondack Mountains, and northern Maine. Small acreage here results from conditions which have retarded agricultural development in general, particularly short and occasionally frosty summers, hilly to mountainous topography, and locally thin soils due to glacial erosion. Although the actual acreage is small, more than half of the land in crops in these regions is in hay.

Hay and forage is the second most important crop in the Central States, three important conditions preventing its exclusion by corn and other more valuable crops: (1) Hay is needed as winter feed for live stock, and since hay is bulky the expense of importing it from long distances is prohibitive; (2) hay fits well into the rotations, requiring labor at a time of year when corn does not urgently need attention; (3) the hay crop, especially clover, is valuable in maintaining the humus content and the fertility of the soil.

The Southern States have a small hay acreage for several reasons: (1) A system of agriculture based almost entirely on cotton and corn, which are more productive and more restricted in their geographic range; (2) small farms, lack of capital, and a credit system which makes cash crops of primary importance; (3) the absence of a beef and dairy industry, due in part to the warm climate, the cattle tick, lack of ice for refrigeration, unskilled character of labor, and the limited local markets; (4) the prevalence of tenancy and the migratory character of the tenants, which discourages crop rotation; (5) frequent summer rains and high humidity detrimental to curing hay; (6) a considerable amount of waste land, the result of erosion of the surface soil, on which it is difficult to secure a good catch of grass; (7) climatic conditions to which northern hay crops are not adapted, and the absence of good perennial grasses and legumes.

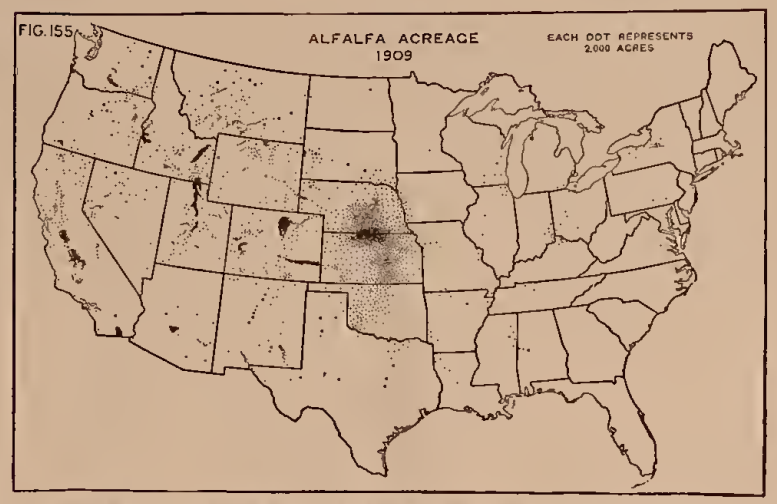


FIGURE 155.—Alfalfa is a crop whose distribution is limited both by soil conditions and by climate. It demands soils that are not acid, and its culture is most profitable in a climate that is not rainy during the summer. Consequently it thrives best in the Western States, and fairly well in the limestone regions in the East, where its culture is increasing rapidly. This increase is retarded, however, by the fact that the first cutting of alfalfa commonly conflicts with corn cultivation. About one-half of the alfalfa of the United States is grown under irrigation and less than 6 per cent of the acreage in 1909 was east of the Missouri River. It is raised quite extensively in the Black Prairie of Alabama and Mississippi, however, where the annual rainfall is 50 inches, and is being grown in Saskatchewan upon a rainfall of less than 15 inches. Its deep roots enable it to endure drought much better than does clover. Including the various varieties, alfalfa grows under almost as great variations of temperature as any other cultivated plant, its range extending from the intense heat of the Imperial Valley of California to the cool climate of northern Montana and Saskatchewan. It thrives best, however, and produces the most cuttings per season in the warmer Southwestern States.

The rapidly extending use of the cowpea in the South, and the more frequent utilization of Bermuda grass and Johnson grass, combined with the growth of cities, improved transportation facilities, and increase of capital, which may be expected to result in a moderate development of dairying and other live-stock enterprises, promise in large measure to correct these adverse conditions.

CANADA (fig. 159).—The hay crop of Canada is important in connection with the dairy industry (fig. 180), and also furnishes a considerable export to Europe. The value of the crop in the Dominion ranks next to that of wheat. It holds first rank in crop value in all provinces except Alberta, Manitoba, and Saskatchewan. Timothy and clover are grown in the eastern provinces and in British Colombia, while wild grasses are more important in the prairie provinces.

ROOT FORAGE.

EUROPE (fig. 158).—The roots grouped under this heading are chiefly turnips, rutabagas or Swedish turnips, and mangel-wurzels. These crops require the cool summers and abundant rainfall of northern Europe and are not grown to any extent as field crops in the Mediterranean countries. The importance of these crops is greatest in Denmark, Great Britain, and northern France. In all of this section of Europe, where corn (maize) does not thrive, there is great need for an intertilled crop to plant in rotation with the small grains. This need is filled by the root crops. In mild, humid climates, such as that of Ireland, very large yields, 20 to 50 tons per acre, are obtained. The high water content, about 90 per cent, is counterbalanced by a large sugar content, ranging from 3 to 9 per cent in the various roots.

Roots in Great Britain have the largest acreage in Norfolk, where their cultivation has been encouraged for over 100 years. Turnips are commonly grown, as they are better suited than other roots to the cool summers and to the high rainfall of the northern counties and of Scotland. Roots, particularly the turnip, grow best on light soils, such as are used for barley (note England and Denmark in figure 48). Moreover, the turnip is not greatly damaged by frost and is frequently left in the ground to be eaten off by sheep. Large quantities of the roots are stored, particularly in northern England and Scotland, where they form the staple winter feed both for cattle and sheep. In Scotland beef cattle fatten very well on a ration of turnips and oat straw. The succulent nature of the root makes it an important feed for dairy cows, as is shown by its use in Denmark.

In the German Empire, with its more continental climate, and to some extent in southern England, the mangel-wurzel is grown more commonly than the turnip, as it is more resistant to drought and the higher summer temperatures. The mangel-wurzel, however, is more sensitive to frost and is not fed from the ground, as are the turnips. The importance of the potato as a stock feed in Germany does not give roots so large a relative place as in England. In France the equable climate of the west coast, together with the very large and intensive cattle industry of the region, furnishes favorable conditions for a large acreage of roots. Turnips and rutabagas are the most important, while cabbage and potatoes are also grown for forage.

FIG.156

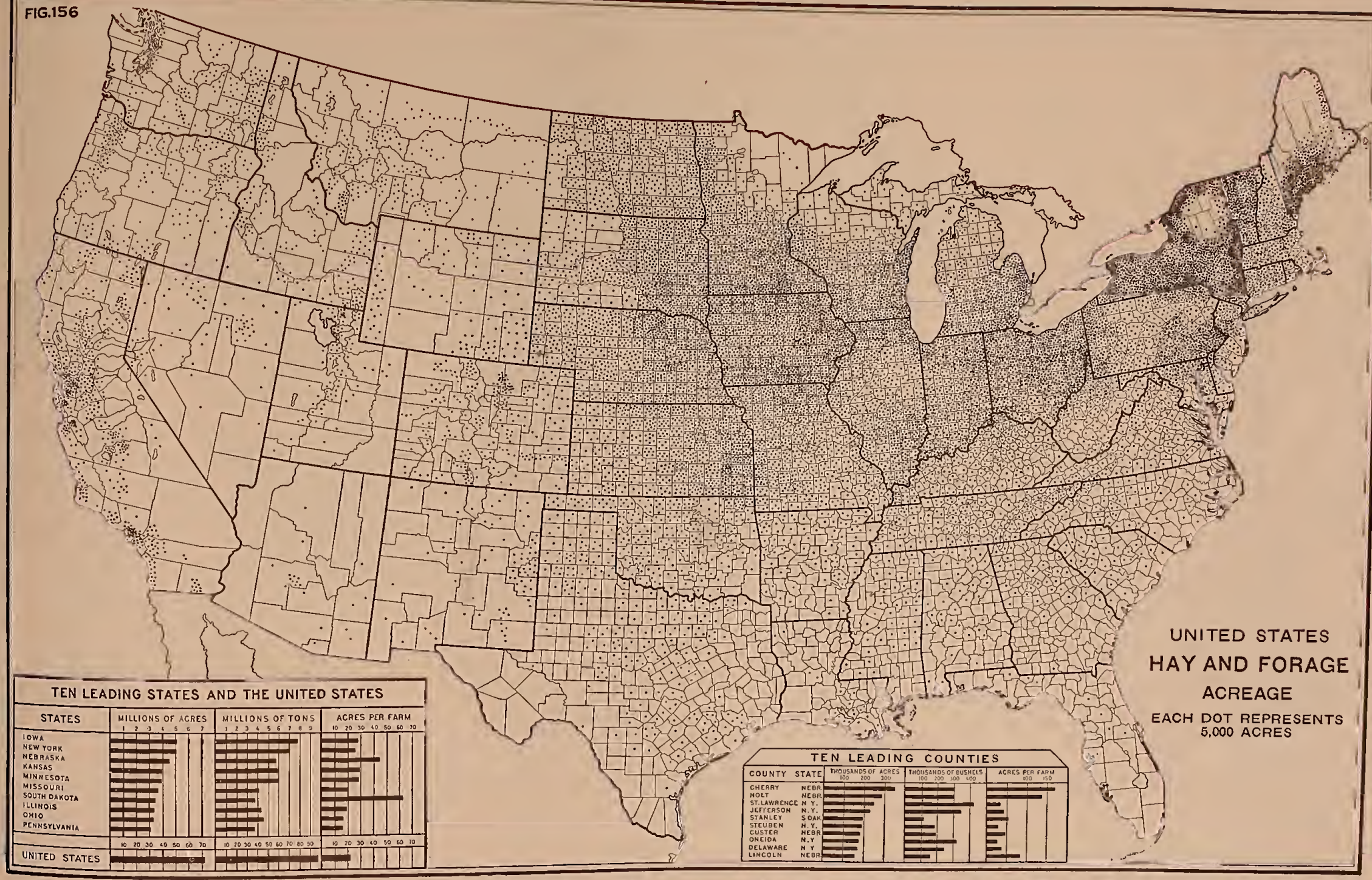


FIGURE 156.—Distribution of hay and forage acreage in the United States. The map shows only a thin acreage in the Southern and Western States, and a concentration in the region lying north of Oklahoma and the Ohio River and east of the Great Plains, with a still greater concentration in New England, New York, the Lake States, Iowa, and eastern Kansas. In the Western States, although the acreage is comparatively small, hay and forage is the most important crop, constituting 44 per cent of the acreage of all crops in 1909; while in the corn belt, despite the large actual acreage, it occupies only a fifth of the land in crops. In the South hay and forage is a minor crop, both absolutely and relatively. The map is made on the same scale (each dot represents 5,000 acres) as that of hay in Europe, and it is noticeable that even the densest areas in the United States are much thinner than the dense areas in Europe. New York State averages 106 acres of hay and forage per square mile, while the Department of Manche, in Normandy, has 315 acres, the Netherlands 251 acres, and Venetia, in Italy, 184 acres per square mile.

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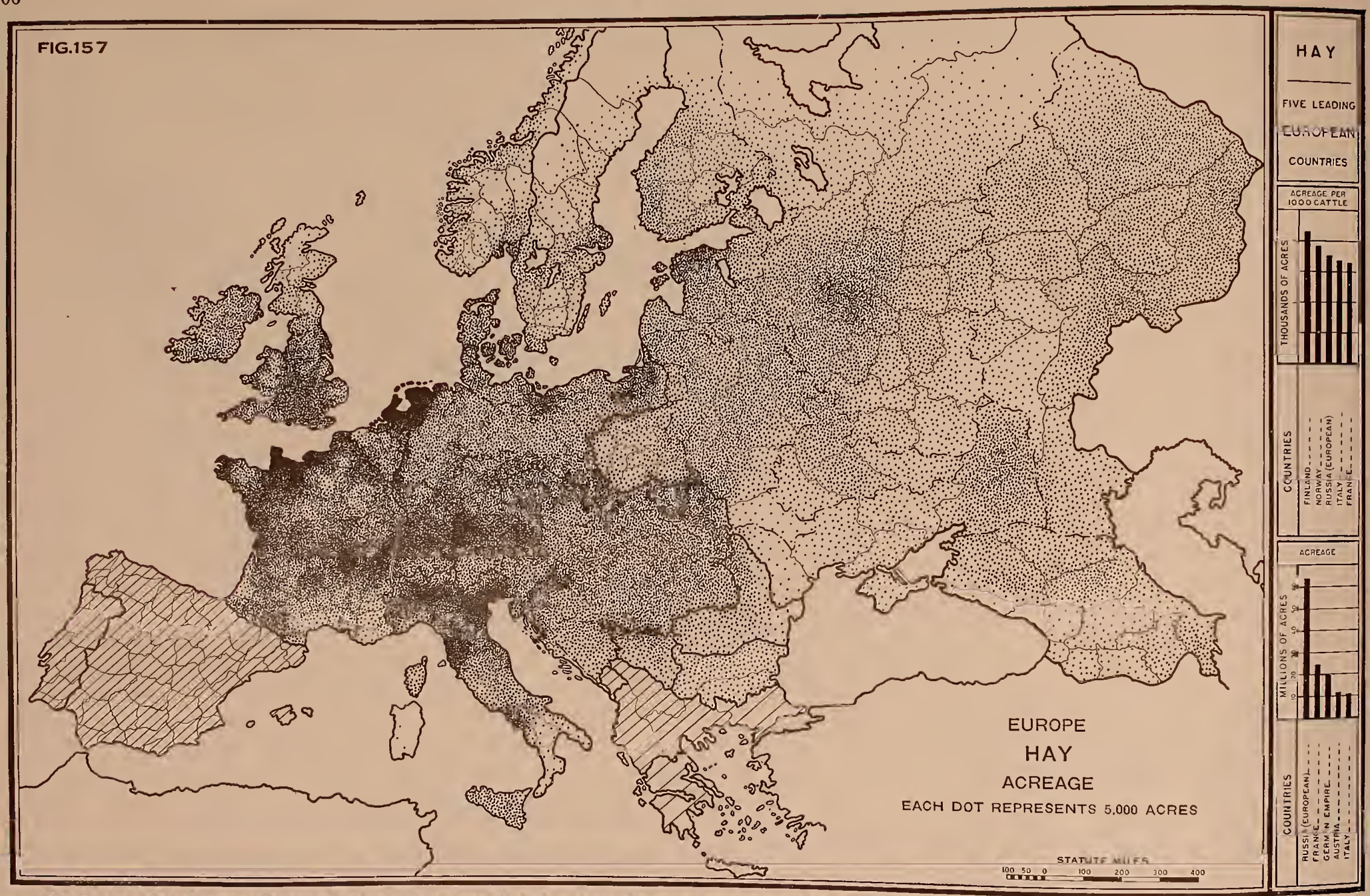


FIGURE 157.—Distribution in Europe of land in certain crops of which at least the major portion is cut for hay. A complete list of these crops is given in the accompanying text. The areas of densest acreage of hay are the Netherlands, Normandy, and Brittany, along the north coast, and the Auverne region in central France, the northern slope of the Alps in Switzerland, Wurttemberg and Bavaria in Germany, the valley of the Po, Tuscany, and the region around Naples in Italy. In some of the departments in northern France nearly half of the total land area is in hay, and in these same departments the number of horses (see fig. 165) and cattle (fig. 177) reaches the greatest density to be found anywhere in the world. Statistics of hay acreage in Spain and Portugal, in Turkey, and in Greece are not available.

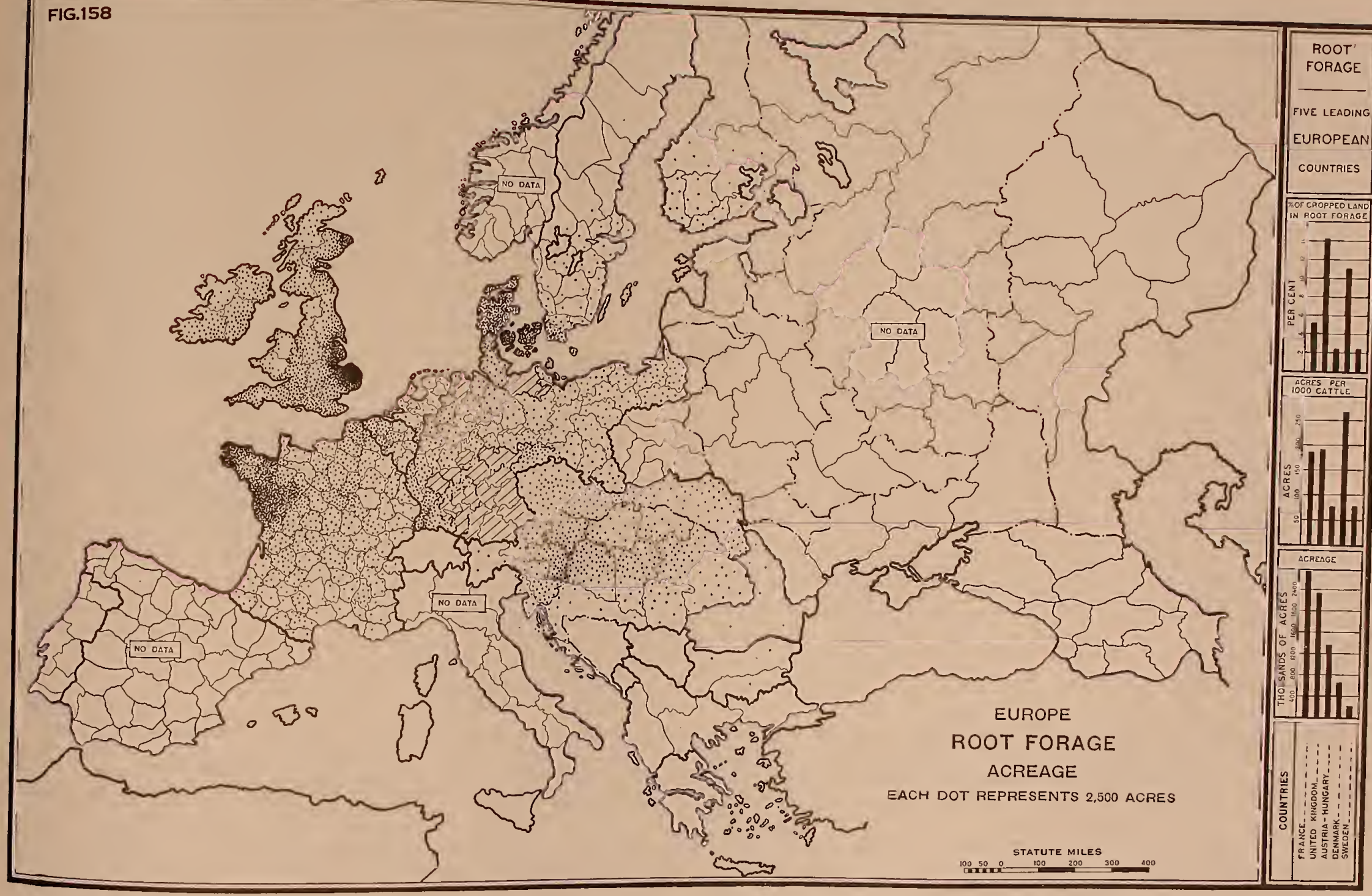


FIGURE 158.—Root-forage acreage in Europe. Under this head are included beets, turnips, and mangel-wurzels, and other roots grown for feeding live stock. In northwestern Europe, where no corn (maize) is grown, these root crops are doubly important in that they provide a hoed or cultivated crop in the usual rotation and also a supplement to the fattening ration for cattle. The root crop is of greatest relative importance in County Norfolk, England, where it was introduced from the Continent more than a century ago, in northwestern France, and in Denmark.

FIGURE 159.—Hay acreage in Canada (tame grasses only). The hay crop of Canada is second in value only to the wheat crop. In each of the five eastern provinces it ranks first in this respect. The distribution of hay is similar to that of dairy cows (fig. 180), the region of greatest density surrounding Montreal. In eastern Canada the hay is principally timothy and clover, sown separately or mixed, while in the western provinces most of the hay crop is made from the wild grass of the prairies, which usually yields as well per acre as cultivated grasses. Absence of statistics, however, prevents this acreage of wild and prairie hay from being shown on the map. In British Columbia there is a considerable acreage of alfalfa and of roots grown for foiage, as well as of timothy and clover.

HORSES, MULES, AND ASSES are principally beasts of draft and burden, though they are used in a few regions for meat and to produce milk. The horse and the ass are closely related, yet each has certain characteristics which give it special importance in certain sections of the world (figs. 162 and 167).

Horses.—The wild stocks from which our horses have descended were native to the grassy plains, and probably also to the forest lands of Europe and Asia. The descendants of the Eurasian horse are of several types, one of which is the heavy horse of western Europe and another the Arab stock. These general differences of type are due in part to geographic environment, including the character of food. The European war horse, the progenitor of the modern draft breeds, was raised on the grassy plains of England and Flanders. On the other hand, the desert conditions of Arabia produced animals of very different physical character. The Arabian horses are slender, with narrow chests but have great muscular force, agility, and spirit. They subsist on scanty food, and require relatively little water. Yet they endure exposure to heat and heavy toil.

These main types of horses are again subdivided. A half dozen breeds of heavy horses, and a score of less specialized types, have sprung up in various regions of western Europe. Likewise, many breeds of desert horses have developed, of which the more important types are the Arabians and North African horses (Berbers or Barbs). Breeding for special purposes has, in modern times, so combined various races that breeds have been produced which bear no relation to the natural conditions of any geographical region. The English thoroughbred is such a combination.

The ability of the horse to subsist under a variety of conditions and in close association with man gives it a wide distribution over the world. In regions settled by the white race there is notable agreement between the distribution of horses and that of population (see fig. 3). That this agreement between the distribution of horses and of men is not more close is due (1) to the large amount of horse labor required in the newer agricultural regions of the world, causing the number of horses in proportion to the human population to be high (1.3 per capita in Argentina); (2) to the use of cattle and of human beings in the performance of heavy labor in the Orient; (3) to the use of mules and asses in regions of warm climate and rough topography; and (4) to the presence of diseases, which bar the horse from large portions of equatorial Africa. The agreement is closest in Europe. The poverty of the Russian peasants does not permit them to keep many horses and the average number per square mile is only thirteen. The greater wealth of the farmers of the industrial countries of western Europe enables them to have more horses (23 per square mile in Belgium) in spite of the greater density of human population. The foreign sales of highly bred animals from this region constitute a source of income sufficient to stimulate horse production in parts of nearly all of the countries concerned. In figure 164 the horses of cities other than Paris,

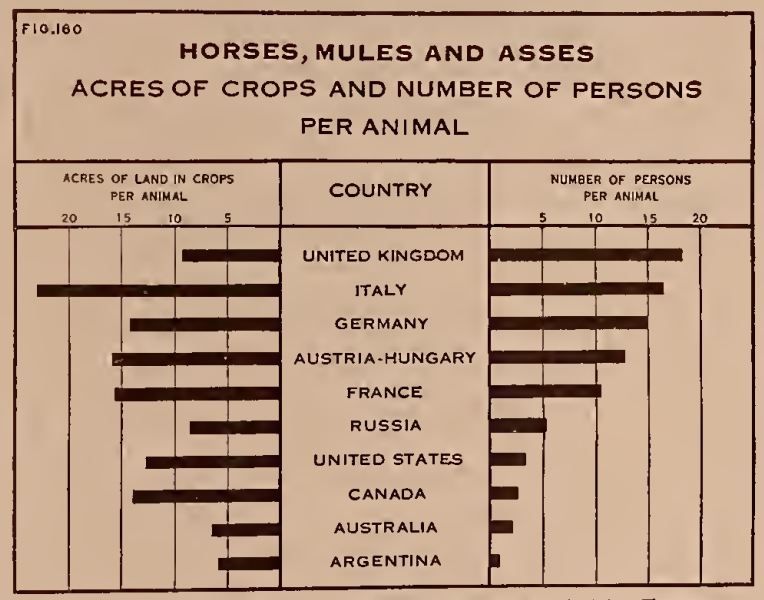


FIGURE 160.—Among the important countries settled by Europeans, Italy has next to the fewest work animals per unit of population and the greatest acreage of crops per animal, which means that most of the farm work is done by hand labor. In Argentina, on the other hand, there are about as many work animals as people, and there are less than 5 acres of crops per work animal, which would indicate that horses and mules in Argentina are not efficiently utilized as work animals or else are raised largely for other purposes. It is notable that in Canada, in spite of long and cold winters, when the horses are idle much of the time, there are more acres of crops per work animal than in the United States.

Berlin, and Moscow are not specifically shown because they are not separately reported in official statistical publications.

Mules and asses.—The domesticated ass is believed to have descended from races of wild asses still found in northern Africa. It is still most abundant in the Mediterranean region and is found principally in the hot and dry regions of the world. As in the case of the horse, the ass by natural and artificial selection has developed many types, varying as greatly in size and form as do the great horses of Flanders from the ponies of the Shetland Islands. Because of their size the large asses of Poitou, in southern France, and those of Spain are used in breeding mules, both in Europe and in America. The American type of ass, as a result of breeding and selection, is larger than the original stock. The ass is particularly important in the eastern Mediterranean lands and several breeds are found, each adapted to a specific use. Both mules and asses are able to subsist on harsh or meager forage, which, together with their docility of temperament and sureness of foot, makes them valuable in dry countries and especially those that are also rough or mountainous. Under such conditions their ability to outgo the horse is proverbial. These characteristics doubtless account for the introduction of the mule and ass into Brazil, the Andean countries, Mexico, and South Africa. In southern United States the mule occupies an important place in the domestic economy of the negro cotton grower. This condition extends over so large an area that it gives the United States nearly double the number of animals found in European Turkey, its nearest rival. It is in rough, dry, pastoral Turkey, however, that the ass and mule are of the greatest importance, measured by number of animals per square mile or by proportion to the human population.

UNITED STATES (figs. 163 and 168).—Horses and mules as measured by total value and universal service are the most important class of live stock on American farms. The thirteenth census reported 19,833,113 horses, 4,209,769 mules, and 105,698 asses and burros on farms, making a total of 24,148,580 such animals valued at $2,622,000,000. Horses alone constituted 43.8 per cent of the value of all domestic animals, and mules 11 per cent. The distribution of horses is more general than that of any other class of live stock. Practically every county in the country in 1910 reported horses on farms and only twenty-three out of nearly three thousand reported no mules.

There are about 20 acres of improved land per horse or mule in the United States, and about one horse or mule for every four people. This ratio has remained approximately constant since the first agricultural census of 1840.

Horses, mules, asses, and burros in the United States, 1840–1910, excluding spring colts.

Census Year.	Number of animals.	Number per 100 population.	Number per 100 acres of improved land	Value.	Average price.
1840	4,335,669	25	Not reported.	Not reported.	Not reported.
1850	4,896,050	21	4.3	.....do.....	Do.
1860	7,400,322	24	4.5	.....do.....	Do.
1870	8,270,785	22	4.4	.....do.....	Do.
1880	12,170,296	24	4.3	.....do.....	Do.
1890	17,581,318	28	4.9	.....do.....	Do.
1900	20,099,826	26	4.8	$1,066,447,684	$53.06
1910	23,426,548	26	4.9	2,597,009,308	110.86

Use is the primary factor governing the geographic distribution of horses and mules, forming as they do so important a part of the working capital of the farm. Their distribution is affected by (1) natural conditions, (2) the type of farming, and (3) the type of farmers. The effects of natural conditions are manifested in variations in the texture of the soil, requiring varying amounts of power in plowing and cultivation; in topography, which governs the proportion which the cultivated land bears to the entire area and hence number of draft animals needed; and in temperature, which determines the selection of animals with the requisite hardiness or heat-resisting power. The type of farming influences horse and mule distribution through variations in the proportion of the farm area in heavily cultivated crops and in hay and pasture and through the intensity of cultivation which determines the number of work animals required to farm a given area. The type of farmer influences it through the operation of personal judgment in the selection of the type of farming, of the size and organization of the farm, and of the kind of animal preferred.

The operation of these forces has resulted in a very uneven regional distribution. The western half of the country, together with the northern portions of Minnesota, Wisconsin, Michigan, and Maine, and southern Florida, is very scantily supplied; the South and East show only a moderate density; while the maximum density is found in an irregular area running in a broad belt almost directly northward from Texas to Nebraska and Iowa and thence eastward to Ohio, with a small detached area in southeastern Pennsylvania. The major portion of this area lies within the limits of the corn belt. One-half of all the horses and mules of the United States in 1910 were found in the East and West North Central States.

The most obvious relation of this irregular distribution is that which it bears to the location of cultivated land. The aridity and the rough topography of the West, the short growing season and swampy or sandy character of much of the land in the northern sections of the Lake States, and the large amount of relatively infertile stony soil in New England cause the percentage of area cultivated to be very low; while in the more or less level prairie regions a high proportion of the entire area is in crops, thus creating a maximum demand for work animals.

Another, though less obvious cause, is the type of farming. The greater the predominance of intertilled crops and the more intensive the methods used, the smaller the acreage which can be worked with a given force of horses and the larger the force required on a farm of a given size. In Illinois, for instance, where the principal crop is corn, requiring frequent and thorough cultivation, the average acreage of crops per work horse or mule is less than 17; while in the spring-grain region of North Dakota, where the wheat and oats require labor only in plowing, seeding, and harvesting, the average acreage of crops per work horse or mule is over 30 (see fig. 161).

FIG. 161

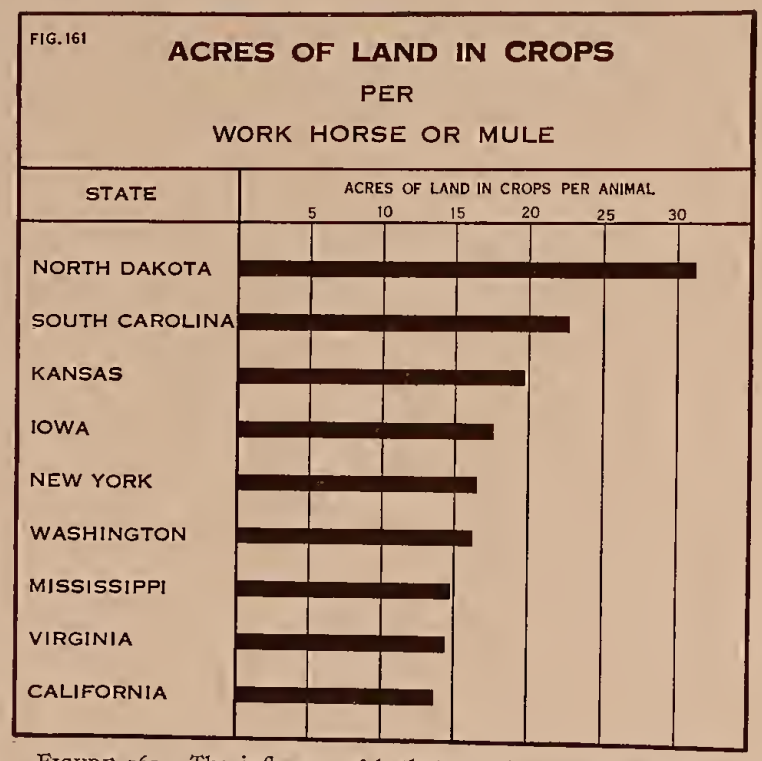


FIGURE 161.—The influence of both type of farming and climatic conditions upon the efficient use of work stock is evident in this graph. In North Dakota the wheat crop requires horse labor for plowing, planting, and harvesting, but not for cultivation, while the farms are large and well equipped with machinery, so that despite the long winters the farmers handle on the average over 30 acres of crops per work animal. In South Carolina the principal crops, cotton and corn, require many cultivations, while the farms are small and poorly equipped with machinery, yet the long season permits the cultivation of over 22 acres per work animal. In some States, particularly Iowa, Kansas, and New York, much of the work stock is also used for breeding purposes, which reduces the cultivated acreage per animal.

The division of territory between horses and mules while not exclusive is very marked. Horses are the principal work animals thoughout most of the United States except the cotton belt, where mules predominate. The fact that a smaller proportion of all farmers reported horses in 1910 than in 1900 while a larger proportion reported mules at the later date indicates that mules are growing in favor.

One important factor in the uneven distribution of horses and mules is the presence of many young animals even in excess of those needed to keep up the work stock in some regions and the almost total absence of them from other regions. The former may be called surplus regions and are shown in the insert maps, figures 164 and 169. It will be seen that the area of maximum horse production coincides rather closely with the area of greatest density of total horses. This is true first of all because horse production is not a specialized but an incidental industry and colts will be found in abundance only where the type of farming requires the work of many horses and furnishes favorable conditions with regard to the produetion of feed. Conditions are even more favorable where the seasonal distribution of horse labor is such as to provide considerable periods of rest for the mares, which must work as well as produce colts in order to be profitable. The best eombination of these eonditions is to be found in the eorn-belt States. Iowa, Illinois, Kansas, Missouri, and Nebraska are the leading States, in the order named, in the number of yearling horses, and Missouri in the number of yearling mules in 1910. Texas is an important State in the production of both horses and mules, ranking sixth in young horses and second in young mules. Another production area includes the small-grain States, Minnesota and the Dakotas. In the West the old range States are still producing many horses of somewhat lower grade than those raised in the Eastern States. Northern Kentucky and central Tennessee are still important producing regions though, relative to other States, they have not maintained their former rank. Southeastern Pennsylvania, Maryland, and the mountain distriets of Virginia form another region in which horse production is an important enterprise.

As in use so in produetion there is a noticeable division of territory between horses and mules. Mule raising is centered to the south of the area of heaviest horse produetion in northern Missouri, southern Illinois and Indiana, and eentral Kentucky and Tennessee. In Kansas, Oklahoma, Arkansas, and Texas there is found a somewhat lighter though very important mule producing area. There is also some production in the West, particularly in California. With the exeeption of Texas, it is very light in the cotton States. Horses are produced throughout the mule-producing region, but mules are not raised in the leading horse-producing regions. The regions where mules are grown have a smaller proportion of cultivated land and more permanent pasture. This is more favorable to specialization, and mule raising shows a greater tendency in this direction than horse raising. This is particularly noticeable in feeding young mules and preparing them for market. The fact that mule breeding was early located in a region within easy driving distance of the cotton States doubtless has had an influence in fixing this enterprise permanently over the region.

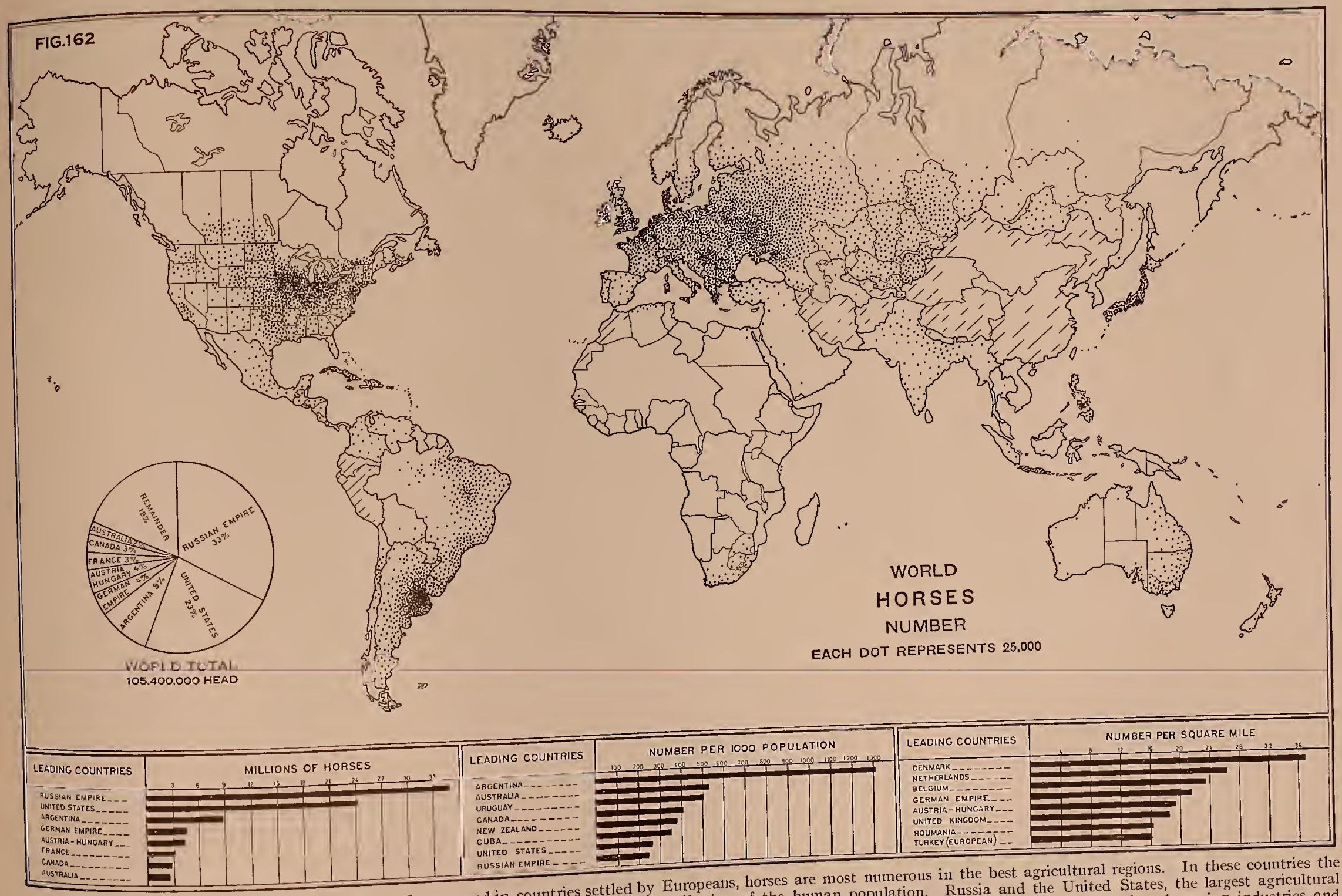


FIGURE 162.—World distribution of horses. In Europe, and in countries settled by Europeans, horses are most numerous in the best agricultural regions. In these countries the distribution of horses, more than that of any other farm animal, corresponds to the distribution of the human population. Russia and the United States, the largest agricultural nations, lead in actual number of horses. Relative to the population, horses are most numerous in those countries which have extensive agricultural and grazing industries and sparse populations. The number of horses relative to area, however, is greatest in northwestern Europe, where agriculture is highly developed and intensive. In the Orient, where human labor is plentiful and cheap, and cattle are used both in agricultural labor and in transportation, horses are few.

FIG. 163

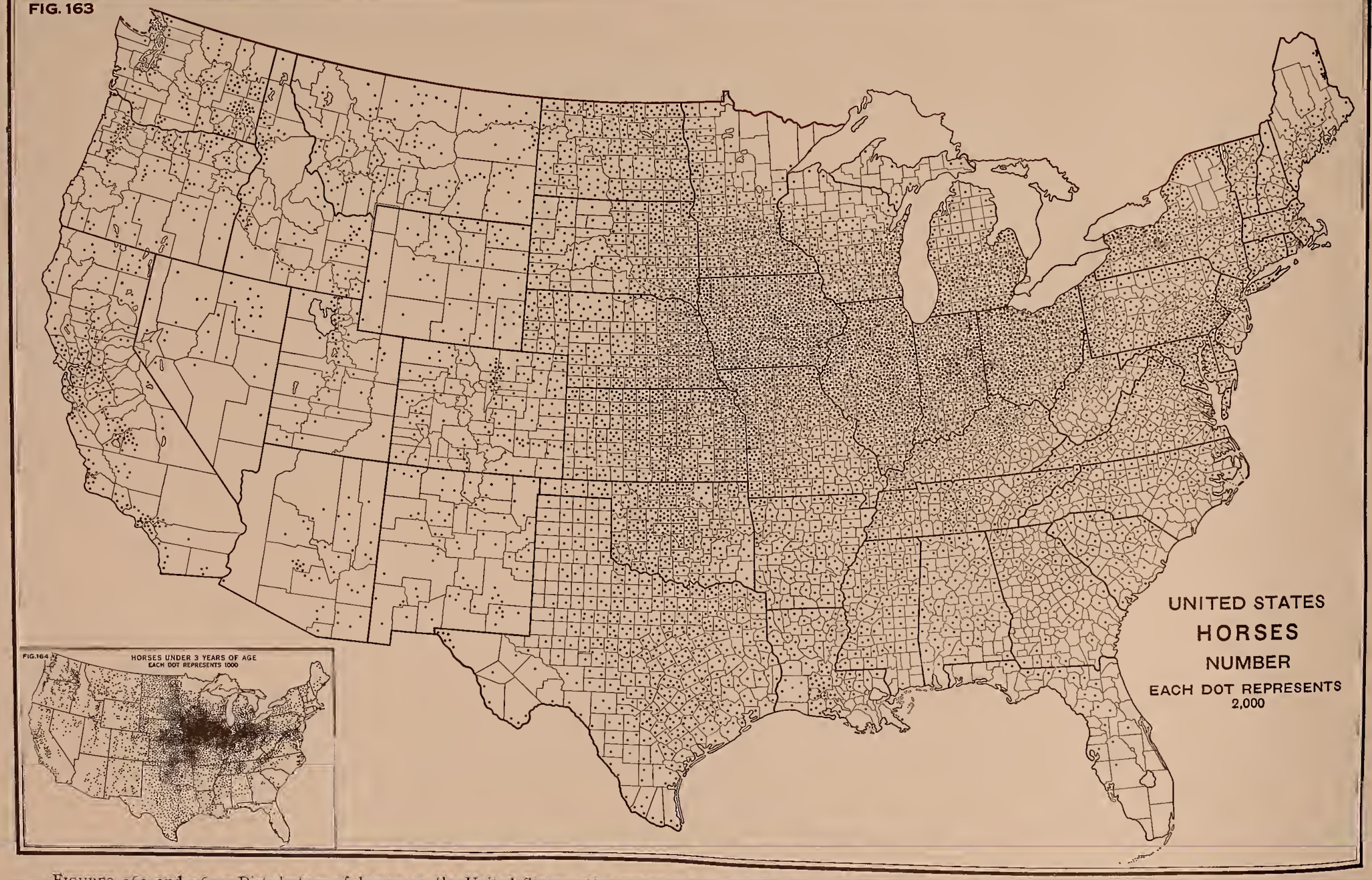


FIG. 164

FIGURES 163 and 164.—Distribution of horses in the United States. The region of greatest density practically coincides with the corn belt (see fig. 36). In this region, the percentage of the cropped land in corn, which requires much horse labor for plowing, planting, and cultivating, is large. Furthermore, the farms are large in this region and horse labor is used to replace man labor wherever possible. Finally, feed is cheaper in the corn belt than in most other parts of the United States, consequently a large number of horses and mules are raised for shipment to the South and to the cities (see fig. 164). In the West there are comparatively few horses relative to area, owing to aridity and rough topography, but relative to population there are more horses in the West than in any other portion of the country. The short growing season and swampy or sandy character of much of the land in the northern sections of the Lake States and the large amount of poor, stony soil in New England cause the percentage of area cultivated to be very low, hence the comparatively few horses. In the South mules are used instead of horses for much of the farm labor (see fig. 168).

FIG.166

FRANCE
DISTRIBUTION OF HORSES
UNDER 3 YEARS OF AGE
EACH DOT REPRESENTS 1000

FIG.165

EUROPE
HORSES
NUMBER
EACH DOT REPRESENTS 2.000

STATUTE MILES
100 50 0 100 200 300 400

HORSES

FIVE LEADING EUROPEAN COUNTRIES

NUMBER PER SQUARE MILE
HORSES
4 8 12 16 20

NUMBER PER 1000 INHABITANTS
HORSES
30 60 90 120 150 180

NUMBER
MILLIONS OF HORSES
5 10 15 20

COUNTRIES
RUSSIA
GERMAN EMPIRE
AUSTRIA-HUNGARY
FRANCE
UNITED KINGDOM

FIGURES 165 AND 166.—Distribution of horses in Europe. Though horses are more uniformly distributed than other farm animals, there is a noticeable concentration on the north European plain and in the agricultural section of Russia. The large number of horses in Paris, Berlin, and Moscow are noticeable. (The absence of a center near London is due to incomplete statistics.) The horse-breeding industry of France, Belgium, and the United Kingdom, important as it is to the American horse breeders, involves relatively so few animals as to be scarcely noticeable on the general map. The insert map of France (fig. 166) is introduced to show the Percheron breeding centers which are discernible in the concentration of dots in Normandy. Of greater local importance, however, is the production of coach horses on the plain of northern Finisterre, where, in spite of a dense population, horses outnumber people three to one.

64505—15°

FIG.167

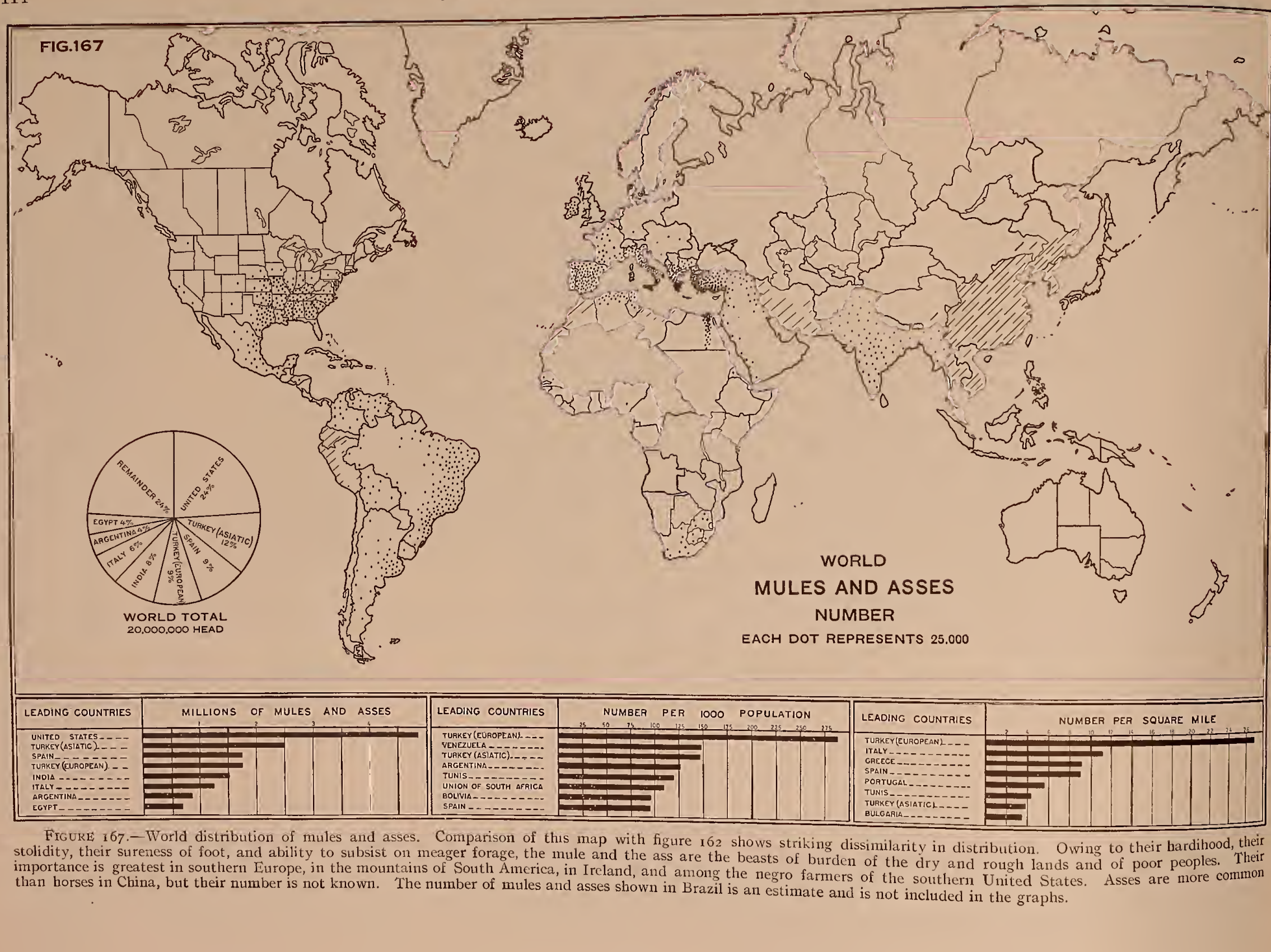
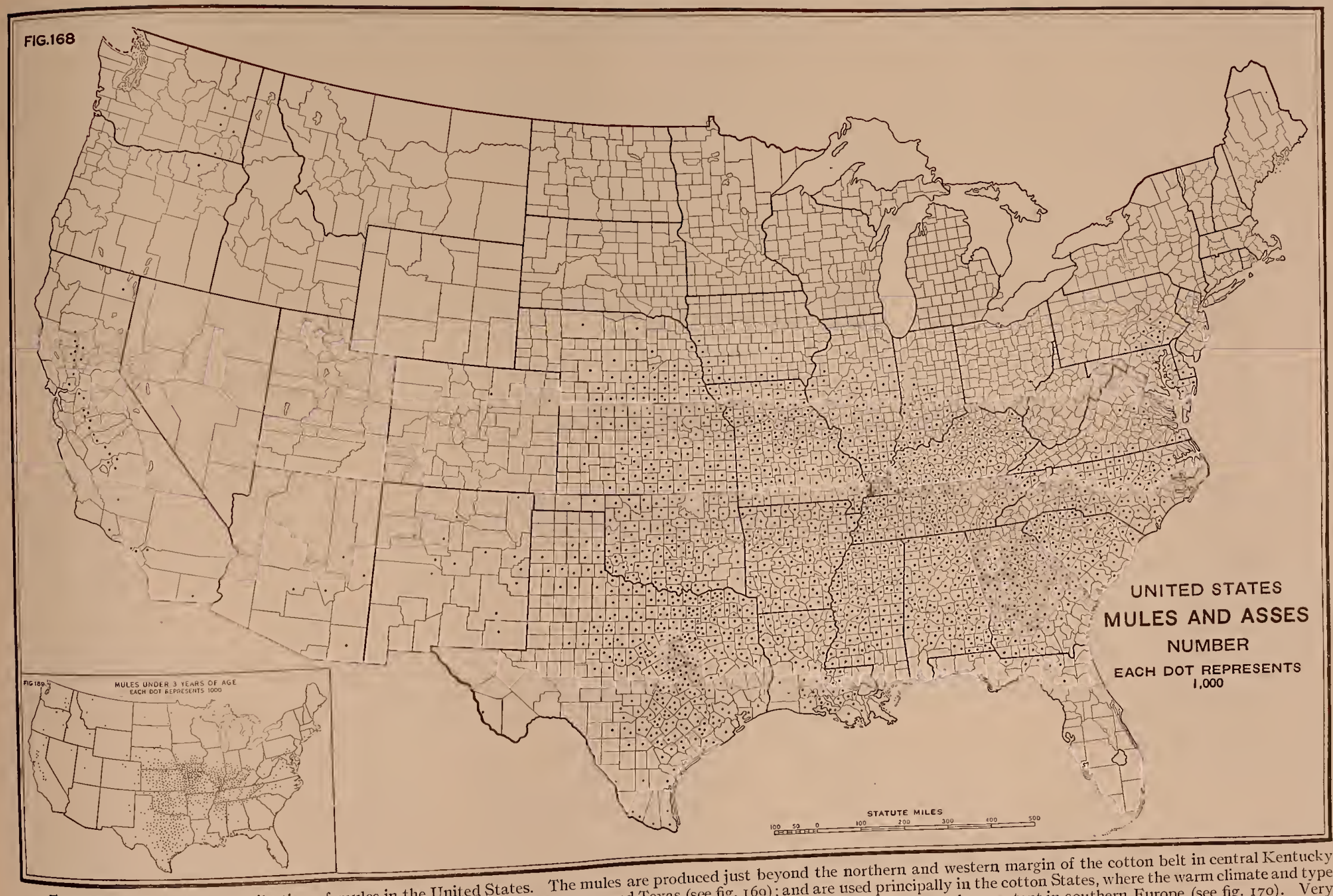


FIGURE 167.—World distribution of mules and asses. Comparison of this map with figure 162 shows striking dissimilarity in distribution. Owing to their hardihood, their stolidity, their sureness of foot, and ability to subsist on meager forage, the mule and the ass are the beasts of burden of the dry and rough lands and of poor peoples. Their importance is greatest in southern Europe, in the mountains of South America, in Ireland, and among the negro farmers of the southern United States. Asses are more common than horses in China, but their number is not known. The number of mules and asses shown in Brazil is an estimate and is not included in the graphs.



FIGURES 168 and 169.—Distribution of mules in the United States. The mules are produced just beyond the northern and western margin of the cotton belt in central Kentucky and in Tennessee, in southern Indiana and Illinois, in Missouri, Kansas, Oklahoma, and Texas (see fig. 169); and are used principally in the cotton States, where the warm climate and type of farming make them preferred to horses. The importance of climate, is indicated by the fact that mules also replace horses to a large extent in southern Europe (see fig. 170). Very few mules are produced in the cotton States, except Texas, the cheaper feed and large amount of pasture in the border States making competition unprofitable. North of the corn belt very few mules are either raised or used, and there are comparatively few in the West, except in California.

MULES AND ASSES

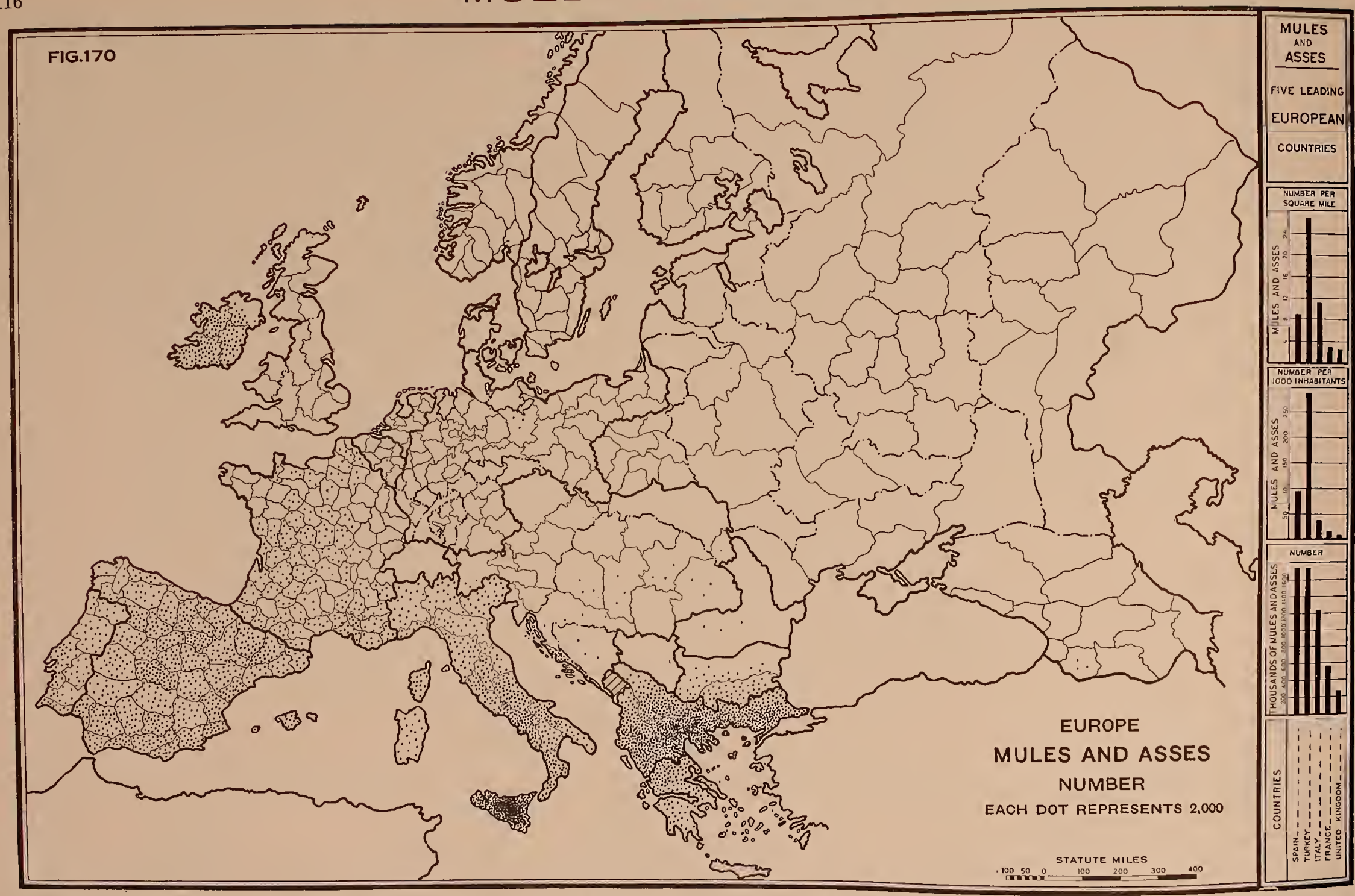


FIGURE 170.—Distribution of mules and asses in Europe. Comparison with figure 165 indicates a distribution supplementary to that of horses. Because of rainfall distribution the Mediterranean countries have poorer summer pasture than the countries of northwestern Europe. Thus, in Spain horses are most numerous in Galicia, where the rainfall is heaviest, while mules and asses are more numerous on the dry Mediterranean coast. Southern France is noted for its excellent mules. Southern Italy, particularly Sicily, where it is both dry and rough, has more mules and asses than horses. An interesting reflection of agricultural conditions is discernible in the presence of mules and asses in level, humid Ireland, where the farms are small and the farming intensive, and their absence from Scotland, which, though having rougher land, has larger farms and a higher degree of prosperity.

CATTLE are used for the production of beef and of milk, and as work animals. In most of the important cattle regions of the world (fig. 174) each of these uses has a part, and in certain limited areas they may be of nearly equal importance. In general, however, regions may be classified as to the dominance of one and the subordination of the other two phases of the industry. Thus, for example, Uruguay may be taken as typical of beef-producing regions, the Isle of Guernsey of dairy regions, while India is typically a region of draft cattle.

THE BEEF-CATTLE INDUSTRY.

EUROPE (fig. 177).—Although the countries of western Europe are not dominantly beef-producing regions, there is a very large aggregate beef production. In this industry the United Kingdom ranks high, not so much in number of cattle as in their quality and in the attention given the industry. The farmers of Britain have for generations given attention to the selection of animals of special merit, until about a dozen breeds of beef or dual-purpose cattle have been developed, each characteristic of a definite region. Some of the more important are the Shorthorn, Hereford, Aberdeen-Angus, Galloway, Red Poll, Devon, Sussex, and West Highland. The suitability of most of these breeds to New World conditions gives the British farmer a considerable income from the exportation of breeding stock.

British beef cattle are raised largely for home consumption. The annual production is now about 60 per cent of the amount consumed, the balance being supplied by importation. While cattle are most numerous in the western counties and on the Cornish peninsula, the fattening of beef cattle is most important in the midland and in the eastern counties. In Northampton, for example, cows form only 25 per cent of the total number of cattle, while in the dairy region of Cheshire the percentage is 63. Cattle fattening is done mostly on pasture in summer with stall feeding in winter. In southern England the chief winter ration is hay, oil cake, and roots; in the eastern counties more roots and less hay; and in Scotland large quantities of roots with oats, while the hay is supplemented by oat straw. In Ireland nearly 65 per cent of the land is under grass, and cattle raising is a very important industry. Some of these cattle are fattened and slaughtered on the island, but about half a million head, chiefly young cattle, are sent annually to England for fattening.

The breeds of cattle on the Continent, while less well known in America, are numerous. In France about 25 are recognized. The more important of the beef cattle are the Charolais, which is also largely used as a draft animal, and the Parthenaise. Compared with British cattle, these breeds mature and fatten slowly. The regions of extensive cattle raising—the northwest coast, the peninsula of Brittany, and the central plateau—are regions of large forage production, due to moist climate and soils unsuited to wheat. The Mediterranean coast of France and of Spain is not a cattle-producing region, largely because of summer drought, which is unfavorable to pasture and hay production.

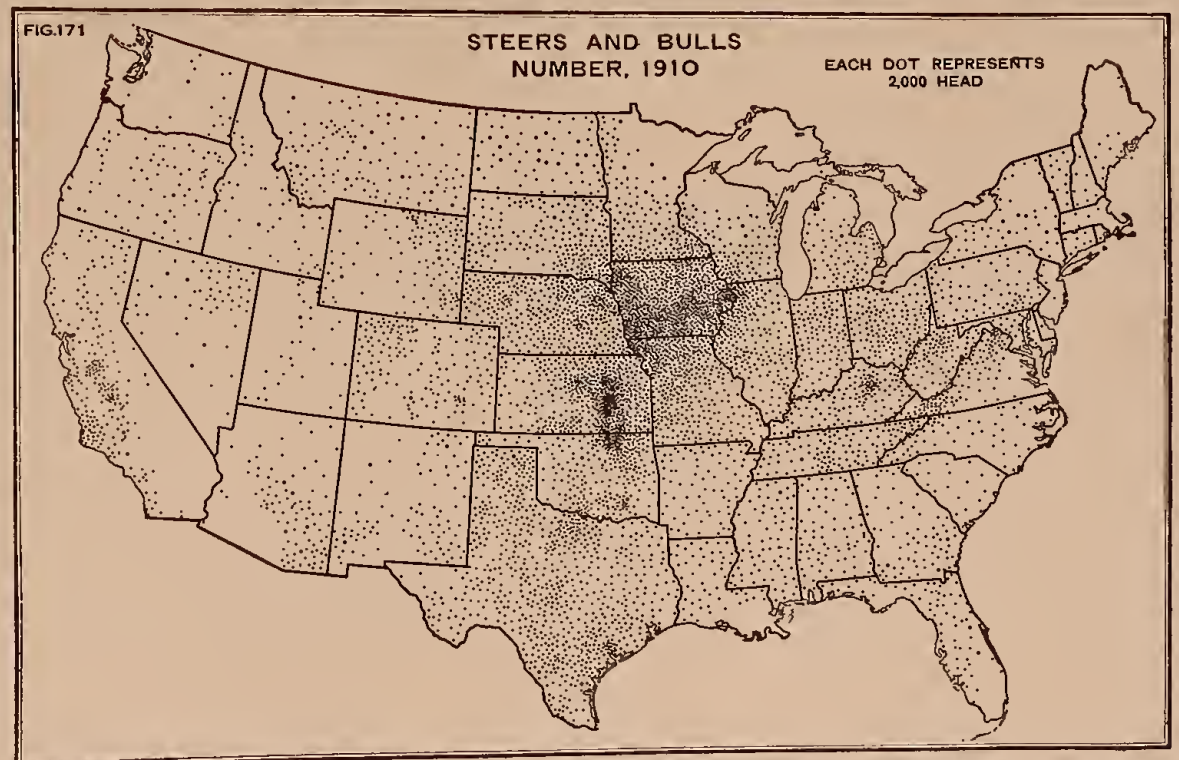


FIGURE 171.—The number of steers and bulls is densest in Iowa and northwestern Missouri, and in the Flint Hills region of Kansas and adjoining section of Oklahoma, where there were, in 1910, an average of 60 cattle per square mile, and nearly as many hogs, on land 60 per cent in pasture. Minor centers are located in the blue-grass region of Kentucky, in the valleys of southwestern Virginia, also a blue-grass region, and in several districts of the West, where the open range supplemented by alfalfa and wild hay provides cheap and nourishing food. Despite the large extent of arid land the density of distribution of steers and bulls in the West is almost equal to that in the Eastern States.

In Germany and in the coast countries of northwestern Europe beef is produced mainly in connection with dairying. In these countries cattle are still used as draft animals. As in England, a considerable import of flaxseed and cottonseed cake and of grain is necessary to supplement the local feed supplies. Russia with its great area has the largest number of cattle of any European country. It has, however, only one-fifth as many per square mile as has Germany or the United Kingdom. Russian cattle are mostly poor and the industry is declining. Italy has the largest cattle industry of any of the Mediterranean countries. While the number of animals is but half that of the United Kingdom, the number of breeds is nearly as large, many small districts having their own breed.

UNITED STATES (fig. 175).—The number of cattle on farms in the United States in 1910 was about one-eighth of all the cattle in the world, or 62,000,000, of which one-third were classified as "dairy cows," another third as "other cows," somewhat over one-fifth as "steers and bulls," and about one-seventh as calves. Five-sixths of all the farms in the United States have cattle. The number of cattle per 100 population and per 100 acres of improved land in the United States declined materially between 1890 and 1910.

The geographic distribution of beef cattle in the United States (fig. 171) depends largely on availability of cheap feed and pasture. The greatest density is found in the western portion of the corn belt (see fig. 36), with an area of somewhat lesser density extending

Cattle in the United States, 1840–1910.

Census year.	Number of animals.	Number per 100 population.	Number per 100 acres of improved land.	Value.	Average price.
1840 [a]	14,971,586	87.7	Not reported.	Not reported.	Not reported.
1850 [b]	17,778,907	76.7	15.7	....do....	Do.
1860 [c]	25,620,019	81.5	15.7	....do....	Do.
1870 [c]	23,820,608	61.8	12.6	....do....	Do.
1880 [c]	39,675,533	79.1	13.9	....do....	Do.
1890 [d]	57,648,792	91.6	16.1	....do....	Do.
1900 [d]	52,403,828	69.0	12.6	$1,337,914,632	$25.53
1910 [e]	53,997,327	58.7	11.3	1,447,523,474	26.81

[a] "Neat cattle."
[b] "Cattle one year old and older."
[c] Consists of "milch cows," "working oxen," and "other cattle."
[d] Total cattle excluding calves under 1 year of age on June 1, the date of enumeration.
[e] Total cattle excluding calves born between January 1 and April 15, the date of enumeration.

southward through Oklahoma and Texas. Both corn and hay are cheaper in these Middle Western States than in the eastern portion of the corn belt, and the most profitable use for these crops is found in feeding and fattening cattle, which, being worth several times as much per pound as corn or hay, can better bear the cost of transportation. In the Far Western States the vast expanse of wild-grass range, where the rainfall is insufficient for the successful production of crops, is largely utilized for the grazing of cattle, which roam over the plains and mountains in large herds. Much of this western stock is shipped to farmers in the corn belt to be fattened and finally sent to the packing centers at Chicago, Kansas City, or South Omaha.

There is a notable sparsity of beef cattle in the spring-wheat region of Minnesota and the Dakotas, in the dairy region of eastern Wisconsin, New York, and New England, and in the cotton belt. The climatic conditions in the spring-wheat States do not permit the extensive production of corn or other cheap feed crops and the long winters involve an expensive outlay for feed and shorten the season during which the cattle can be kept on pasture. In the South the production of cotton, the labor question, and the cattle tick, have combined to hinder the growth of the cattle industry; while in the Northeastern States the development of the dairy industry and the high price of feed have prevented the extensive production of beef cattle.

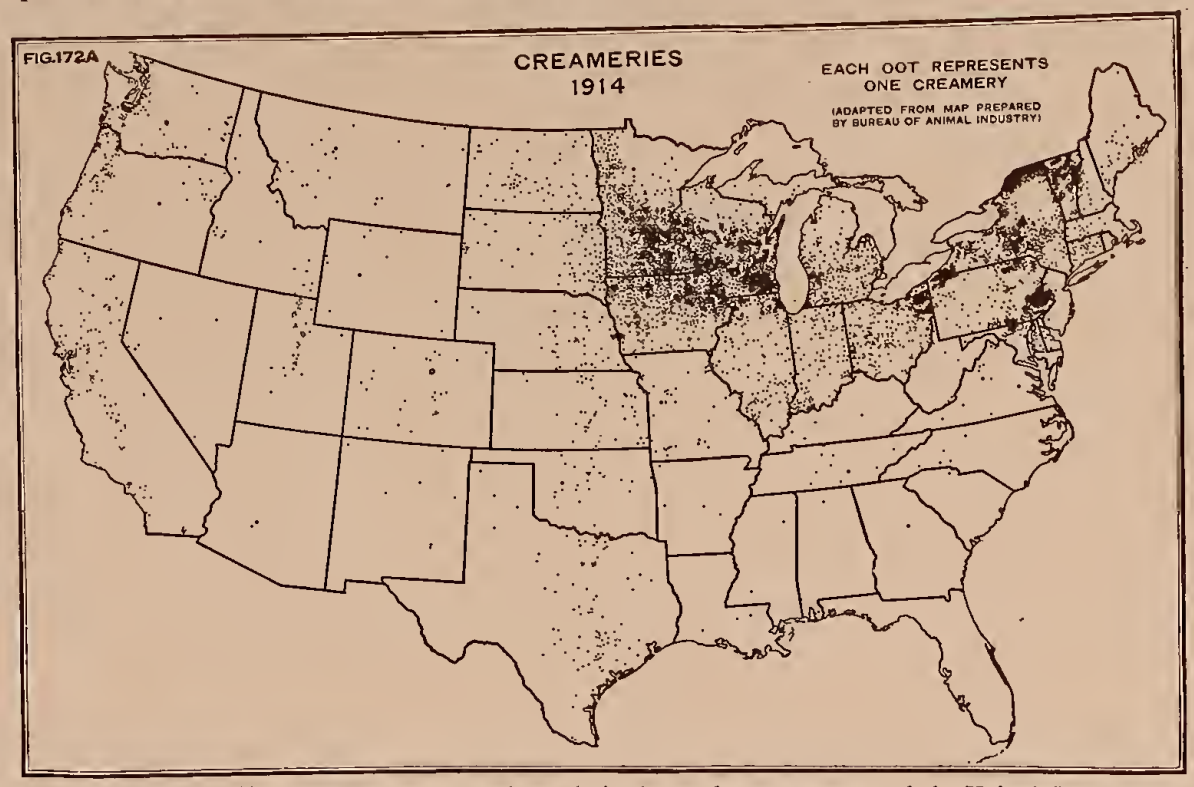


FIGURE 172A.—The creameries are located mostly in the northeastern quarter of the United States, very few being found south of the Potomac and Ohio Rivers, or in the Great Plains or arid interior regions. There is a notable thin belt of creameries, however, along the eastern margin of the Great Plains from North Dakota to Texas, another belt along the west front of the Wasatch Mountains in Utah, a third and more important belt in the series of valleys between the Sierra-Nevada and coast ranges which extend northward from the Tehachapi across California, Oregon, and Washington, and a fourth belt along the immediate Pacific coast.

SOUTH AMERICA (fig. 184).—The cattle industry, like that of the western plains of the United States, is practically confined to beef production. Dairy cattle have been introduced, but their number is too small to affect the general character of the industry. Cattle of Spanish origin were introduced into Argentina during the sixteenth century. Settlement took place slowly, and 100 years later the early inhabitants found an abundance of wild cattle on the plains. As in the early days of the cattle industry in Texas, poor transportation facilities made it impossible to market the cattle or the beef, and immense numbers of animals were slaughtered for their hides and tallow, the carcasses remaining on the plains. Early in the nineteenth century processes of meat salting were introduced, and after 1820 large quantities of jerked beef were exported. During the later years of the nineteenth century considerable numbers of live cattle were shipped to Europe. This industry was, however, never very profitable, and the exportation of frozen beef, which began in 1882, and more recently the adoption of the chilling process, marked a new era in the Argentine cattle industry.

The Argentine cattle region lies mainly in the eastern states, where the climate is warm and humid. The rainfall is of the summer maximum type; the winters, mild and open. Cattle are fattened on the native grass or alfalfa range, ordinarily without shelter or grain ration, and at a low cost. The best agricultural land of the country is included within this grazing region. The original cattle have been greatly improved by the introduction of Shorthorn and some Hereford blood.

The history of the cattle industry in Uruguay differs little from that of Argentina save that more Hereford blood has been used. The land is divided into large holdings, frequently 50,000 acres or more, and the proportion cultivated is very small. Uruguay leads all countries in number of cattle relative to population, and ranks with the western European countries in number per square mile.

In southern Brazil the production of cattle is increasing. Distance from transportation lines does not permit fresh beef to be profitably marketed, and while the number of cattle killed for salting in Argentina has decreased in recent years, that of Brazil increased 50 per cent between 1908 and 1912.

AUSTRALIA AND NEW ZEALAND (figs. 182 and 183).—The cattle industry of Australia, like that of the United States, may be divided into two classes. In Victoria and New South Wales denser settlement and cooler climate cause beef production to be subordinated to grain farming and dairying. In the more tropical climates of Queensland and northern Australia, where population is sparse, great unfenced grazing ranges exist, some of them amounting to 10,000 square miles and supporting many thousand head of beef cattle. The cattle industry of New Zealand resembles that of southern Australia.

INDIA (fig. 185) ranks first in the world in number of cattle, nearly equaling the combined numbers of the United States and the Russian Empire. The cattle are utilized very little for food, as the Hindus, who make up nearly 70 per cent of India's population, do not eat beef under any conditions, and the Mohammedans, who form over 20 per cent, forego it largely out of sympathy, except on feast days. The cattle are of the humped type, though many breeds exist. The bullocks are used universally for labor. In most parts of India cattle are objects of religious esteem and the cows and bullocks beyond their years of usefulness are not killed, but subsist in a meager way until they die natural deaths. The carcasses are then skinned by a special caste and become carrion, or are sometimes buried. The utilization of cattle instead of the buffalo for labor in the delta region of Bengal is due in part to prejudice against the latter and especially against its milk. The cattle of this region are small and of poor quality and might well be supplanted by the buffaloes, which are suited to this region, as is shown by their number in the delta of the Kistna, north of Madras.

In China and Japan cattle are used for draft, but little for milk production. Although human labor is largely utilized, cattle are common and considerable exports of cattle and hides take place annually from Shantung, Szechwan, and other provinces of China.

THE DAIRY INDUSTRY.

Europe (fig. 179).—In eastern Europe there is little distinction of breed between cattle used for dairy purposes and those used for beef or draft, but in western Europe the combination of favorable climate and growing demand for dairy products induced the development of highly specialized animals, and in America this specialization has been carried to a still higher degree. As in the case of beef cattle, the United Kingdom has contributed to the world the largest number of famous breeds of dairy cattle. Of these the better known are the Jersey, Guernsey, Ayrshire, and Kerry, as well as the Devon, Shorthorn, and Red Poll, used for both milk and beef production. From the Continent come what are known in America as the Holstein-Friesian and also the Brown Swiss. Besides these, several other breeds are of importance—the Normande, Flamande, and Bretonne cattle of France; the Danish Red and the Black and White cows of Jutland, and the Simmenthal cattle of Switzerland.

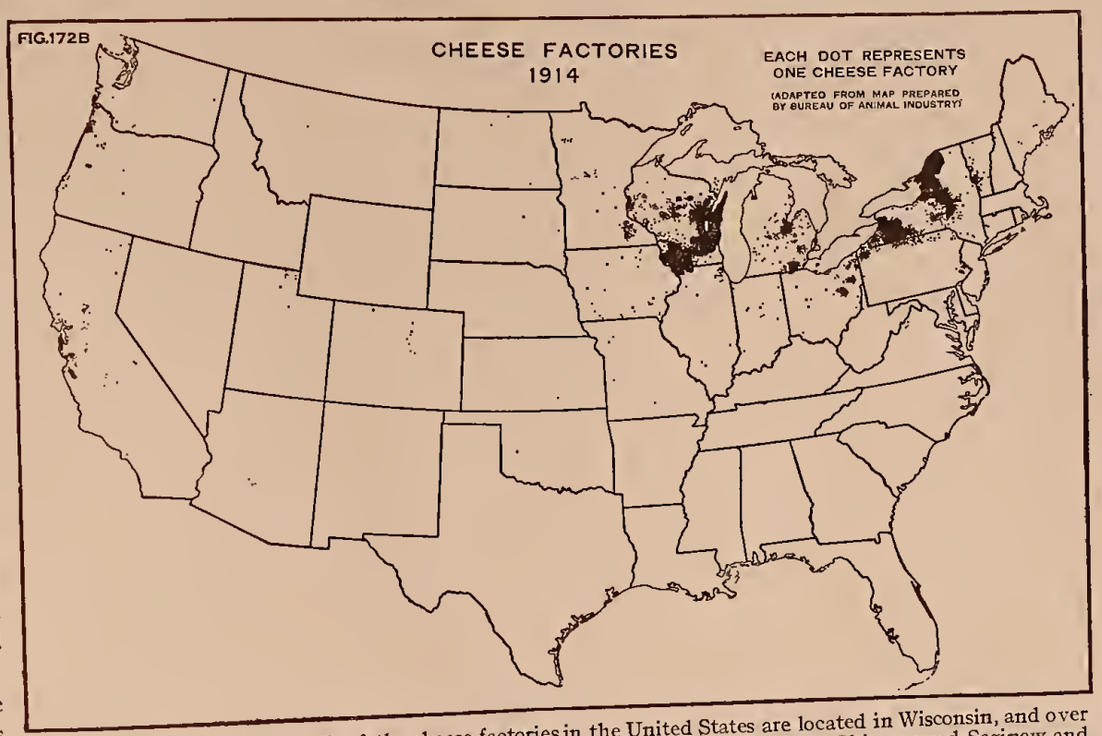


Figure 172B.—About half of the cheese factories in the United States are located in Wisconsin, and over one-fourth in New York. Minor centers of production are found in northeastern Ohio, around Saginaw and Adrian, Mich., in southeastern Minnesota, and along the California coast south of San Francisco and the Oregon coast near Tillamook. Very little cheese is made where the growing season is over 155 days (except along the Pacific coast and shores of the Great Lakes) or where the mean summer temperature is higher than 70°.

To what extent the qualities of these different breeds of dairy cattle as regards bodily form, temperament, yield, and quality of milk are due to the natural conditions in the regions of their origin is not well known. Doubtless the breeders' ideals have been very important factors in their formations. The force of environment, however, may be seen in certain well-recognized characteristics. Such are the heavy, well-muscled bodies of the Brown Swiss, required in climbing mountain pastures, and the thriftiness and ability to thrive on scant pastures of the Ayrshire breed, which originated on the uplands of Ayr in Scotland, where disagreeable climate and poor, thin soils produce coarse and scanty forage. The striking contrast in characteristics between the Dutch or Holstein-Friesian cattle and the Jersey is doubtless due also in part to the difference in geographic environment. The native home of the Holstein-Friesian cattle is that portion of the Netherlands lying contiguous to the North Sea, where the climate is cool and moist and the soil is a heavy clay, which induces a luxuriant growth of grass carrying a high percentage of water and a corresponding low content of nutrient substance. The cows calve during the spring months, and during their heaviest milking period are obliged to obtain the needed sustenance from luxuriant but watery grass. As a result of this necessity there has been developed a cow having a large abdomen with a corresponding large digestive capacity. The cows also are large in size and their bony structure somewhat coarse and angular. Perhaps as a result of these large quantities of watery food, the flow of milk is larger in quantity and lower in percentage of butter fat and other solids than the milk of other improved dairy breeds.

Quite opposite are those conditions under which the Jersey cattle have developed. Their native isle possesses a mild climate much drier than that of Holland. The soil is a light loam and carries an herbage not abundant, but comparatively high in nutritive substance and low in water content. At no time is the Jersey obliged to consume large quantities of succulent food. The character of the food supply has doubtless been one factor in developing a body of moderate size and rather fine, bony structure. Environment, food, and selection by the breeder have resulted in making the Jersey cow a moderate producer of milk that is richer in fat and in other solids than the milk of any other breed of cattle.

The importance of the dairy industry in northern Europe in general reflects favorable conditions for grass production and for the manufacture and storage of dairy produce and also the presence of large industrial populations. The unimportance of the industry in the Mediterranean countries, with the exception of northern Italy, reflects the reverse of these conditions. Greece, for example, has not more than 4,000 cows, mainly near Athens. The Italian Alps and the Po Valley, where irrigation permits intensive hay production, are important dairy regions.

The character of the dairy industry in any region is determined in part by accessibility to markets. Thus, in Great Britain about 70 per cent of the total milk production is consumed as milk, in Germany about 43 per cent, while in Canada only about 27 per cent is so used. The accessibility of a region is often more a matter of transportation facilities than of actual distance; thus, Siberia produces butter for the English market, while the Swiss summer dairies produce cheese which can better stand the delay in transportation from the mountain pastures. In Germany the northern lowlands produce mainly milk and butter, while in rough southern Germany, especially in Bavaria, cheese factories are much more numerous. In Italy the extensive use of olive oil has resulted in cheese becoming the most important dairy product.

Nongeographic factors, such as reputation, are often important in the development of dairy industries. Thus Denmark has established a reputation for fresh butter and utilizes practically her whole milk supply in this way, while the Netherlands, with somewhat better climatic conditions and transportation facilities, but lacking an equal reputation for butter, finds it profitable to convert a considerable portion of her milk supply into cheese, for which a reputation has been established.

United States (fig. 178).—Over one-fourth of the dairy cows in the United States are found in four States, Wisconsin, New York, Iowa, and Minnesota, and the receipts from sale of dairy products in these four States together with Pennsylvania and Illinois were, in 1909, over half those in the entire country (fig. 173). This development of the dairy industry in the northeastern section of the United States is due to several causes, among which may be mentioned the proximity to the large city markets, especially important in the production of market milk, and the cool summer climate which favors the production of dairy products of high quality, and although often preventing the proper maturity of corn for grain, permits its production for silage. The climate of the Northeastern States has also resulted in making them the most important hay-producing region in the United States, and a market for this hay is secured by keeping dairy cows. The relatively large summer rainfall, especially in the western section of the region, is also an important factor, since it promotes the maintenance of green pastures which greatly reduces the agricultural work of the summer so far as the feeding of cattle is concerned. Moreover, by producing market milk and manufacturing butter and cheese the rural population finds profitable employment during the winter season in a way that would be practcally impossible if only the production of crops was undertaken. In other words, dairying enables the farmer to earn the equivalent of wages during the winter season, even though they be low, which he would not otherwise secure at all. Not least important among these factors which have promoted the development of dairying in the Northeastern States is the presence of a class of farmers of English and Teutonic origin familiar for several generations with methods of dairy-farm management.

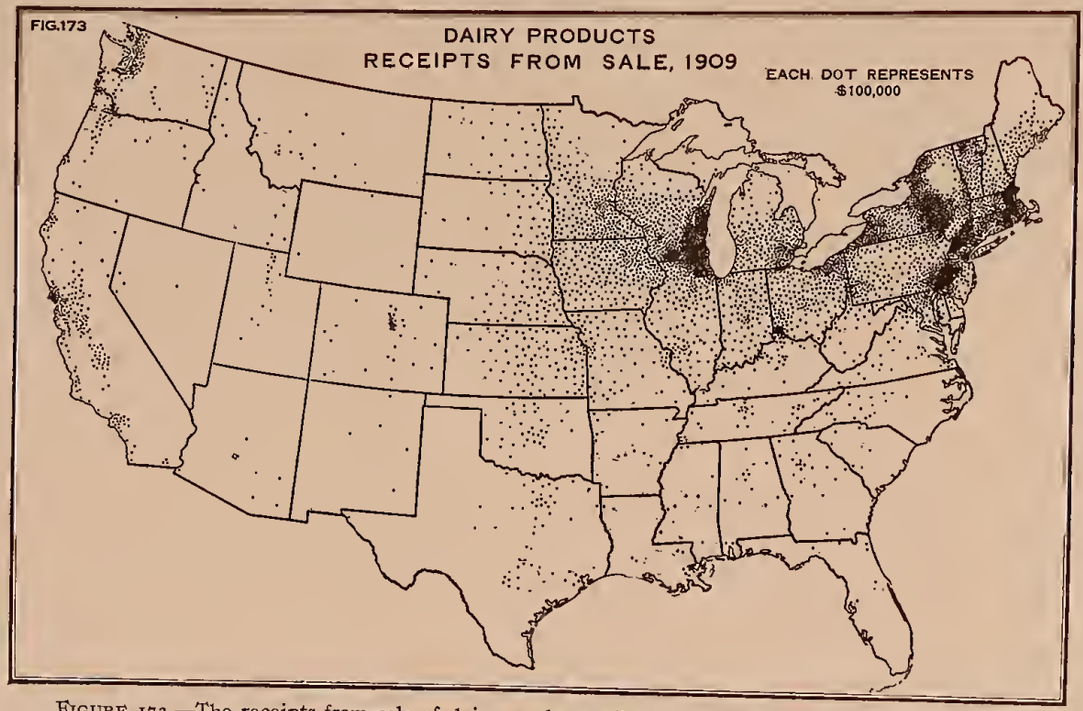


Figure 173.—The receipts from sale of dairy products afford a measure of the relative importance of dairying as an industry in different sections of the United States. New York leads all the States in the amount of receipts, totaling over 75,000,000 dollars in 1909, and probably two to three times that amount to-day. Wisconsin ranks second, with Pennsylvania third, while Illinois, Iowa, Ohio, and Minnesota were practically equal in amount of sales of dairy products in 1909, each receiving about 25,000,000 dollars. The total receipts in the United States amounted to nearly 500,000,000 dollars in 1909 and are undoubtedly well over a billion dollars to-day. The dots were distributed by counties, but the boundary lines of the counties are not shown on the map.

The creameries (fig. 172A) are located mostly in this northeastern quarter of the United States, nearly nine-tenths of all the creameries being found east of the Missouri and north of the Ohio and Potomac Rivers. Minnesota leads the States in number, having 848 creameries in 1914, and Wisconsin ranks second, with 812 creameries. The large production of butter in these States is due not alone to the favorable climatic conditions and the large acreage of corn for silage, hay, and pasture, but also to the long distance from the centers of population in the East. Butter is a food of exceptionally high value per unit of weight, endures storage and transportation without deterioration, and is carried from Minnesota to New York at a cost of a cent or two per pound, or usually at from 3 to 5 per cent of its original value. Under such conditions it is difficult for the dairymen in the Eastern States, especially those who have to buy mill feeds from the West, to compete in butter production with the farmers in Minnesota and Wisconsin who have more abundant and cheaper feed; hence, wherever possible the eastern dairymen produce milk for the city markets. There is a notable absence of creameries from the region around Boston, New York City, Rochester, Buffalo, and Detroit. In New York and New England, especially, the creameries are found in the less accessible sections of the State. On the other hand, there are a large number of creameries in the environs of Philadelphia and Chicago, where more milk is produced on the rich agricultural lands than can be consumed in the city.

There are very few creameries in the Southern States or in the semiarid Great Plains or arid interior sections of the country, but the industry is developing in each of these regions. There is a notable belt of creameries along the eastern margin of the Great Plains from Texas to North Dakota, another belt in the Great Valley of California and in the valleys between the Cascade and Coast ranges in Oregon and Washington, and a third belt along the immediate Pacific coast. In each of these regions hay is a very important crop.

The location of the cheese factories in the United States (fig. 172B) exhibits some interesting climatic correlations. Practically all of these factories are located where the average growing season is less than 155 days, except along the immediate shores of the Great Lakes and on the Pacific coast, where, although the growing season is longer, the temperature is cool. South of the summer (June, July, and August) temperature line of 70° also there are very few cheese factories in the United States. The significance of these climatic limits appears to reside largely in the fact that south of this line the summer temperature is too high for the production of the best cheese. Where the climate is cool it is easier to secure a uniformly high quality of milk, thus making possible the production of a higher grade of cheese and its sale at a higher price. Moreover, in the cheese regions of Wisconsin and New York, which lie north of this line, from 50 to 80 per cent of the improved land is in pasture or meadow. The pasturage encourages summer dairying and cheese production.

The absence of the cheese factories from central Wisconsin and western Michigan is due primarily to the sandy soils, which do not produce good pastures, while the scarcity in the Ontario Shore and Finger Lakes regions of New York may be accounted for in part by the large acreage in fruit, beans, and truck. The cheese factories in New York are located mostly in the highlands where the climate is cool and the land is hilly and largely devoted to hay and pasture.

India (figs. 185 and 186).—In regions of tropical climate the dairy industry is of small importance. Thus, in India, while milk is in general use, it is usually the milk of the buffalo, except in Bengal, where there is a prejudice against the strong odor and taste of the rich milk of this animal. Cheese and butter are not extensively manufactured. Ghee, a clarified butter, is made chiefly from buffalo milk.

FIGURE 174.—World distribution of cattle. The four important produeing regions of the world are Europe, particularly the northwestern portion, India, the United States, and eastern Argentina, Uruguay, and southern Brazil. Of these countries India ranks first in number, although the eattle are used very little for meat or milk, but mostly for beasts of burden. It should be observed, however, that owing to distortion due to the map projeetion the greater density of eattle in India than in Europe is only apparent. India has but about 60 head per square mile, while Germany, where the eattle appear to be less dense on the map, has 100 per square mile. Relative to the population, the number of cattle is highest in those new countries of the Southern Hemisphere where the population is sparse and the grazing industry extensive.

64505—16°

FIG.175

UNITED STATES
CATTLE
NUMBER
EACH DOT REPRESENTS
5,000

FIG 176 CALVES, YEARLING HEIFERS, AND YEARLING STEERS AND BULLS
EACH DOT REPRESENTS 5000

FIGURE 175.—Distribution of cattle of all ages in the United States. The region of densest distribution lies west of a line drawn from Chicago to Dallas, Tex., and thence to Galveston, and includes southern Wisconsin, southeastern Minnesota, Iowa, eastern Nebraska and Kansas, northwestern Missouri, Oklahoma, and most of Texas. There is also a less dense, but very important area east of a line drawn from Chicago to Louisville, and including about half of Indiana, the blue-grass region of Kentucky, Ohio, southern Michigan, New York, and Vermont. A large proportion of the cattle in this northeastern area consists of dairy cows. There are several dense centers in the valleys and irrigated areas of the West, particularly in the San Joaquin Valley in California and the region around San Luis Obispo.

FIGURE 176.—The production of cattle, as indicated by the number of calves, yearling heifers, and yearling steers and bulls, is heaviest in southern Wisconsin, Iowa, eastern Nebraska and Kansas, and northwestern Missouri.

FIGURE 177.—Distribution of all cattle in Europe and Algeria. The features of this distribution are an interesting reflection of conditions of climate, of the pressure of competing agricultural industries, and of the economic status of the rural population. The concentration in Ireland, Denmark, Holland, Belgium, and the northwestern coast of France is particularly noticeable. Ireland, with its evergreen pastures, has 150 cattle per square mile, as compared with 70 in Iowa, 41 in New York, and 40 in Wisconsin. In France the greatest density of cattle is in the departments of Finisterre and Manche, where there is also the greatest density of horses and swine (see figs. 165 and 191). In Russia the poverty of the peasant and low productivity per acre of the land makes cattle relatively much less numerous than in northwestern Europe; while in the Mediterranean region the long summer drought prevents the production of sufficient hay and forage to feed a large number of cattle.

FIG. 178

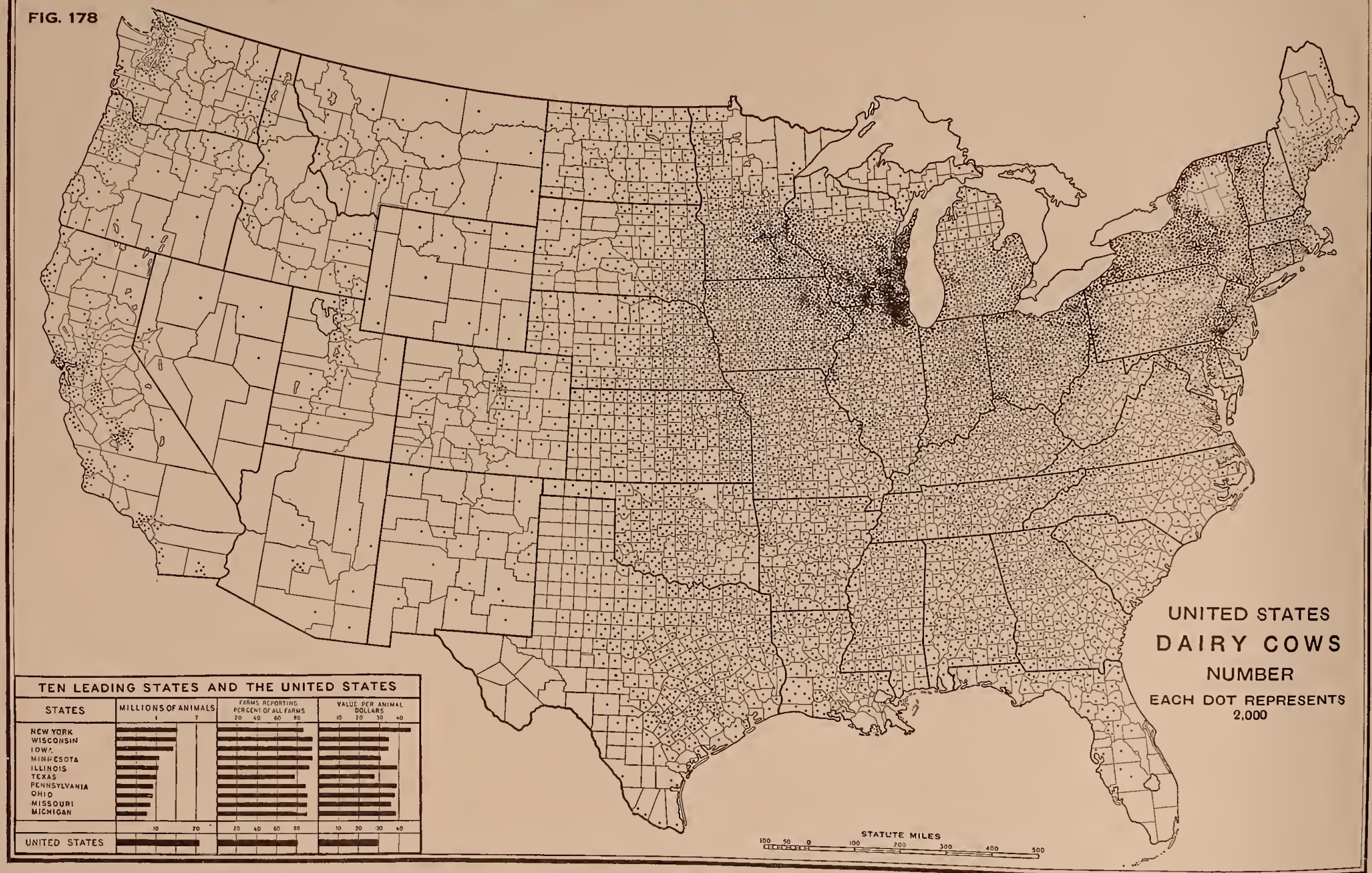


FIGURE 178.—Distribution of dairy cows in the United States in 1910. The greatest center of dairy production consists of the so-called Elgin district in northern Illinois and the adjoining counties of southern Wisconsin. A scarcely less important district includes central New York, the St. Lawrence Valley, and northwestern Vermont. A third district extends northeasterly from Baltimore, Md., across southeastern Pennsylvania and northern New Jersey to the Hudson Valley of New York. This is primarily a market milk district supplying the adjacent large cities. Northeastern Ohio, northeastern Iowa, and southeastern Minnesota are other important dairy districts. The rather uniform distribution of dots in the eastern half of the United States outside of these areas represents largely cows kept on the farms to supply domestic needs.

FIG. 179

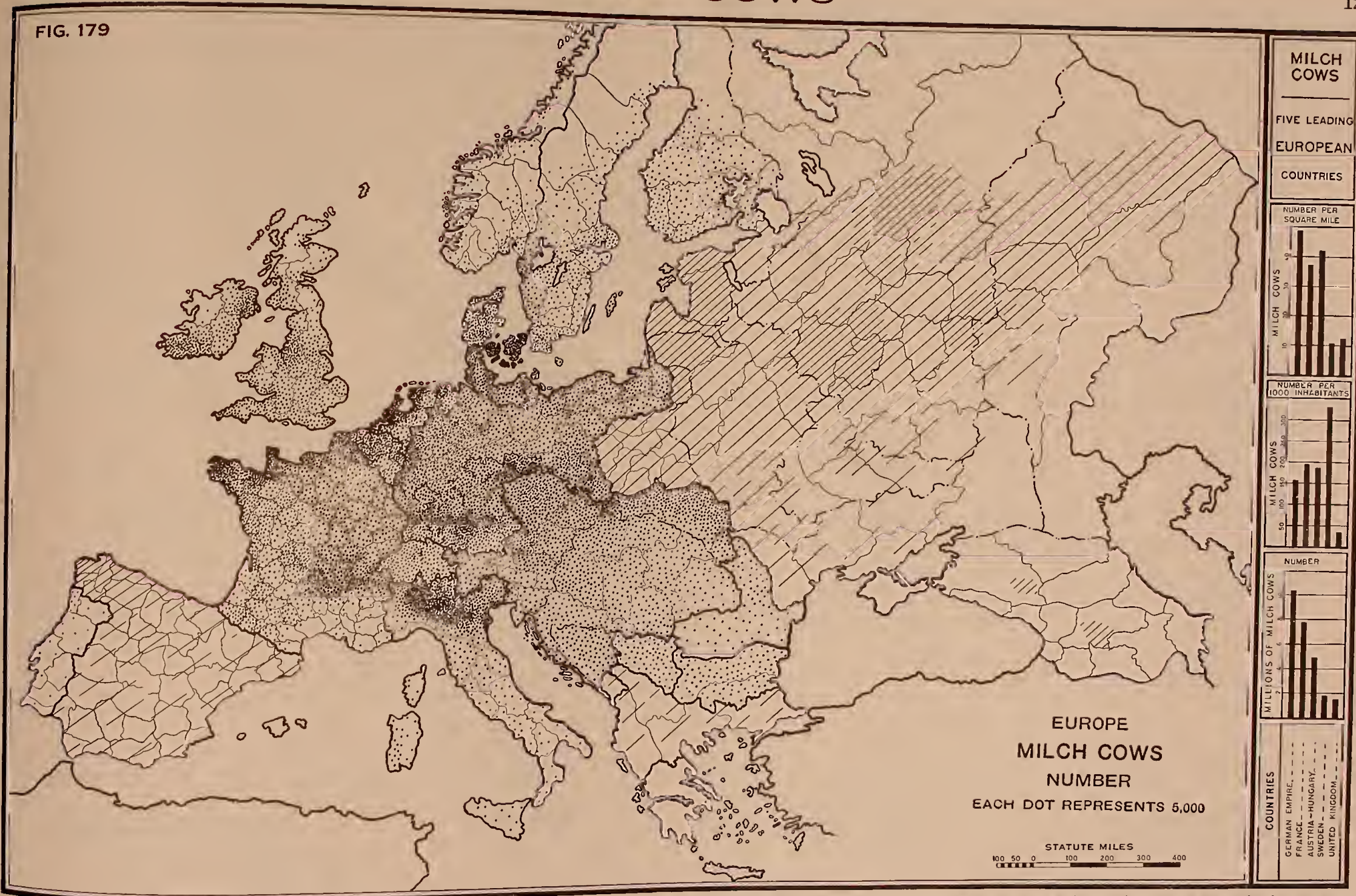


FIGURE 179.—Distribution of cows in Europe. Most of the cows in Europe are of the dual-purpose type, but in the northwest the specialized dairy breeds are quite important. The importance of the dairy industry in Great Britain, especially Ireland, is, however, inadequately shown on the map, owing to different statistical classification. As might be expected, the general features of distribution conform closely to those of all cattle. It is interesting to note the greater density of cows along the northwest coast, where climatic conditions favor rich pastures. Pasture and dairying are even more closely connected in Europe than in the United States. The difference in scale between this map and that opposite, of dairy cows in the United States, should be noted. The intensive dairy districts in northern Italy and along the northern coast in France, the Netherlands, and Denmark have between two and three times as many cows per square mile as the densest dairy regions in the United States.

FIG.180

CANADA
MILCH COWS
NUMBER
EACH DOT REPRESENTS
1,000
STATUTE MILES
100 50 0 100 200 300 400

FIG.181

CANADA
CATTLE, OTHER THAN MILCH COWS
NUMBER
EACH DOT REPRESENTS
1,000
STATUTE MILES
100 50 0 100 200 300 400

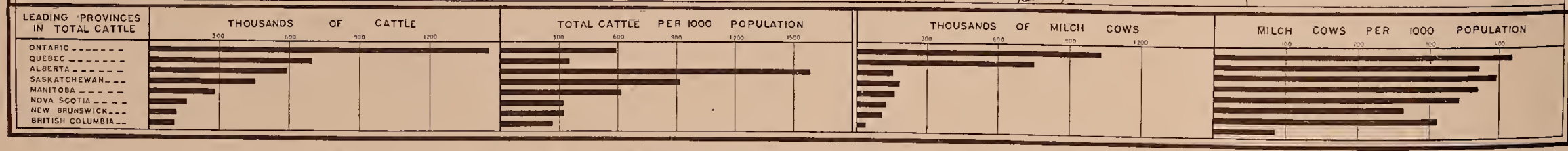
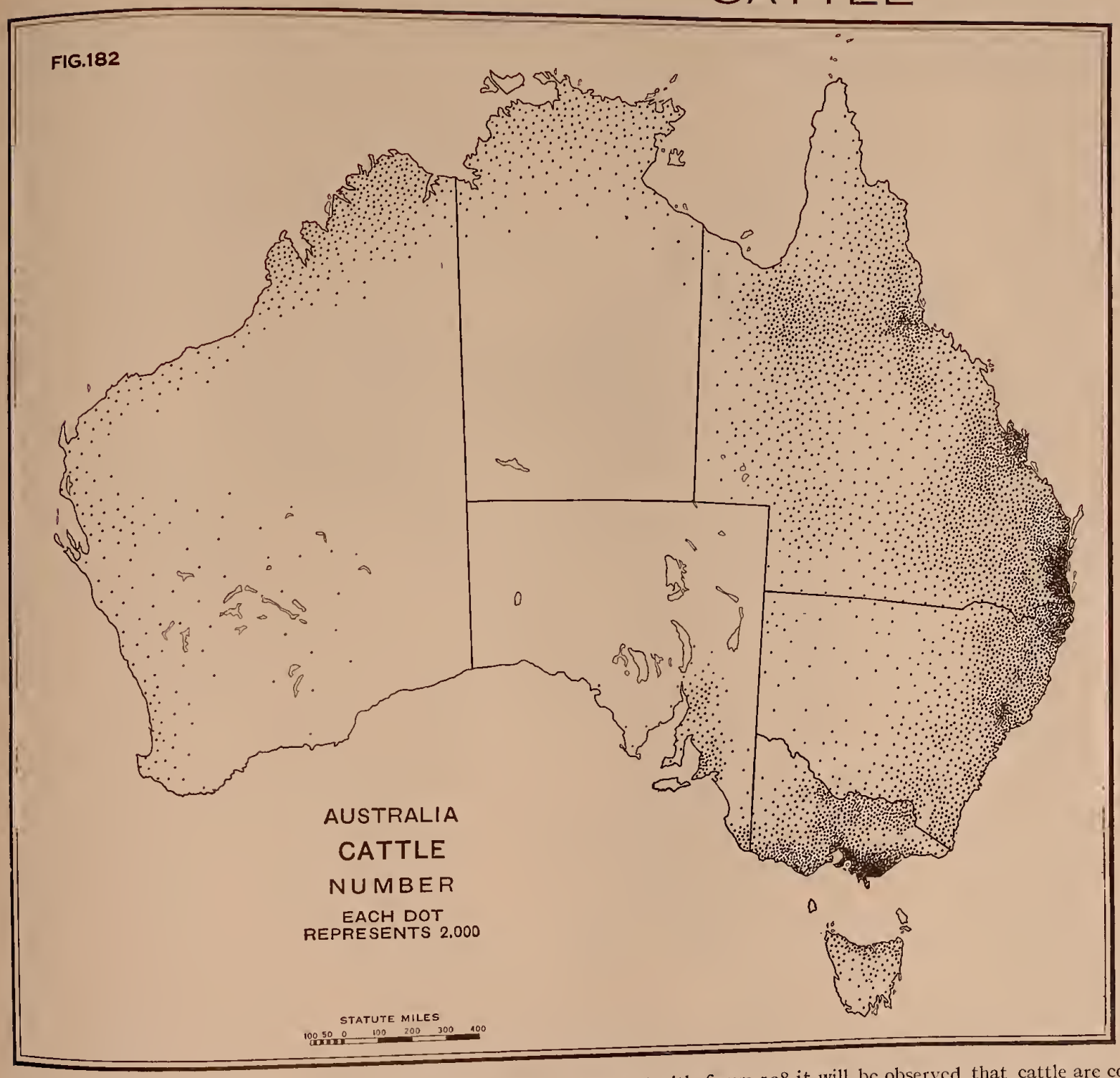


FIGURE 180.—Distribution of milch cows in Canada. The large number in the St. Lawrence lowlands and the peninsula of Ontario shows the importance of dairying in the more thickly settled, non-wheat-growing eastern provinces, where the abundant summer rainfall and cool climate has resulted in an extensive acreage of hay and pasture. In the prairie provinces the cows are mainly breeding stock, principally of the beef type.

FIGURE 181.—Distribution of all cattle other than cows. The larger relative importance of the western Ontario peninsula and southern Alberta reflect the use of the corn crop of the former and of the winter-grazing ranges of the latter for feeding beef cattle.



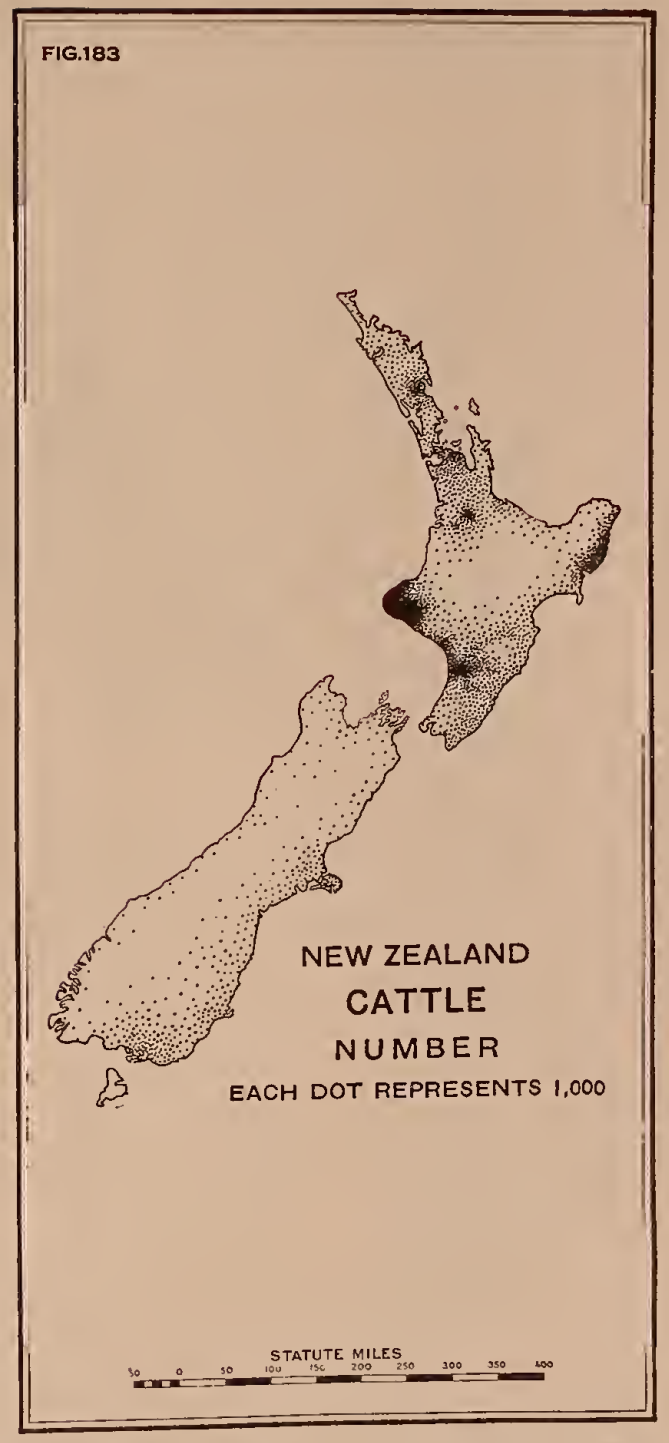


FIGURE 182.—Distribution of cattle in Australia. When compared with figure 198 it will be observed that cattle are confined much more closely than sheep to the moist coastal portions of the Commonwealth; also that they are more numerous in subtropical Queensland and North Australia. Queensland is still characterized by extensive cattle ranching of the open-range type. In New South Wales and Victoria denser settlement and cooler climate have favored the development of the dairy industry.

FIGURE 183.—Distribution of cattle in New Zealand. Regions such as the slopes of Mount Egmont, which are too wet for sheep raising, are important cattle regions. Dairying is rapidly becoming the dominant phase of the New Zealand cattle industry.

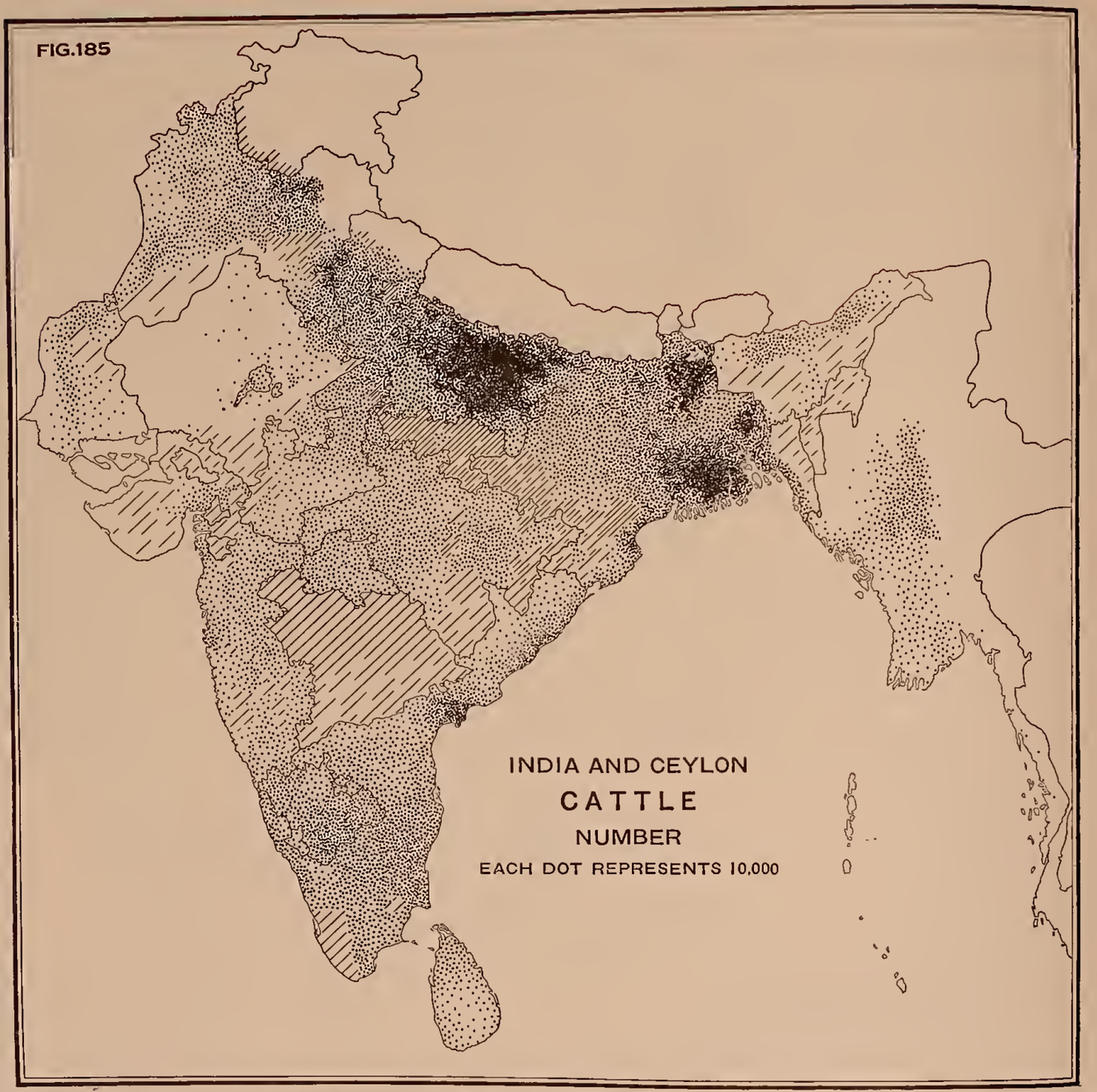


FIGURE 184.—Distribution of cattle in Argentina, Chile, and Uruguay. In these countries of sparse population agriculture is still largely pastoral. The cattle are concentrated in the warm northeastern section, where there is abundant summer rainfall. Chile, with its west coast climate, suffers severely from summer drought.

FIGURE 185.—Distribution of cattle, including buffalo calves, in India. This country is unique in the cattle industry in that while it ranks first in number of animals, the inhabitants neither eat nor export the meat nor use the milk of cattle to a large extent. The cattle are used almost entirely as draft animals and beasts of burden.

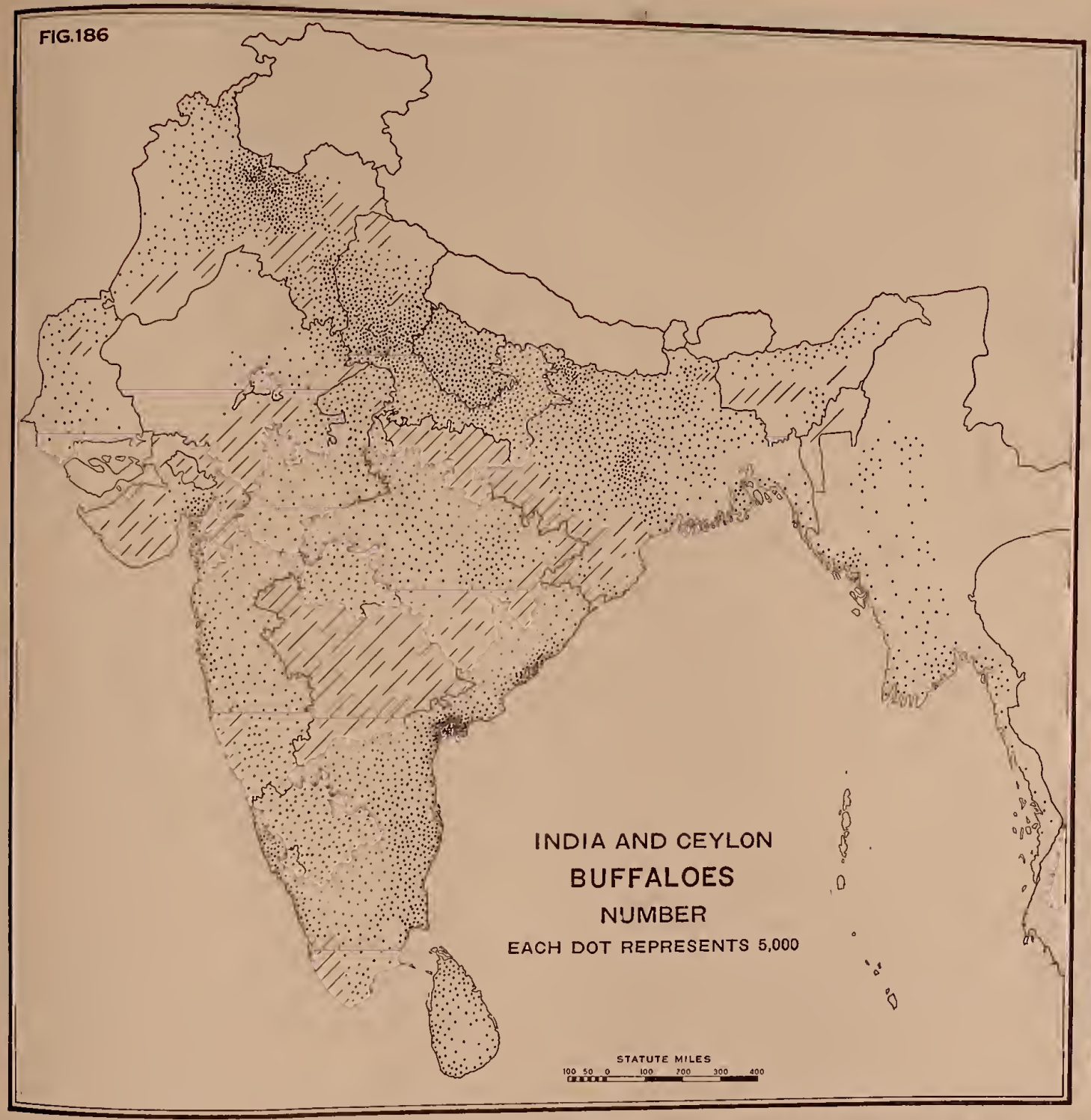


FIGURE 186.—Distribution of buffaloes, not including buffalo calves, in India. While less numerous than the cattle of India, this animal serves a double purpose. It is the chief dairy animal, the milk being richer than that of the cow, and it serves as a draft animal in the cultivation of wet or flooded lands.

FIGURE 187.—Distribution in the Philippine Islands of the carabao, or water buffalo. This animal is the chief work animal of the Islands and is also found wild in the forests. It thrives only in wet climates, where there is an abundance of mud and water. It is especially adapted to the tillage of rice fields. The distribution is densest along the western coast of Luzon, in the Cagayan Valley, in the region north of Manila, and in the islands of Cebu, Negros, Panay, and Leyte.

64505—17°

SWINE production is affected more directly by economic than by climatic conditions. The omnivorous feeding habits of the animal make it a suitable means for converting household and dairy waste as well as surplus grain products into meat. In many localities the hog is maintained upon home products and is destined for home consumption. Such is the case in China, Russia, portions of the United Kingdom, and locally in nearly all countries.

EUROPE (fig. 191).—The great swine industry of northwestern Europe depends upon the production of large quantities of grain, root crops, and dairy by-products. None of the important swine regions, with the exception of Hungary, produce corn (maize) (see fig. 37). In northwestern Europe swine are fed largely on barley and potatoes, supplemented in some measure, particularly in Denmark and Ireland, by corn (maize) imported from the United States, Argentina, South Africa, and Russia. Upon this combined ration the pig thrives and at the age of 7 months nearly equals the weight of the American type of hog (200 to 225 pounds). He is, however, more rangy and less fat and is adapted mainly to the production of hams and bacon. In the cool European climates these products keep much better than in America and are used in large quantities. Ireland and Denmark are particularly famed for their bacon, which is largely exported to England. The excellence of these products is attributed in no small part to the feeding of barley meal, skimmed milk, and potatoes, all of which are said to tend to the production of superior bacon. In Germany about 600,000,000 bushels of potatoes, or 40 per cent of the average crop, is fed to stock, mainly to swine.

In the Mediterranean countries pork production is not as great as in northern Europe. Both the demand for pork and the supply of feed are less. Deficiency in the latter is supplied in part by mast obtained in the chestnut and oak forests. In Spain and Portugal, particularly, large herds of swine range the cork and other oak forests in the autumn, gathering the acorns, which are knocked down for them by herders.

UNITED STATES (fig. 190).—The number of swine (hogs) in the United States is slightly less than in Europe and about one-third of the world total. There are approximately the same number of swine as of cattle in the United States but the value of the swine is only a third as great. Relative to the population the number of swine has declined from 154 per 100 inhabitants in 1840 to 63 in 1910.

Swine in the United States, 1840–1910.

Census year.	Number of swine.	Number per 100 population.	Number per 100 acres of improved land.	Value.	Average price.
1840[a]	26,301,293	154	Not reported.	Not reported.	Not reported.
1850[a]	30,354,213	131	26.9	.....do.....	Do.
1860[a]	33,512,867	107	20.6	.....do.....	Do.
1870[b]	25,134,569	65	13.3	.....do.....	Do.
1880[a]	49,772,670	99	17.5	.....do.....	Do.
1890[a]	57,426,859	91	16.1	.....do.....	Do.
1900[c]	62,868,041	83	15.2	$231,978,031	3.69
1910[d]	58,185,676	63	12.2	399,338,308	6.86

[a] "Swine."
[b] Spring pigs not enumerated.
[c] "Swine all ages."
[d] "Mature swine" and "spring pigs." Census taken April 15; previous censuses June 1.

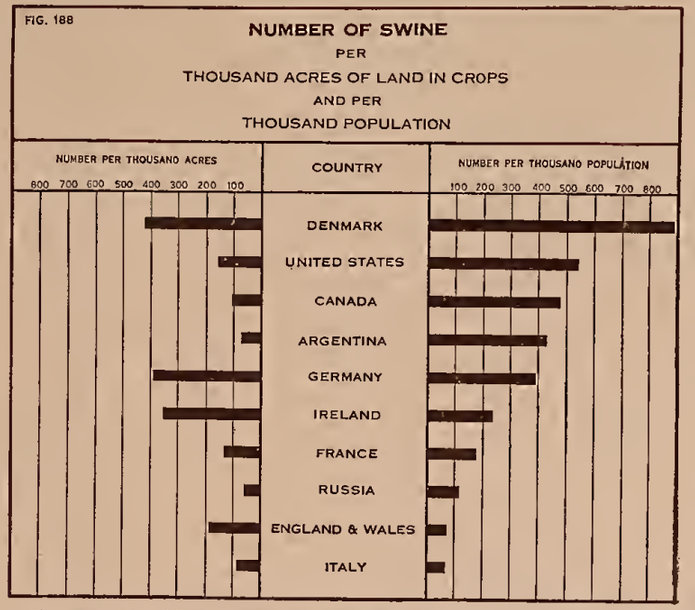


FIGURE 188.—The number of swine (hogs) per 1,000 acres of land in crops is very much greater in Denmark, Germany, Ireland, and England than in the United States, but the number per 1,000 population in the United States is exceeded only by Denmark, where the number of swine nearly equals the number of inhabitants.

Swine are raised in every county in the United States, but about one-half are found in the corn-belt States of Iowa, Illinois, Missouri, Nebraska, Kansas, Indiana, and Ohio. The number of swine in Iowa alone is equal to the number in all the Rocky Mountain and Pacific States and the Atlantic States north of Georgia. The geographic distribution of swine in the United States is primarily determined by the distribution of corn (see fig. 36).

There are, however, several interesting discrepancies between the distribution of swine and of corn. The greatest center of corn production is in east central Illinois, yet comparatively few swine are raised there, principally because of the high price of corn and small amount of clover grown. The farm price of corn in Illinois averages about 5 cents per bushel higher than in Iowa, owing in part to nearness to the Chicago market where a large amount of corn is made into glucose, shipped to other parts of the United States, or exported. This influence of the Chicago corn market, as can be seen on the swine map, extends through a radius of 100 to 150 miles, on the west almost to the Mississippi River, and on the east as far as the Wabash River in Indiana. The freight rates to Chicago on corn from points in Iowa are enough higher than from nearby points in Illinois to make the feeding of the corn to hogs and the shipment of the hogs to Chicago more profitable than the shipment of corn. Hogs are worth several times as much per pound as corn and hence can bear better the cost of transportation. In Iowa, and western Illinois also, more clover and other kinds of hay are grown, owing in part to soil adaptations, which combined with corn makes a more complete feed than corn alone.

In many places the hog belt extends beyond the corn belt. This is notably true in the northern tiers of States, from North Dakota and Wisconsin to New York and New England. In all of these States, except North Dakota, the dairy industry is extensively developed, and a large amount of skim milk is left over from the manufacture of butter (see fig. 172A). There is no better food for growing pigs than skim milk combined with corn, barley, or mill feed and a little alfalfa or clover hay. Hence, a considerable number of swine are produced in the dairy districts even where corn becomes a subordinate crop. In the Western States also, particularly California, Oregon, and Washington, a few swine are raised, fed principally on barley and alfalfa.

The comparatively small number of swine in the Great Plains, Rocky Mountain, and Arid Interior regions is due to the small amount of land in crops. The digestive system of the pig requires more concentrated food than does that of other farm animals, hence hogs can not be grazed upon the range land like cattle and sheep (see figs. 125 and 194). Swine in these regions are practically confined to the irrigated districts where grain and alfalfa are grown. In very few places in the West is the supply of hogs equal to the local consumption, a large proportion of the ham, bacon, and lard being transported halfway across the continent from the packing-house centers in the corn belt.

FIG.189

FIGURE 189.—World distribution of swine (hogs). The United States has more swine than any other three nations of the world, but in number per square mile it falls behind many European countries. Swine are most numerous in countries having relatively intensive agriculture and an abundance of certain food products, particularly corn (maize), barley, potatoes, and dairy by-products. In the United States the geographic distribution of swine corresponds closely with that of corn, but in Europe it follows rather the distribution of potatoes and dairy cows. Swine are barred from countries under Moslem influence because of religious decrees. They are known to be numerous in China, but their number or distribution can not even be approximated. The number of swine in Brazil is an estimate and is not included in the graphs.

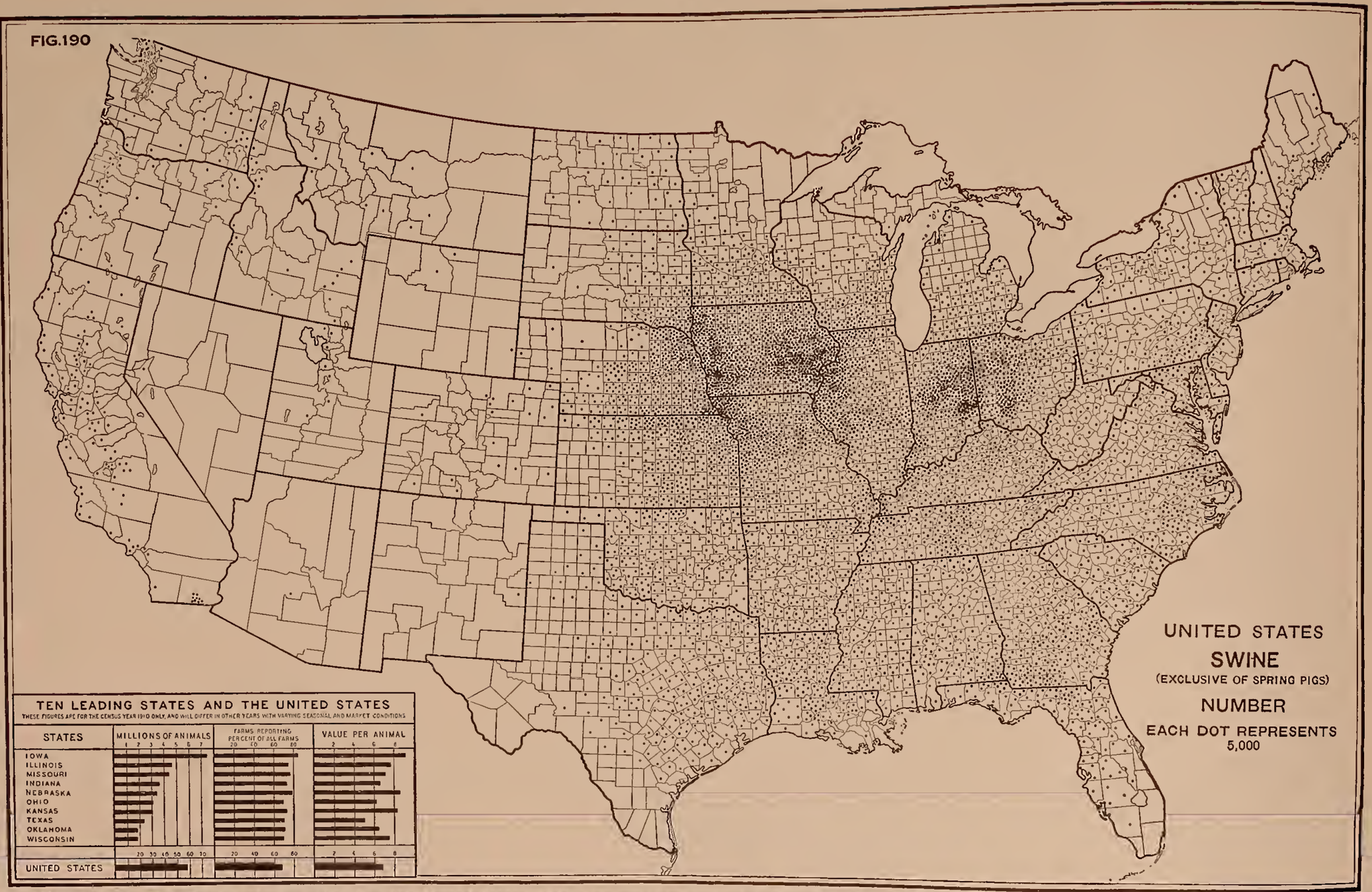


FIGURE 190.—Distribution of swine (hogs) in the United States. Hogs are raised in every county in the United States, but about half are found in the corn-belt States of Iowa, Missouri, Illinois, Nebraska, Kansas, Indiana, and Ohio. The number of hogs in Iowa alone is equal to the number in all the Rocky Mountain and Pacific States and the Atlantic States north of Georgia. The distribution is primarily determined by that of corn (see fig. 36). In the region around Chicago, however, the higher price of corn, due in part to nearness to this market, prevents the extensive production of hogs in competition with the cheaper corn in regions more remote from market. On the other hand, a large number of hogs are raised in the dairy districts lying to the north of the corn belt, where the hogs are fed the skim milk, together with barley, corn, or mill feed.

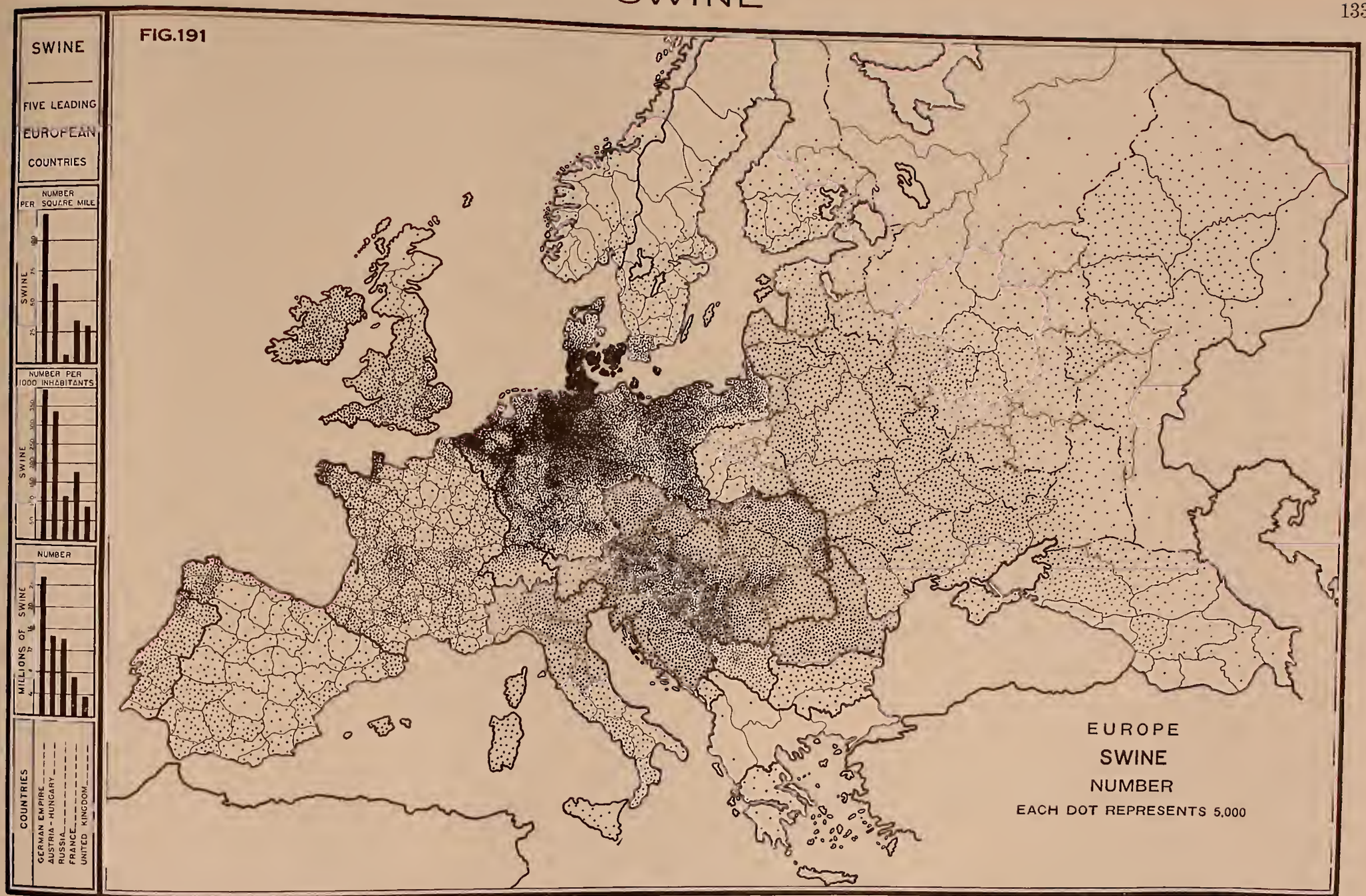


FIGURE 191.—Distribution of swine (hogs) in Europe. In Europe the centers of swine production do not reflect the influence of corn, except in Hungary, northwestern Spain, and Portugal. The large swine production of Germany, Holland, Belgium, and Denmark shows the effects of a combination of governmental encouragement of the industry, together with the availability of barley, potatoes, and dairy by-products. There is no apparent reason for the remarkable decrease in the number of swine in passing from Germany into Poland, except the encouragement that the German farmer has had from his government. In France the greatest density of swine is found in the departments of Finisterre and Manche, which are also regions of the greatest density of horses and cattle (see figs. 165 and 177).

FIGURE 192.—Distribution of swine (hogs) in Canada. Swine are found in practically all settled portions of the country. In the western provinces the numbers are small and the animals are slaughtered principally for local use. The two important centers in Quebec and Ontario are in part the result of oat production and of the dairy industry. The area of greatest density of swine lies in the extreme western counties of the peninsula of Ontario, where there is also a considerable corn (maize) crop. A dot on this map represents only 2,000 swine instead of 5,000 as on the maps of Europe and the United States.

SHEEP AND GOATS were, in origin, native to rough uplands and dry plateaus. Their wild relatives are now found in the most inaccessible mountains. When bred upon moist lowlands, particularly such as lack drainage, these animals are subject to foot rot and parasitic diseases.

Sheep are raised for their wool, for their flesh, and in certain regions for their milk. The wool industry, as carried on in most parts of the world, is an extensive type of agriculture and tends to disappear from regions of dense population and expensive land. This tendency is shown in Germany, where the number of sheep declined from 25,000,000 in 1873 to less than 6,000,000 in 1912. In Great Britain, however, the industry on a mutton and wool basis thrives in spite of dense population and high-priced land.

EUROPE (fig. 195).—The preeminence of Great Britain in the production of improved breeds of sheep is as pronounced as in the case of cattle. About 30 breeds exist now, some of them purely the result of selection and some the result of crossing older breeds. The relationship between the breeds and the soil and topography led to a division by McConnell into six groups: (1) The Leicester or lowland type; (2) the upland or red sandstone type; (3) the Horned Down or chalk type; (4) the Sussex Down or polled-down type; (5) the Blackface or limestone type; (6) the mountain or Arehæan type. In the moist climate of Britain the chalk downs and limestone hills of the south of England have, owing to their altitude and permeability, formed some of the most famous sheep "walks" of the country. The lowland sheep are the heaviest, while the upland type is of medium size. The mountain type bears marks of primitiveness, i. e., resembles the goat more closely in horns, body, and wool. The closest adaptation to environment is found in the Kent or Romney Marsh breed, a member of the lowland group. These large sheep have been bred for centuries upon a diked swamp area in southern Kent. They have a heavy fleece, are good foragers, and are extremely resistant to rough weather and wet land. These qualities cause them to be appreciated in New Zealand and along the river lowlands of Argentina and in Patagonia. English sheep are as a whole coarse-wooled and of the mutton-producing type.

Of the fine-wool sheep the best known is the Merino, which originated in Spain and, traveling by various routes, reached the United States, Argentina, South Africa, and Australia. This breed shows well the conditions of its native habitat in its sensitiveness to excessive moisture. By reason both of topography and climate, Spain is a country of contrasts. It has abundant rainfall only in the northwest. In other sections the mountain pastures may be green, while on the lowlands the grass is burned during the summer drought. Under these conditions sheep were forced to migrate in great flocks in search of food, a condition which developed in the Merino a light, wiry body capable of endurance but of relatively little value as a mutton producer. The sheep industry was formerly very important, but during the last century interest has declined relative to that in agricultural crops and Spain is not now an important producer of either sheep or wool.

Owing to the poor summer pasture conditions in the whole Mediterranean region, including the Balkan States, the sheep is a most important animal. In nearly all of these countries it furnishes, besides meat and clothing, a considerable supply of milk, which is used mainly in cheese making. In Greece the hardy Vlachican breed lives in migratory flocks, summering in the mountains and wintering on the plains. They yield about 12 ounces of milk per day for half the year. In Italy sheep occupy the central and southern portion of the peninsula, where it is too dry for cattle. The ewes are quite generally milked and their number is estimated at twice the number of cows in the country. The total annual product of about 120,000,000 gallons is used mostly in cheese making. Roquefort cheese, made originally in southern France, is also generally made of ewes' milk, and Brindza cheese, from the mountains of northern Hungary, is another ewes'-milk cheese well known in America. In Algeria hardy native breeds of sheep graze the semiarid plateau region well into the borders of the Sahara. In the hot, dry portions of Africa varieties of woolless sheep are found which in general appearance are similar to the goat

AUSTRALIA AND NEW ZEALAND (figs. 198 and 199).—Sheep are very important in the new and sparsely populated countries of the world. Australia leads the world in total number of sheep and New Zealand ranks next to Uruguay and Turkey in number per square mile.

Sheep were introduced into Australia near the close of the eighteenth century. They were of poor quality, and the industry was not prosperous. The first blooded sheep introduced were Merinos. The conditions of the humid, southeastern coastal zone, where the first settlements were located, were not the best for this breed, but as the industry expanded and the sheep were driven into the drier region beyond the mountain ranges their condition improved. Later, with a larger population calling for foodstuffs, sheep were forced out of the coastal region to make room for crops, beef production, and dairying. Old sheep districts which formerly carried three wool sheep per acre are now largely given over to more intensive agriculture. A comparison of figure 198 with that of cattle, figure 182, shows the relative unimportance of sheep on the coastal strip, particularly in the warmer northeastern section with summer rainfall. Beyond the mountain ranges the western slopes descend gradually to the arid interior. Their eastern borders receive about 30 inches of rainfall per year, while on the western boundary of New South Wales and southwestern Queensland the amount is less than 10 inches. On this relatively dry and rolling land most of the sheep are now raised. This region suffers severely from periods or years of extreme drought, and flocks are sometimes greatly reduced by starvation. In the best portion of the western slopes, that having 25 inches of rainfall, about 1 acre of land is required to support 1 sheep, while on the dry margin of the pastoral zone several acres are required.

In the early years of the Australian sheep industry the production of wool for the British market was the only object. Transportation was poor, the local population small, and mutton almost worthless. With the progress of settlement the open range began to be fenced for cultivation. In 1880 frozen meat was first successfully carried to London. These two changes have somewhat modified the character of the sheep industry. Cultivation of the land has increased its capacity to support sheep, and the foreign demand for mutton has led to the introduction of English breeds and the production of crossbred lambs.

In Tasmania, which lies in the belt of westerly winds, the sheep are produced mainly on the eastern side of the mountains. The rainfall in this region is from 20 to 30 inches, while on the western coast it ranges from 40 to 100 inches.

New Zealand has a climate comparable to that of Great Britain. The temperature, however, is more equable and less severe in winter. Arrangement of topographic features and wind direction give the North Island a relatively uniform rainfall distribution, while in the South Island the same causes make the east side much less rainy. Most of the sheep are raised in regions having from 20 to 70 inches of rainfall per year, with an average of about 40 inches. In the early days of the sheep industry (1860 to 1880) Merinos were grown chiefly for their wool and tallow. With the opening of the frozen-meat trade this breed declined and the heavy English breeds increased, so that at present most of the sheep are crossbred or mutton animals. The regions where sheep are fewest are the high mountain ranges of the South Island, where heavy rainfall (70 to over 100 inches), rough topography, and winter snows make conditions unfavorable, and the plateau of the North Island, where

the volcanic peaks and pumice-covered plains are almost barren. A considerable number of sheep, owned and enumerated on the eastern side of South Island, are driven through the mountains in the summer and grazed on the rich feeding grounds of the west coast.

South America (fig. 196).—Sheep, like cattle, were introduced into Argentina and Uruguay at an early date, mostly Merinos. In the pioneer days of the industry they were of so little value that large numbers were slaughtered and the wool pulled from their bodies, this process being more expeditious than shearing. The dried carcasses were even used as fuel. As settlement progressed and transportation improved, the sheep industry expanded more rapidly than the eattle industry into drier western and southern Argentina. The demand for long wool and heavy sheep has led to the introduction of the English breeds, chiefly Lincolns, for stocking the coastal regions and erossing with the Merinos. From the bleak Falkland Islands, where sheep raising is the chief industry, settlers have invaded Tierra del Fuego and southern Santa Cruz, where the westerly winds bring more abundant rainfall than in northern Patagonia. In this climate, the Romney Marsh sheep have been introduced with success. Other agricultural enterprises, particularly alfalfa and beef produetion, are now displacing sheep in eastern Argentina

United States (fig. 194).—In number of sheep the United States ranks fourth among the countries of the world, and has about one-twelfth of the world total. The number of sheep in the United States is somewhat less than the number of swine or cattle, but about twice that of horses and mules. The importance of sheep, as indicated by number per 100 population or per 100 acres of improved land, has declined almost steadily sinee the first agricultural census in 1840.

Sheep in the United States, 1840–1910 (exclusive of lambs).

Census year.	Number of sheep.	Number per 100 population.	Number per 100 acres of improved land.	Value.	Average price.
1840[a]	19,311,374	113	.....	Not reported.	Not reported.
1850[a]	21,723,220	94	19.2	.....do.....	Do.
1860[a]	22,471,275	71	13.8	.....do.....	Do.
1870[a]	28,477,951	74	15.1	.....do.....	Do.
1880[b]	42,192,074	84	14.8	.....do.....	Do.
1890[b]	40,876,312	65	11.4	.....do.....	Do.
1900[b]	39,852,967	52	9.6	$128,186,791	$3.22
1910[b]	39,644,046	43	8.3	203,516,144	5.13

[a] "Sheep."
[b] Excluding spring lambs.

The densest center of production of sheep is located in central and eastern Ohio and in Washington and Green Counties, Pa. A considerable number of sheep are found also in southern Michigan, northeastern Indiana, the blue-grass region of Kentucky, the valley of Virginia, and in central Tennessee. About half of the sheep in the country, however, are in the Rocky Mountain States, and a large number in addition are in Oregon and California.

The sheep industry in Ohio began with the settlement of the State, and quickly assumed large proportions. The importance of the industry in the Ohio district was little affeeted before 1890, although sheep in the other farming States, save in newly settled sections, declined quite rapidly following the period of artificial stimulation which occurred during the Civil War. Sheep raising was primarily a wool-growing enterprise, and with low prices wool produetion could not profitably compete with pork, beef, and grain production, dairying, and other relatively intensive enterprises.

The cheap grazing afforded by the western ranges enabled the western sheep men, raising Merinos mostly, to compete with foreign wool, and caused a rapid development of the American sheep industry as soon as transportation facilities were extended to the Rocky Mountain region. The West has steadily increased in importance, particularly during the stress of the 90's, when the sheep industry in the East suffered severely. During the later 90's, mutton blood began to invade the range country, owing to the demand of the rapidly increasing population for meat and the resulting rise in price of mutton, and the Merino has steadily given way before the influx of mutton blood. No small factor in this change to mutton types on the range has been the curtailment of the range area by agricultural settlement and attendant increase in cost of production of sheep and wool. At the present time flocks of pure Merino blood are comparatively rare throughout most of the range country.

The sheep in the Western States are grazed largely on the open range. Most of the sheep are in semiarid regions where the annual precipitation is between 10 and 15 inches, the grazing where the rainfall is much less than 10 inches being too poor to support many flocks of sheep. In the mountainous seetions they range through the mountain meadows in summer, where the melting snow maintains green pasturage even late into the fall, and in winter they are brought down into the valleys and the lower desert areas whieh can not be grazed except in winter.

GOATS, like sheep, are at home in dry lands or mountainous regions where forage is seant and fibrous (fig. 200). With the exception of the Angora, the goat has a relatively valueless coat and is produced for its flesh, its skin, or its milk.

Europe (fig. 202).—In Scandinavia and Switzerland, the Mediterranean region, and portions of Ireland, France, and Germany, where the goat has found favor with thrifty populations, the milk is a most important eonsideration. The milch goats of Norway and the Saanen and Toggenburg breeds of Switzerland have aehieved a wide renown. In the Mediterranean countries goat's milk is still in many regions the main dependenee of the people. Throughout the eities and villages of Spain the goats are daily milked before the door of the consumer. On the French slopes of the Pyrenees flocks of goats are wintered and in the spring are driven northward to supply goat's milk, as a delieacy, to the cities of Franee during the summer months. In rough portions of the Alps goats are often kept and their rieh milk used with skimmed cow's milk in the manufaeture of eheese. In Turkey and Greece the goats are pastured mainly in the mountains and the milk used in making butter and eheese. Goats brought from the mountains to the cities furnish the chief milk supply.

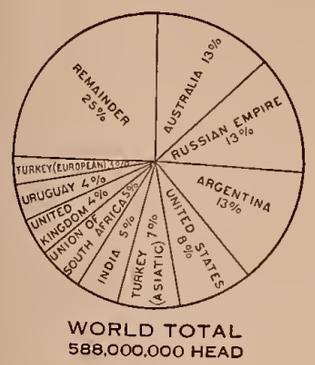
India (fig. 203) ranks first in number of goats, but the local importance of the animal is not very great. Its most important use is as a producer of milk. Since no sanctity attaches to it, as is the case with cattle, the flesh is quite generally eaten. The males are used also in religious sacrifice, and coarse blankets are woven from goat's hair.

Asia Minor and South Africa.—The Angora goat is native to Asia Minor and is kept chiefly for its mohair. The highest quality of mohair is still produced in Asia Minor, but South Africa (fig. 205) now produces a larger quantity. Of the 12,000,000 goats in Cape Colony nearly all are Angoras, and mohair is the chief agricultural product of portions of the state.

United States (fig. 201).—Goats are of small importance in the United States, except in southwestern Texas, where in eight counties there were about 740,000 goats in 1910, or one-fourth of the total number in the United States. There are a considerable number of goats also in New Mexico, Arizona, and the Willamette Valley of Oregon. The latter is a moist region where Angora goats are used largely for clearing underbrush from cut-over land.

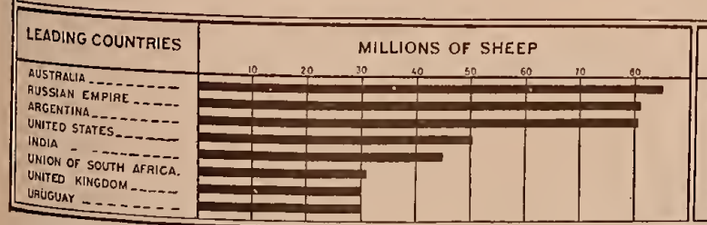
Mexico and Argentina (fig. 204) eaeh have more goats than the United States. They are raised principally in the arid and semiarid sections of these eountries.

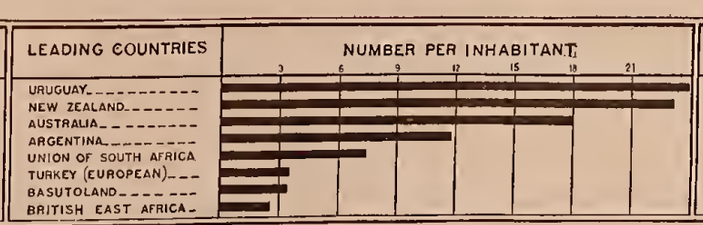
FIG. 193



WORLD TOTAL
588,000,000 HEAD

WORLD
SHEEP
NUMBER
EACH DOT REPRESENTS 200,000





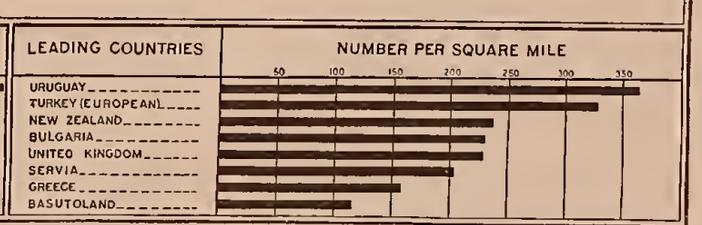


FIGURE 193.—World distribution of sheep. It will be noted that there are six world centers of sheep raising, of which four, the South American countries, South Africa, Australia, and New Zealand, are new lands with sparse population and are all located in the Southern Hemisphere. The two centers in the Northern Hemisphere are the Balkan States and Great Britain. In Asia Minor and in the Balkan States conditions of topography, climate, and the nomadic habits of the people in the recent past cause sheep to be important farm animals. In Great Britain many factors combine to make sheep raising a prominent industry in spite of high land values and extreme industrial concentration of population. The Russian Empire and the United States, although they rank high in total number of sheep, are, owing to large area, far down the list in number per square mile.

64505—18°

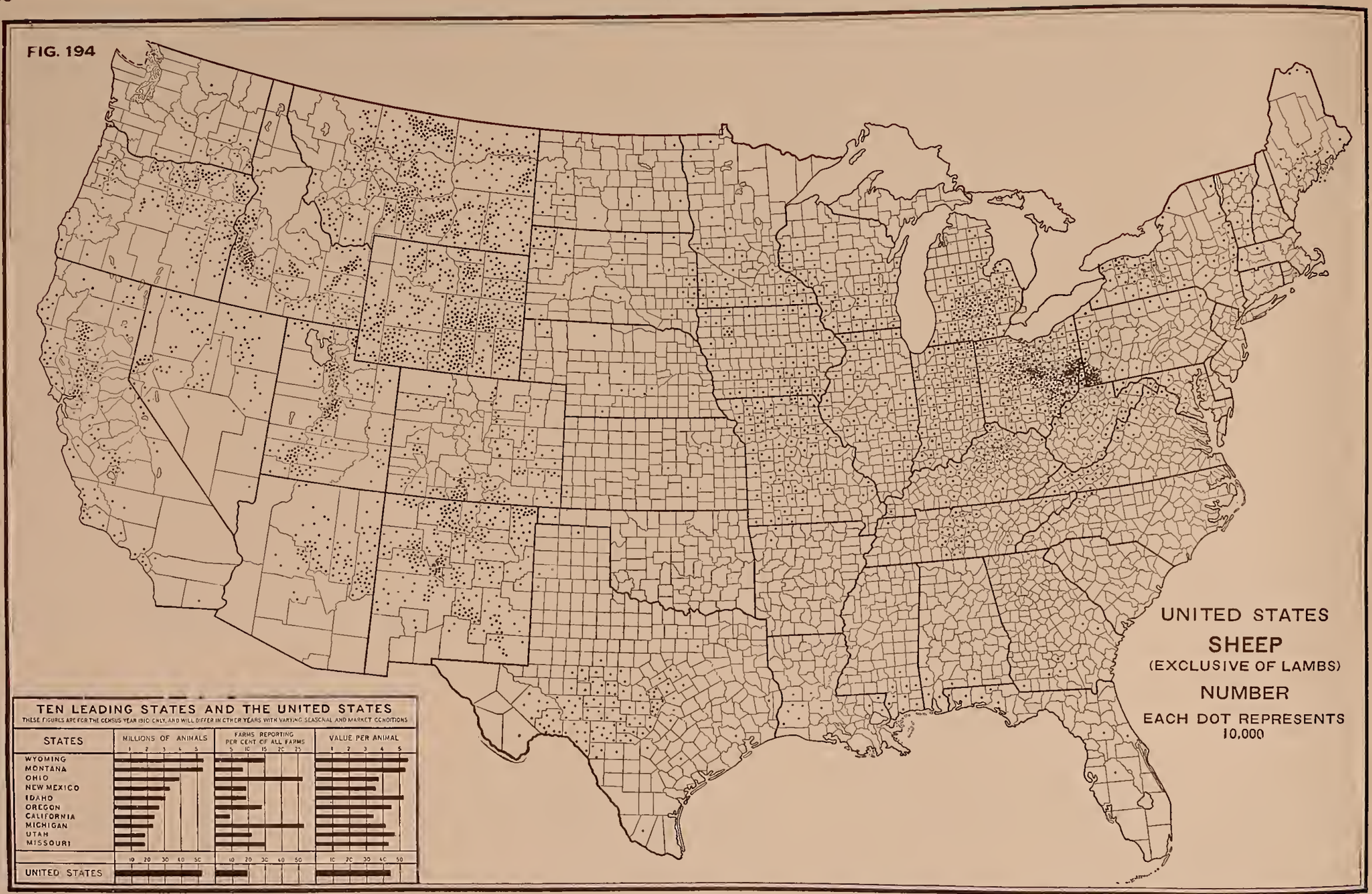


FIGURE 194.—Distribution of sheep (excluding lambs) in the United States. In 1910 62 per cent of the adult sheep were in the far West, and over 90 per cent of these were in the Rocky Mountain section and the semiarid or mountainous parts of the Pacific Coast States. The sheep are grazed largely on land unsuited for cattle because of climatic or topographic conditions. In the East, aside from the small spring-lamb districts of Tennessee and Kentucky, the only prominent sheep sections are the Ohio district (which includes adjacent counties in West Virginia and southwestern Pennsylvania) and the central Michigan and western New York districts. In the Ohio region sheep have been retained in the system of farming because of the hilly pasture land, which is better suited to sheep than to cattle, and also because the district has acquired a reputation for pure-bred breeding stock. With the exception of small parts of the Ohio district, sheep in the East are now predominantly of the mutton type.

FIGURE 195.—Distribution of sheep in Europe, Algeria, and Tunis. The new countries of the world have obtained their sheep from Europe. The breeds of sheep in Europe are numerous. Great Britain alone has now over 30 distinct breeds and had, a century ago, many more. The scarcity of sheep in Germany and Belgium has come about recently as a result of the economic pressure of growing industrialism. In Belgium sheep are no longer listed in statistical publications. Although Russia has more sheep than any other European country, they are relatively more important in England and the Balkan States. In what was formerly European Turkey there were estimated to be over three times as many sheep as people, before the Balkan wars, and over 300 per square mile. Sheep are also important in portions of France, Spain, Italy, and Algeria.

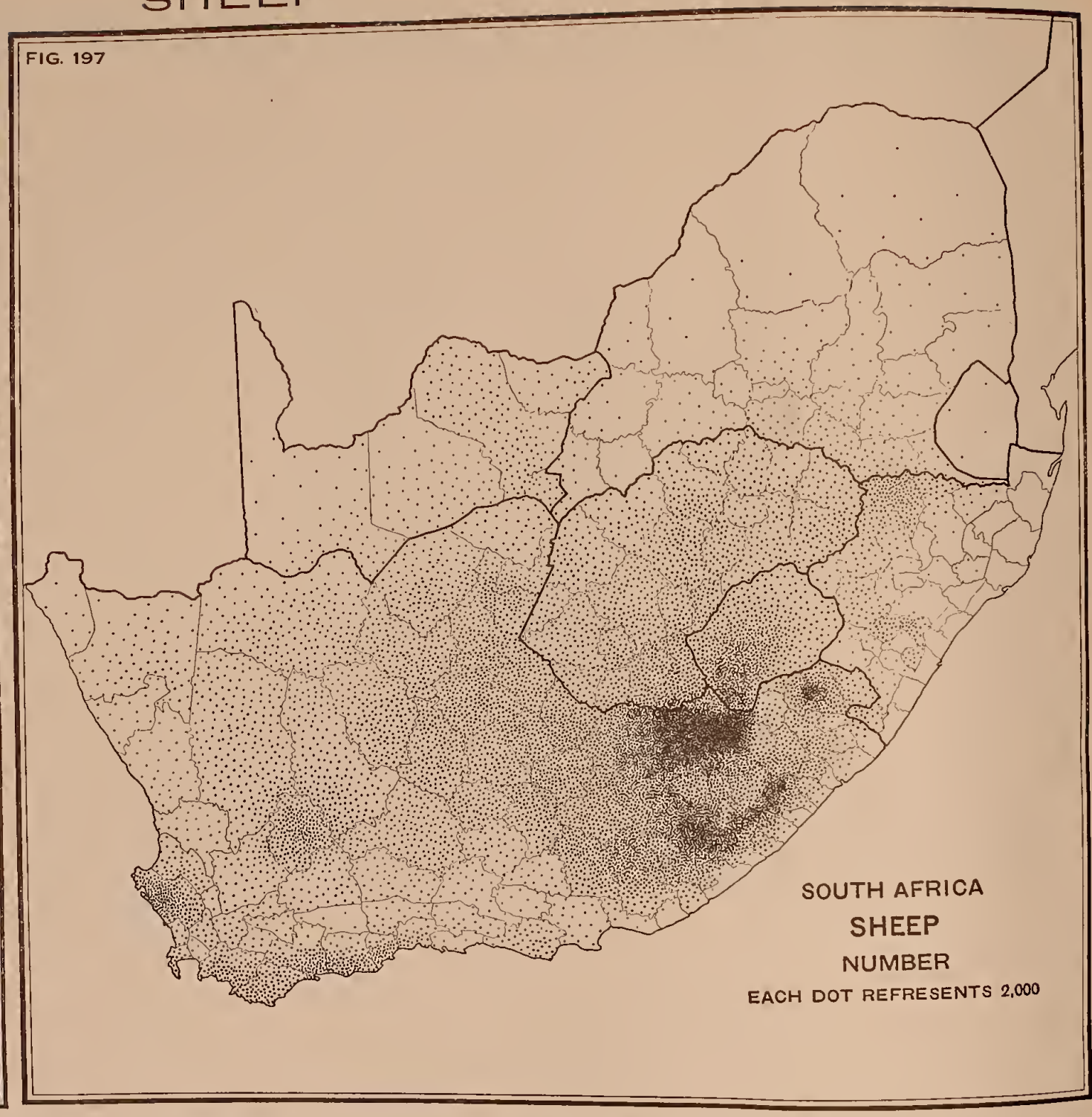


FIGURE 196.—Distribution of sheep in Argentina, Chile, and Uruguay. In Uruguay and the Argentine state of Buenos Aires, where the rainfall is sufficient to support luxuriant forage, the pastoral interests early occupied the land and still hold a large part of it, in spite of the pressure of encroaching agriculture. The decreasing rainfall westward and southward does not permit so many sheep per square mile. In Tierra del Fuego the west winds bring more rain and the density of sheep is greater.

FIGURE 197.—Sheep in South Africa, as in Australia, are raised for the most part in the drier and hilly regions lying between the western desert and the moist agricultural lands along the eastern coast.

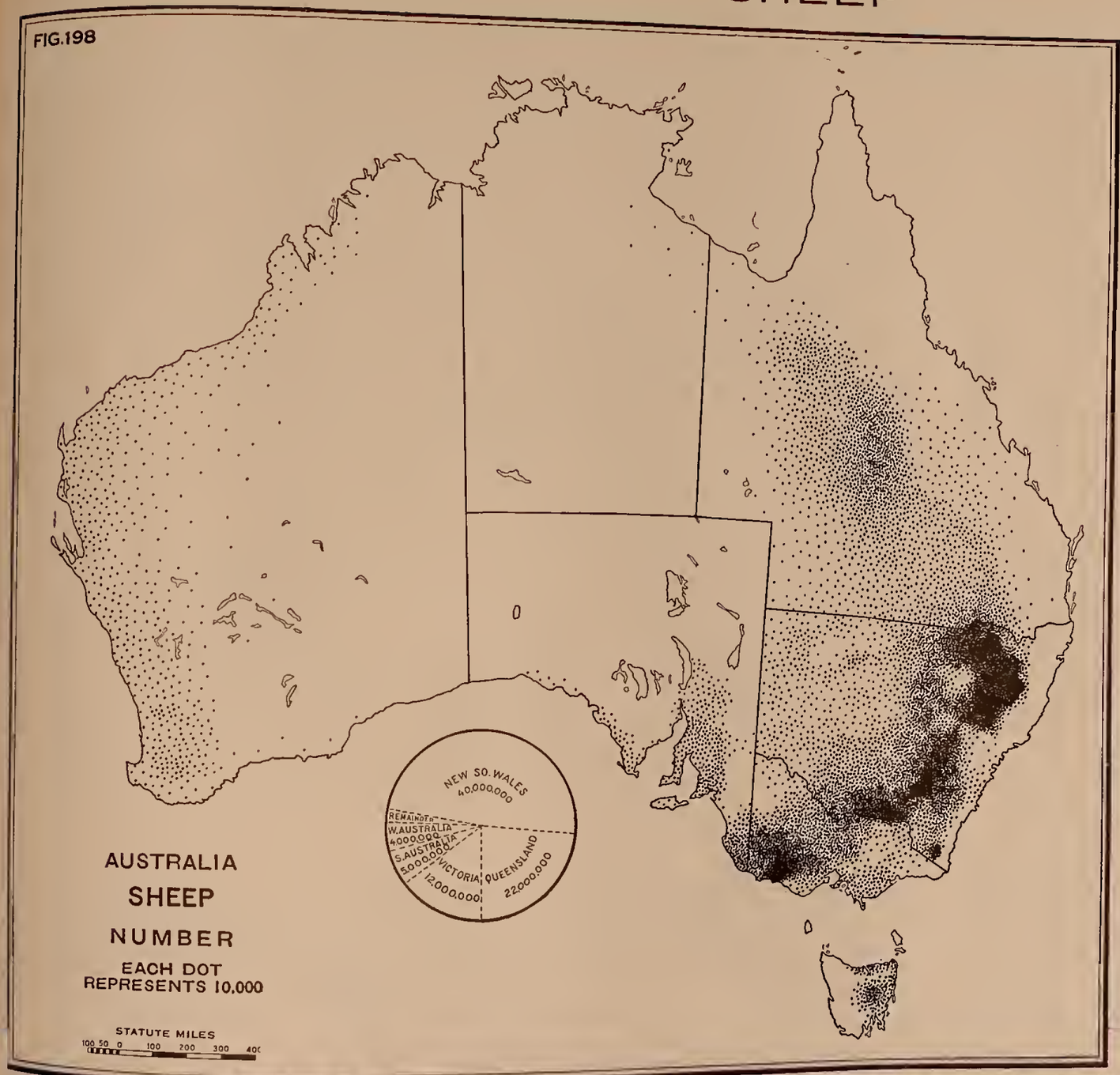


FIGURE 198.—Distribution of sheep in Australia. This map emphasizes the adaptation of the sheep to semiarid lands. The curved zone of sheep production lies on the western slopes of the mountain ranges, beyond the influence of the coastal rains and east of the great interior desert. The average annual rainfall ranges from less than 10 inches along the western boundary of Queensland and New South Wales to 25 inches in the regions of dense production in eastern New South Wales and Victoria. It will be noted also that the sheep of Tasmania are concentrated on the dry side of that island.

FIGURE 199.—Distribution of sheep in New Zealand. Relatively few sheep are found on the wet western coast and in the warm, moist northern region. They find more congenial conditions on the drier plains bordering the mountains north of Wellington and on the eastern side of South Island.

GOATS

FIGURE 200.—World distribution of goats. Goats are found in practically all the countries of the world, but their distribution is much the densest in the Balkan States of southeastern Europe. The other important centers are in Asia Minor, northern Africa, India, which has more goats than any other country, East and South Africa, Argentina, Brazil, Venezuela, Mexico, the southwestern United States, and the countries of western Europe. The goat is even hardier than the sheep in its ability to subsist on scant forage and in regions of rough topography. It has the added advantage of a relatively large milk production. The goat is therefore found principally in rough or dry lands or among poor peoples.

FIGURE 201.—Distribution of goats in the United States. Goats are of minor importanee in the United States, except in southwestern Texas, where in Edwards and seven adjoining counties, about one-fourth of the 3,000,000 goats in the eountry are found. There are a considerable number of goats in New Mexico, Arizona, and the Willamette Valley of Oregon. The latter is a moist region where Angora goats are used largely for elearing underbrush from cut-over land. A few goats are seattered through the Southern States and up the Mississippi Valley as far as Iowa. Goats are an important farm animal in the United States only in the rough, semiarid Edward's Plateau region of Texas and in the valleys and plateaus of New Mexico and Arizona.

FIGURE 202.—Distribution of goats in Europe, Algeria, and Tunis. The goat is used largely as a dairy animal. In northwestern European countries, where cows are numerous, the milch goat is of secondary importance. In the Mediterranean region, however, where the dry summers make forage sparse and poor, the goat is of greater importance. In the cities of Spain the goats are daily milked before the door of the consumer, and in France the goats are driven northward in spring from the slopes of the Pyrenees to supply goats' milk as a delicacy to the cities during the summer months. In Greece the goat is practically the only dairy animal. In the Balkan States and in the Alps the milk is used mostly in making butter and cheese.

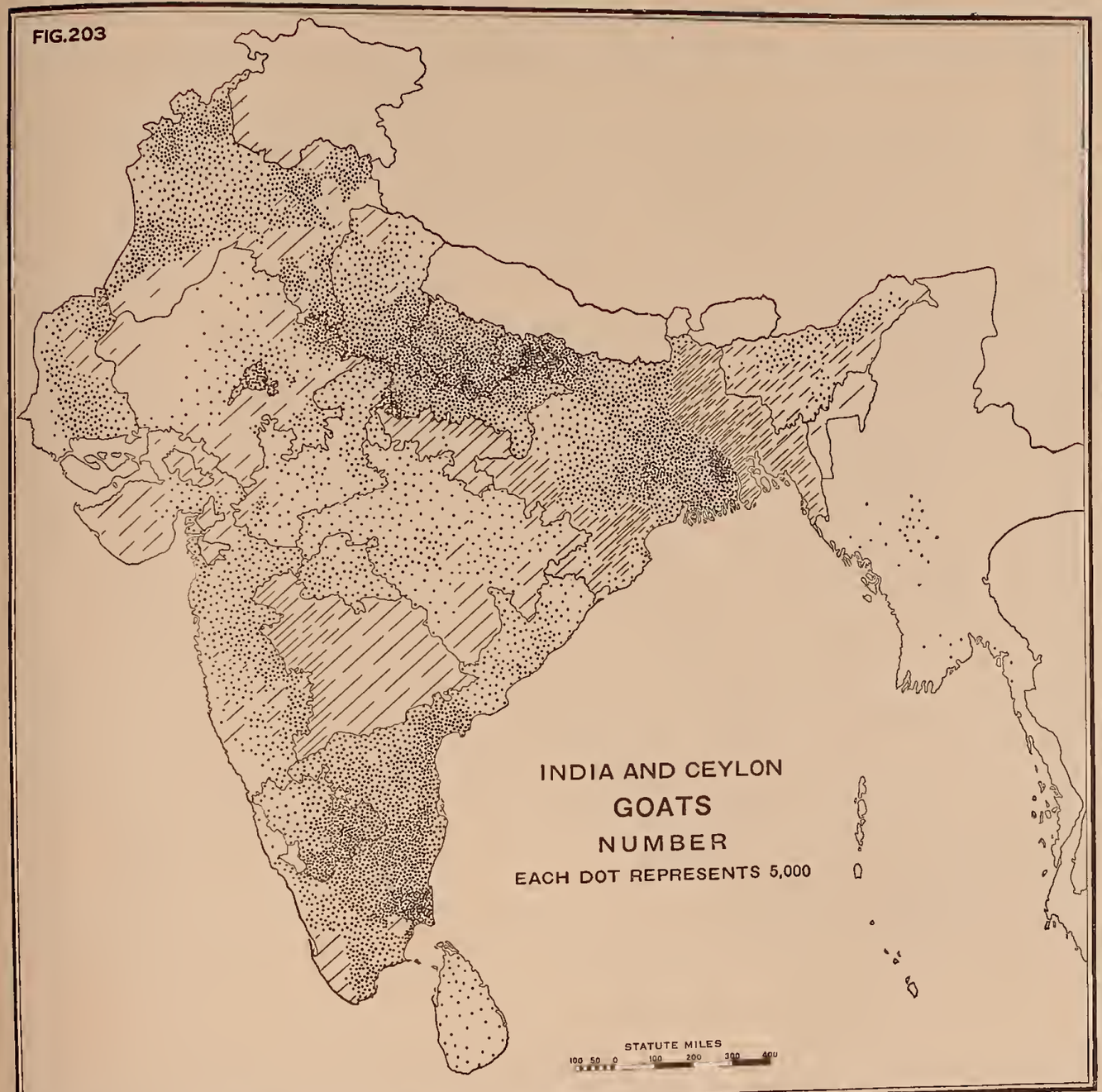


FIGURE 203.—Distribution of goats in India. The areas of greater number correspond in general with eenters of dense population. The Indian goat yields a fair supply of milk and its flesh is by some preferred to mutton. Sinee the Indian sheep yield but a poor fleeee, goats slightly outrank them in number. India has more goats than any other country, but owing to the large area and population their importanee in the life of the people is relatively not so great as in some other eountries.

FIGURE 204.—Distribution of goats in Argentina, Uruguay, and Chile. In Argentina goats are of small importanee eompared with sheep and are most numerous in the semiarid, warm northwestern seetion east of the Andes. A eomparison of this map with that of sheep (fig. 196) and of eattle (fig. 184) exhibits an interesting division of territory, the sheep being found principally to the east and south and the eattle in the moister lands to the east and north of the goats.

64505—19°

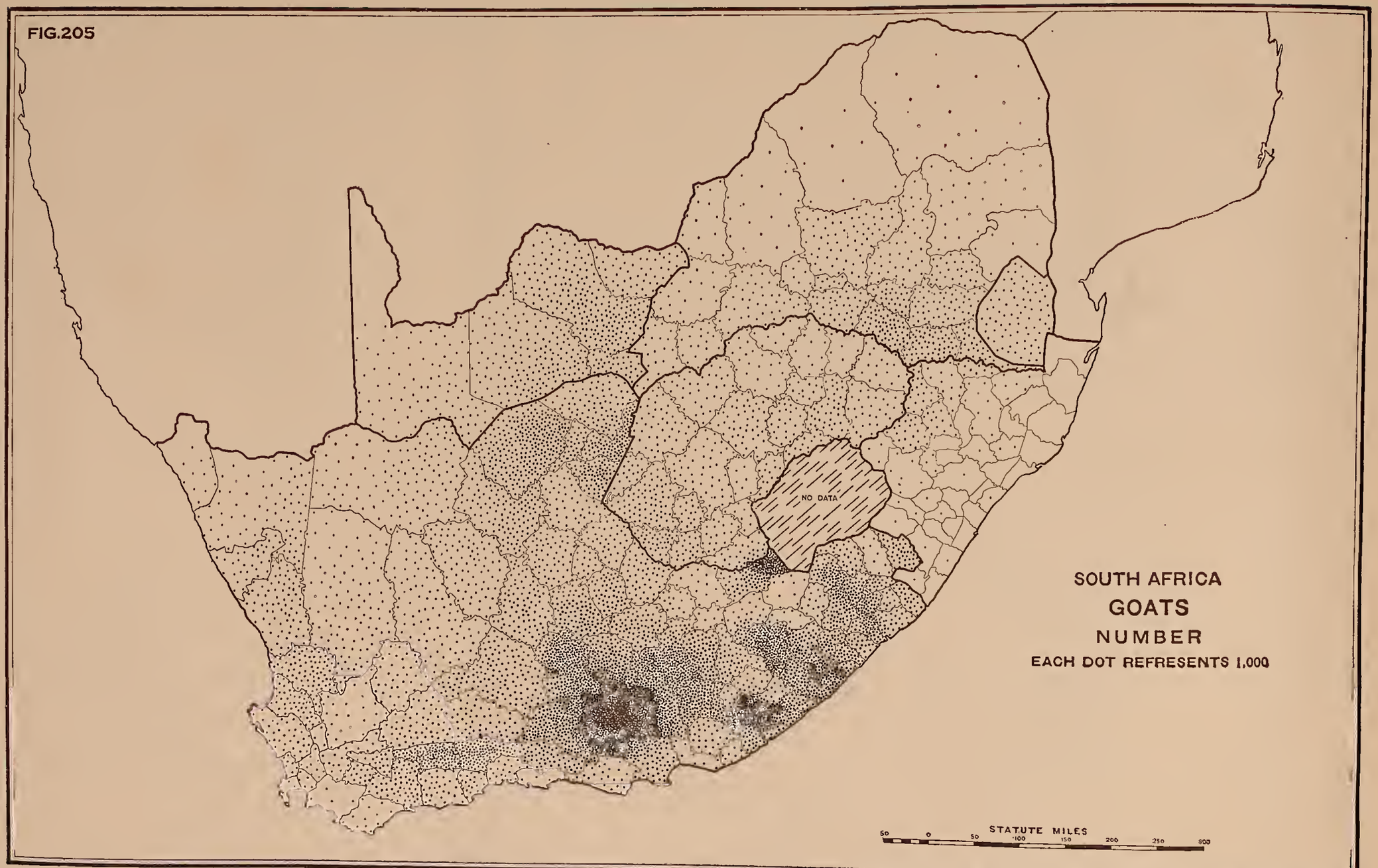


FIGURE 205.—Distribution of goats in the Union of South Africa. The goat is raised here largely for the mohair. The Angora goat, introduced from Asia Minor, finds in South Africa conditions very favorable to its development. The expansion of this industry has made goats more numerous than any other animal except sheep, and South Africa has become one of the world's chief mohair-producing regions.

FIG. 206

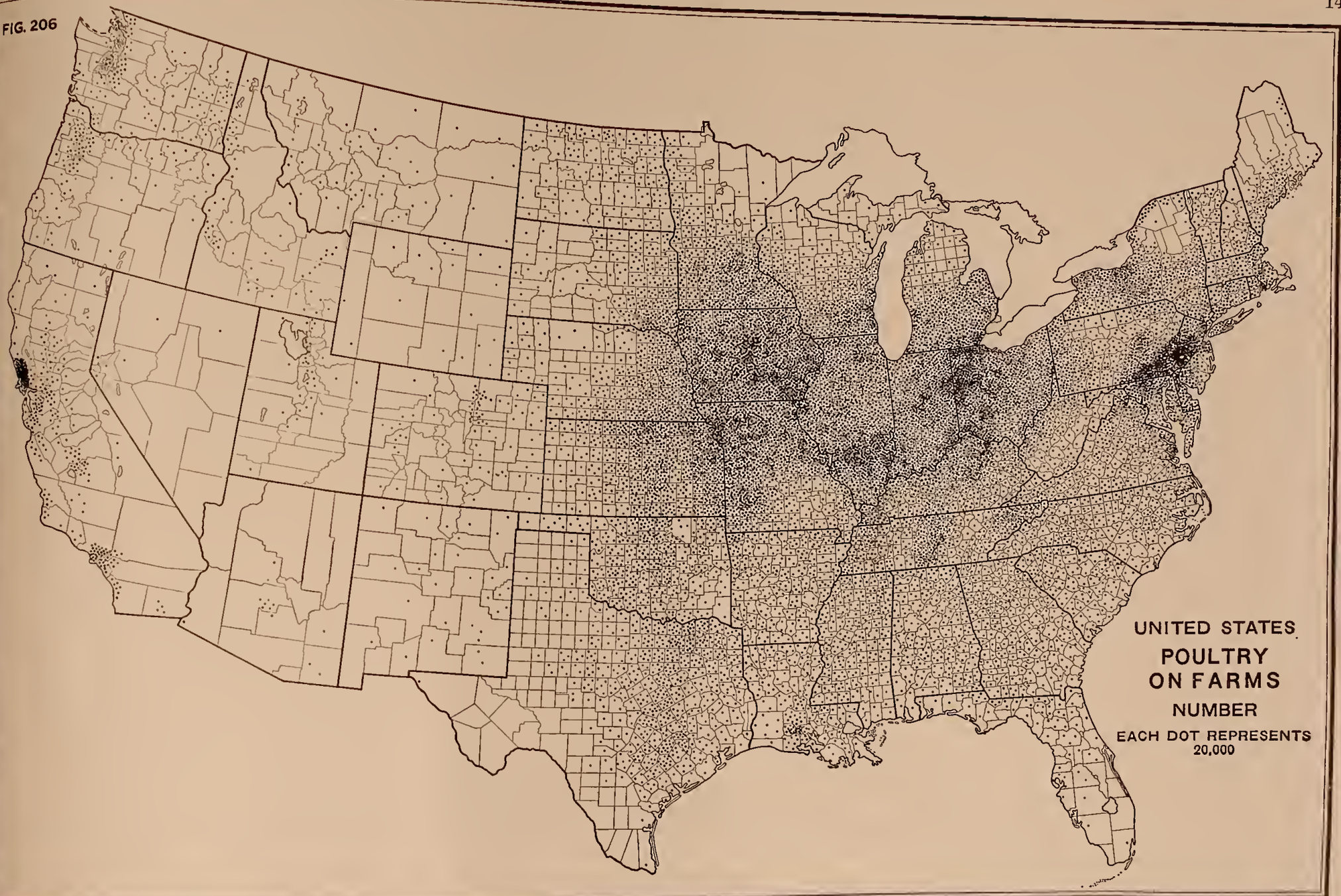


FIGURE 206.—Distribution of poultry in the United States. The two densest poultry areas are located in the nine counties of southeastern Pennsylvania, and in Sonoma County, Cal., prineipally around Petaluma. In both these distriets there is a highly developed poultry industry engaged largely in supplying eggs to the adjacent eity markets. The distribution of poultry is moderately dense throughout the corn belt. Chiekens constitute 94.8 per cent of the total number of poultry in the United States, dueks 1 per cent, turkeys 1.2 per cent, geese 1.5 per cent, pigeons 0.9 per cent, and other fowls 0.6 per cent.

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