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Land utilization

POPULATION TRENDS IN RELATION TO LAND UTILIZATION

O. E. BAKER
BUREAU OF AGRICULTURAL ECONOMICS, WASHINGTON, D.C.

THE present agricultural situation, particularly the disparity between the prices of the things farmers sell and of the things they buy, which is as bad now as it was at the beginning of the period of depression nine years ago, indicates the need of studying the utilization of the land, particularly the relative advantages of use for crops, pastures and forests. In studying this utilization of the land, it is obviously desirable to take a long look ahead.

We will not undertake to discuss the utilization of land in the United States, for the subject is too large to summarize in a brief paper, but we will try to take the long look ahead, not covering the whole of the horizon, however, but only the segments relating to the progress of population, to changes in the per capita consumption of agricultural products, and to trends in agricultural production—and these subjects only from the standpoint of the probable future need for farm land.

THE PROGRESS OF POPULATION

The population of the United States ten, twenty, even fifty years hence, can be predicted with a greater degree of assurance than any other economic or social fact, provided the immigration laws are not changed. This is because man is a long-lived animal, with an expectation of life now subject to little extension in the United States. The births of the last few years determine the number of marriages twenty to thirty years hence, and the number of deaths fifty to seventy-five years hence. A curve representing the population of the United States during the past fifty years is almost a straight line, trending upward (figure 1). No other feature in our national life shows so few fluctuations and such steady progress.

STATIONARY POPULATION APPROACHING

But, it is certain that this curve will soon bend slightly, unless the immigration laws are changed, and slowly approach a horizontal position. Later the curve may trend downward. This is because the birth-rate during the past decade has been declining with

unprecedented rapidity. The number of children born each year in the United States is now fewer than in the year preceding. The

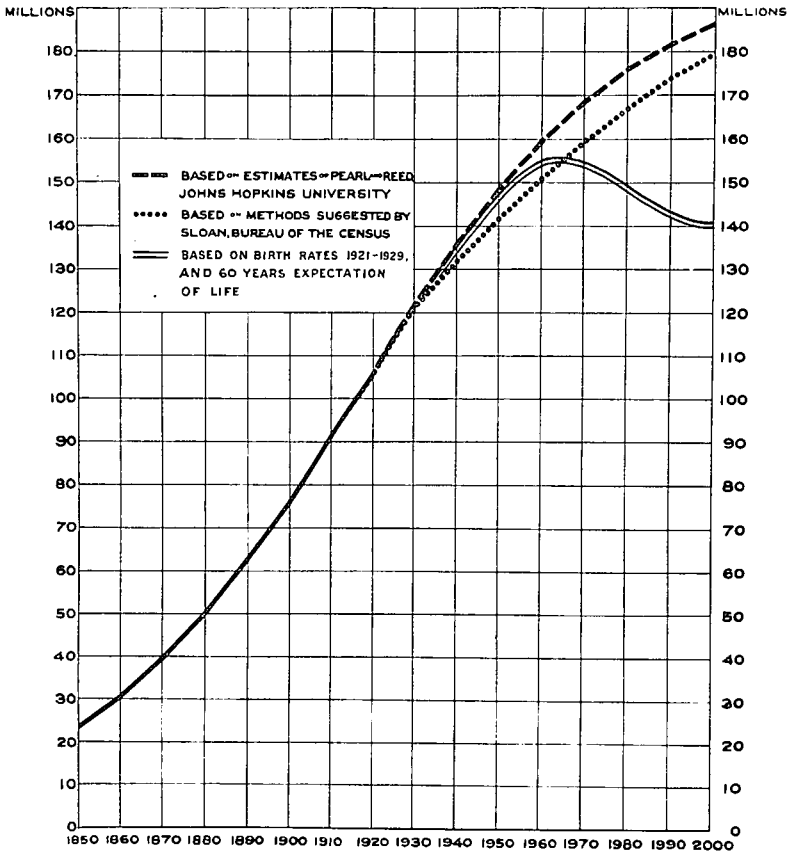

FIGURE 1. POPULATION OF THE UNITED STATES FROM 1850 TO 1920, AND ESTIMATES OF POPULATION FROM 1930 TO 2000 A.D.

Less than ten years ago Professors Pearl and Reed, of Johns Hopkins University, on the basis of the population trends, estimated the United States was slowly approaching a stationary population of nearly 200,000,000 about the year 2020. Dr. Sloan, of the Census Bureau, reached a similar conclusion. But the rapid decline in the birth rate since 1921, indicates a maximum population of less than 160,000,000 about the year 1960, unless the immigration laws are changed. Moreover, if the present decline in the birth rate continues a few years longer, and immigration remains as at present, a decline in the nation's population will set in soon after 1960.

enrollment in the first grade of the public schools has been declining very slowly, but surely, since 1918; in the second grade since 1922; and in the third grade since 1924. As the decline in

the birth-rate has been much more rapid since 1924 than in the years previous, it is clear that enrollment in the schools will decline more rapidly in the next decade than in the decade just past.

But, you may well ask, how can these things be in the face of the 1930 census returns, which show an increase of nearly 17,000,000 people in the past ten years, an increase which was greater than that between 1910 and 1920?[1]

The explanation lies in the fact that the contraction is in the number of little children, and that it will be twenty or thirty years before these grow to maturity and become a major portion of the population. As the larger number of young people—ten to twenty-five years old—grow into middle age, population will continue to increase. It is probable that the census of 1940 will show an increase of 13,000,000 or 14,000,000 over 1930, and that the census of 1950 will reveal an increase of 9,000,000 or 10,000,000 during the preceding decade. But the census of 1960 will show an increase of only a few million, and the census of 1970 will show no increase at all—unless the immigration laws are changed, or unless the ideals of the American people are altered and more men and women become willing to sacrifice for the sake of children.

However, in many cases the limitation on the size of the family is dictated primarily by a sense of responsibility for the education of the children. Three or four children—and it requires over three children per fertile family to maintain a stationary population—will reduce the standard of living, or increase the cost of living, of the average family by about fifty per cent, and fewer families, evidently, are willing to make the sacrifice or assume the responsibility.[2]

Other important factors affecting the birth-rate are the great reduction in immigration from Europe during and since the World War and the rapid urbanization of the American people. The immigrants from Europe prior to the war were mostly young people,

[1] It may be noted that the population returns of the 1930 census fall short by about 250,000 from the calculated population based on birth-rates, death-rates, and net immigration.

[2] The widening knowledge of methods of birth control, which permits the gratification of sexual instincts without involving the normal economic consequences, particularly in a civilization in which economic competition is intense and in which the desire to climb the social ladder is widespread, must be viewed with serious concern. A real conflict has arisen between the economic interests of the individual and his duty to the state and to the race.

recently married or of marriageable age. Moreover, these immigrants came mostly from peasant farms where the tradition of large families persisted. The reduction in immigration, therefore, reduced not only the increase of population, but also reduced the birth-rate in the United States. Similarly, the present migrants from the farms to the cities are mostly young people recently married or of marriageable age—middle aged and old people can-

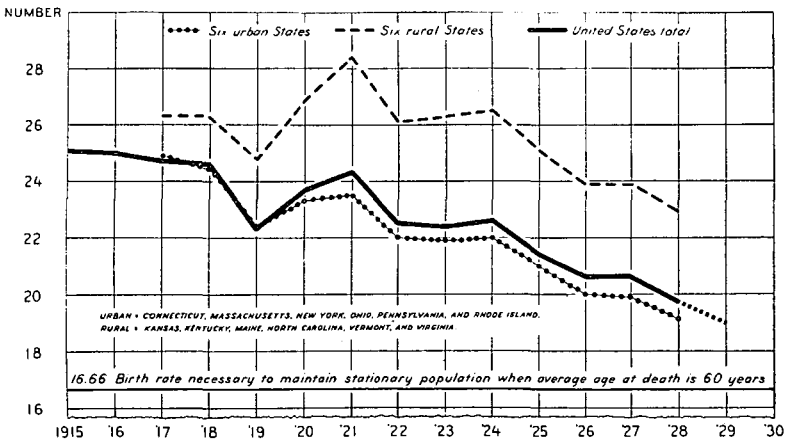

FIGURE 2. BIRTH RATE PER 1,000 POPULATION IN THE REGISTRATION AREA OF THE UNITED STATES, 1915 TO 1928, AND IN SIX URBAN AND SIX RURAL STATES, 1917 TO 1928

The birth rate began to decline slowly after the Civil War, and this gentle decline continued until the World War. Since 1921 the rate has been much more rapid. (The drop in 1919 was owing largely to the epidemic of influenza in 1918.) It will be noted that the birth rate in the six rural states was about two per thousand higher in 1917 and 1918 than in the six urban states, but that since1921 it has been about four per thousand higher. However, the rural birth rate is trending downward in much the same way as the urban birth rate. The fall in the birth rate has been so rapid recently that, despite the increasing population, the number of children born each year is less than in the year preceding. The enrollment in the lower grades of the public schools has already begun to decline.

not well learn a new occupation and make the many other adjustments necessary. Since farm people have a much higher birth-rate than city people, this migration of the young to the cities has reduced the birth-rate still further (figure 2). Only about twenty per cent of the nation's population now lives on farms, as compared with eighty per cent a century ago.

In 1921 the birth-rate in the registration area, which included most of the United States, was 24.3 per thousand population; in

1928 it was 19.7; and preliminary estimates for 1929 indicate that it was only about 18.8 last year (figure 2). A birth-rate of 17 is necessary to maintain a stationary population with our present expectation of life of 59 years, provided there is no immigration, and if the average age at death could be extended to 63 years, which is all that can be hoped for, it would require 16 births per thousand people to keep population stationary. Three or four years hence, therefore, if the present downward trend in the birth-rate continues, the number of children born will be only sufficient to maintain the present population, and any permanent increase will be dependent upon immigration. Moreover, it appears that after reaching a peak of about 160,000,000 near the year 1960 the population of the United States will begin to decline, unless the trend of the birth-rate is reversed or the immigration laws are altered.

AGRICULTURAL SIGNIFICANCE OF A STATIONARY AND OF A DECLINING POPULATION

A stationary population would involve difficult adjustments for American agriculture. During a century or more production has doubled about every 50 years, and our farmers have become accustomed to a demand for food and fibres increasing fully as fast as population. A declining population would be still more difficult to adjust production to; indeed, it would be a calamity to agriculture in many parts of the country, unless enlarged markets were found abroad. It would involve, unless exports increased, a rapid decline in the acreage of crop lands in the nation as a whole, and an even more rapid decline in the farm population. The declining farm population would tend to reduce the national birth-rate still farther, while the decline in crop acreage would affect the prosperity of many communities, urban as well as rural. The reversion of crop land to pasture or forest means generally, and doubtless will continue to mean, fewer farmers for the local merchant to sell goods to and for the local doctor and lawyer to derive a living from, so they also leave the community. There is less property value to tax for the support of schools and roads, and taxes, therefore, tend to rise. This makes more people give up their land, often allowing it to revert to the county or state for the taxes, which in turn raises the tax rate and forces still more land into a delinquent condition.

When the population becomes stationary, a farming community, or a nation, can still be fairly prosperous, because there are fewer children to support and the increase of capital and improvements in technique result, generally, in increasing income per person. But when the population of a community, or a nation, is declining, especially if the decline be rapid, it becomes more difficult for it to be prosperous, because, commonly, farm land lies idle, village houses, and many city houses also, stand empty and unproductive, business diminishes, land values decline, investments become insecure, and the young people and the more ambitious go elsewhere in search of work or better opportunities, leaving the aged or less efficient to farm the land, or to live in the declining cities. Above all, the spirit of enterprise is likely to be depressed. It is not without reason that the typical American community seeks to increase its population, organizes a Chamber of Commerce and employs a secretary to "boost" the locality and secure settlers and industries. It was not without reason that the nation, by means of the homestead laws, railroad land grants, and in many other ways sought to develop the resources of the country and encourage the increase of population.

But now the pioneer age is past, and the farm population is becoming urbanized so rapidly by the automobile and good roads, moving pictures, and popular magazines, that it is doubtful, even if agricultural production for export should be encouraged, whether there would be much clearing of land unless immigrants were admitted to do the manual labor, or unless the manual labor was rendered unnecessary by the use of machinery.

In any case, there will be little need for such land clearing unless immigration increases or unless a shift toward more meat in the diet takes place. Future immigration policy cannot be forecast, but the present national attitude is certainly opposed to reducing the restrictions very much. It is possible, however, to reach a conclusion with reference to changes in diet that may affect the need for farm land. Let us devote a few minutes to this subject.

TRENDS IN CONSUMPTION OF FARM PRODUCTS

The Word War caused changes in the diet of the American people as it did in many other things. Prohibition of the use of alcoholic liquors was also an important factor. The principal

change in diet was a notable decline in the use of bread, of corn meal, and other cereal foods and an increase in the consumption of milk, of sugar, of fresh vegetables, of fruit, and a slight increase in the consumption of meat (figure 3). Apparently the higher wages and salaries of city people after the war enabled them to eat more of the expensive foods. The average total consumption per person of wheat, corn, oats, rye, buckwheat and barley for

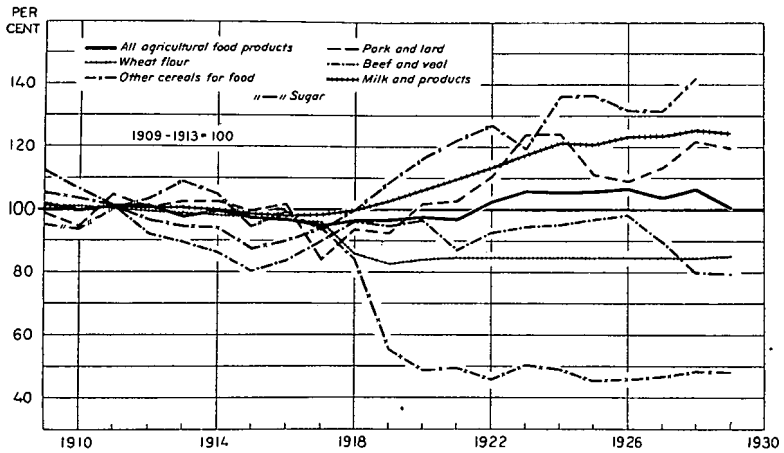

FIGURE 3. CHANGES IN THE TOTAL CONSUMPTION OF FOOD PRODUCTS PER PERSON IN THE UNITED STATES, AND CHANGES IN THE PER CAPITA CONSUMPTION OF SIX PRINCIPAL PRODUCTS, 1909-1929

The World War worked significant changes in the diet of the American people, as it did in many other things. Perhaps of even greater importance was the Prohibition Amendment to the Constitution, the prosperity of the urban people during and after the war, and the food education articles and advertisements in the popular magazines. The result has been a decline since the war years of about 100 pounds per person in the consumption of cereal foods, and an increase of about 27 pounds per person in the consumption of sugar, and almost as great an increase proportionately in the consumption of milk and its products. The per capita consumption of pork has also increased notably, while the per capita consumption of beef has declined. These changes have resulted in a slight increase in the per capita requirement for crop land.

human food averaged about 340 pounds a year during the prewar period 1909-1913, whereas during the last five years it has been only about 240 pounds. This is a decrease of 100 pounds, or nearly 30 per cent. On the other hand, the average American is now eating about 27 pounds more sugar, which is a third more than before the war, probably a fourth more milk and dairy products, possibly a fifth more vegetables, and a tenth more fruit, but only a little more meat.

THE EFFECT OF THE CHANGE IN DIET ON THE NEED FOR LAND

These changes in diet have had a marked effect upon the need for farm land. If man could live on sugar alone it would require only about one-third of an acre of sugar beets (or cane at average acre-yields in the United States) to provide the same amount of energy as that in the food which the average American consumes each year, but it would require three-fourths of an acre of corn or

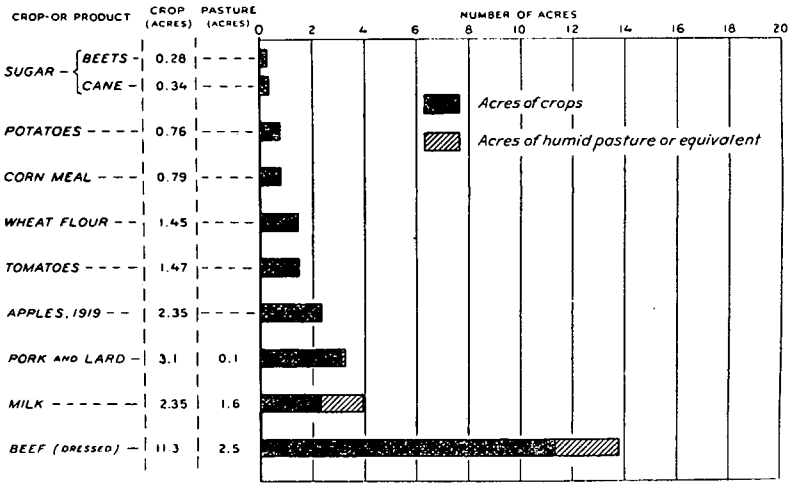

FIGURE 4. NUMBER OF ACRES REQUIRED IN THE UNITED STATES FROM 1922 TO 1924, TO PRODUCE 1,400,000 CALORIES OF CERTAIN FOODS

One-third of an acre in sugar crops produces about as many calories of food as three-fourths of an acre of potatoes or corn, or one and a half acres of wheat or tomatoes. But, lacking protein and fat, a person could not live on sugar alone, and the cereal diet would maintain health much longer. To maintain health permanently meat, milk, or other foods high in protein and fat should be added. These require three to four acres of crops and pasture to yield the same energy value in pork or milk, or 14 acres devoted to beef production.

potatoes, an acre and a half of wheat or tomatoes, about two and a third acres of crops and over an acre of pasture if he lived on milk, over three acres of crops if he ate only pork and lard, and 11 acres of crops, plus two acres of pasture equivalent, if he lived wholly on beef and veal (figure 4).

Of course, no man could live on sugar alone, for in a few weeks he would develop diabetes and other diseases; probably he could not live for a year on wheat alone; but he might be able to do so on milk, which is the most complete food. This comparison of the acreage required to produce an equal quantity of food, meas-

ured in calories, shows that much more land is required to produce a diet based largely on meat than a diet based on wheat, corn, or the other cereals. It now requires over two acres of crops to feed the average American, but only one acre to feed the average German, one-half acre to feed a Chinese, and one-fourth acre to feed a Japanese. This is owing largely to the differences in diet, except that the difference between China and Japan is owing to much higher crop yields in Japan.

The decrease in the United States since the pre-war years in consumption per person of cereal foods, principally wheat flour and cornmeal, has reduced the area of these crops needed to feed a person from about 0.34 of an acre to 0.26 of an acre, or by about one-twelfth of an acre, while the increase in consumption of milk, vegetables, fruits, and of meat has increased the area per person needed to produce these products by an eighth of an acre. Nearly all the increase in sugar consumption has been supplied by Cuba, Porto Rico, Hawaii and the Philippines, so it has not been included in the estimate. However, if this increased amount of sugar were produced within the continental United States it would require only 0.01 of an acre of beets per person, or about 1,250,000 acres for over 123,000,000 people. The net result, therefore, of the change in diet has been an increase in crop land needed to feed each person of about one-twenty-fourth of an acre. Meanwhile, the population of the United States has increased from 93 millions to 123 millions, which, after allowing for the change in diet, indicates that about 70 million acres more crop land would be needed to feed our people than just before the war, provided no changes occurred in production per acre. But the fact is that there are only about 30 million more acres of crops used to produce the nation's food than were used during this pre-war period. Indeed, after the war the acreage of crops actually declined until 1924, and is now only about as large as it was in 1919. This reduction of about 40 million acres in the crop land used to provide food for the American people is owing principally to the automobile and the tractor, which has reduced the number of horses and mules in the Unted States by over seven million and released for the production of food over 20 million acres of crop land, and secondly, to great improvement in the amount of meat and milk produced per unit of feed consumed.

It is evident that the increased use of meat and milk, made pos-

sible by the higher wages and salaries of city people after the war, helped to relieve the agricultural depression. But since 1926 there has been a rapid downward trend in the consumption of beef, the production of which requires so large an area of crops and pasture. If this should continue it would tend to aggravate the agricultural depression. On the other hand, an increase in consumption of beef would aid the farmers to obtain better prices for their products. As the upward trend in the cycle of beef production has now set in, accompanied by lower prices, it seems very likely that the consumption of beef will increase for four or five years, but then it will become, almost certainly, of decreasing importance in the American diet, unless the individual income increases as rapidly as the population. The consumption of pork seems likely to be fairly well maintained. However, the consumption of milk and dairy products declined in 1929—the first decline in 15 years—and prices of dairy products have fallen greatly. This decline in consumption, however, probably is not permanent.

The acreage of crops required to produce the per capita consumption of food in the United States during the last five years is somewhat less than at the beginning of the century, about the same as in the five years before the war, and considerably more than during the war years, but the trend now is downward.

Only one of the non-food products, cotton, requires mention, and it will suffice for our purpose to note that the per capita consumption in the United States of cotton lint, excluding linters, has remained remarkably uniform at between 25 and 30 pounds during most of the years since 1900, despite the rapid increase in the use of silk and rayon.

We come now to the question as to the probable acreage of crops required to feed a population 35 millions greater than at present at the peak, and having a per capita consumption, which, for safety's sake, we will assume to be the same as at present.

THE TRENDS IN AGRICULTURAL PRODUCTION

The changes in farming methods and the geographic shifts in the agricultural industry during the past quarter century have exerted extraordinary effects upon the need for farm land. The progress of population in the United States since the beginning of the century is compared with the changes in agricultural production, crop land, and farm labor, including that of the farmer, in

figure 5.[3] The graph presents the percentage increase over the base period, which includes the five years 1897-1901. This period, centered on the census year 1899, is about as far back as it is possible to secure sufficiently reliable data on the production of meat and milk. The base period, which marks the culmination of the agricultural occupation of the prairies, is one of abundant produc-

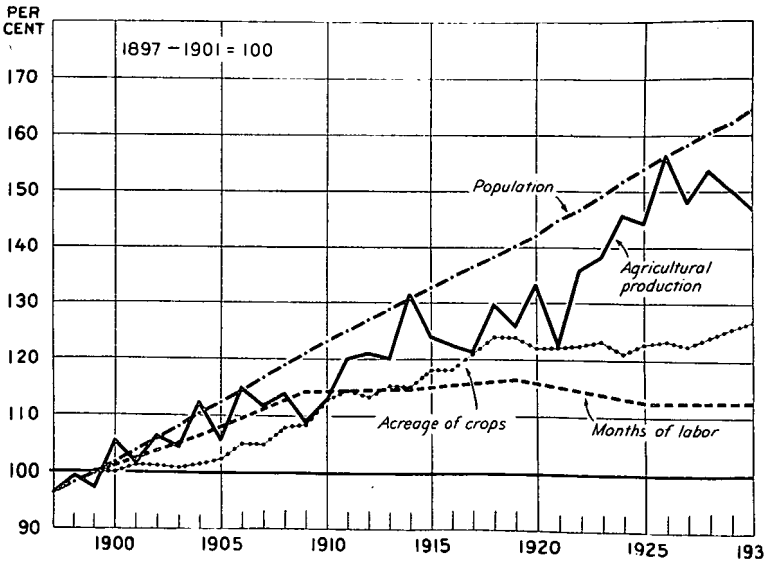

FIGURE 5. PERCENTAGE CHANGE IN AGRICULTURAL PRODUCTION, CROP LAND, FARM LABOR, AND POPULATION, 1897-1930

Although agricultural production is now over 50 per cent greater than at the beginning of the twentieth century, crop acreage is only 20 per cent greater, and the amount of labor employed in agriculture is only about 12 per cent greater. The increase in production per acre between 1919 and 1929, two fairly normal years, was about 16 per cent, practically none of which is owing to increase in acre-yields of the crops, while the increase in production per man was about 25 per cent. The data used in developing the index of production are preliminary and subject to correction after the returns from the 1930 census are available and after revised estimates of crop production prior to 1909 have been completed.

tion; indeed, the ratio of production to population may have been higher during this period than in any period before or after.

It will be noted that this high ratio of production to population persisted with but slight diminution until 1906, when a drop in

[3] The index of production consists of plant products for human food, plus animal products, plus so-called industrial crops, principally cotton, flax, and tobacco. (Crop products consumed by livestock are omitted since animal products are included.)

production the following year, with a further drop in 1909, lowered the ratio of production to population by about 10 per cent. This lower ratio, ranging from 5 to 15 per cent or more beneath the opulent ratio at the beginning of the century, has persisted since, except in the years 1914 and 1926.

THE FOUR PERIODS IN AGRICULTURAL PRODUCTION SINCE 1909

Let us note four periods in this curve of agricultural production since the decline in 1909. The pre-war period, 1910-1914, was one of rapid increase in production, each year being higher than the preceding, except 1913. During these five years production increased over 20 per cent, as compared with less than 10 per cent increase in population, but half of this increase in production occurred in the year 1914, which was characterized by extraordinarily large wheat and cotton crops. Then followed seven years of more or less stationary production, 1915-1921. During the first of these years war was raging in Europe, in which the United States soon joined; but after the disruptions caused by men leaving for the army camps had ceased, production rebounded in 1918 and again in 1920, when it exceeded slightly the high point in 1914. This was followed by an extraordinary drop in production of many crops in 1921, as well as in prices of farm products.

The period 1922 to 1926 was one of extraordinary increase in production. This period was in many ways the most remarkable in American agricultural history. For five years production was greater than in the year preceding and the increase by 1926 had become 25 per cent above the war-period level (1914-1920), whereas population had increased only about 10 per cent (since 1917, the center of the 1914-1920 period).

Not only was this increase in production extraordinary, but more extraordinary is the fact that it took place despite a stationary crop acreage and a decline in the amount of labor employed in agriculture (figure 5). Moreover, between the preceding 5 year period, 1917-1921, and this period, 1922-1926, there was a decrease of 17 per cent in number of horses, of 9 per cent in number of cattle and of 14 per cent in number of swine. The number of farms decreased 75,000 and farm population about 2,000,000, or over 6 per cent. Even more remarkable is the fact that this increase in production occurred despite an unprecedented decline in the level of prices of many farm products. The average purchasing power

of farm products declined 24 per cent between 1920 and 1921, and from 1922 to 1929 remained about stationary at 85 to 90 per cent of the pre-war (1909-1914) purchasing power prices.

What were the means by which this rapid increase in production was achieved on a stationary crop acreage, by a declining farm population, and in the face of a depressed level of prices?

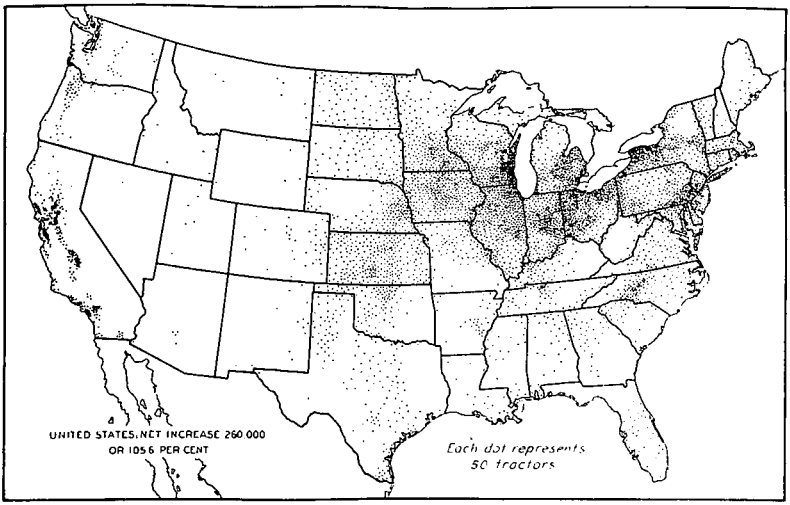

FIGURE 6. INCREASE IN THE NUMBER OF TRACTORS ON FARMS FROM JANUARY 1, 1920, TO JANUARY 1, 1925

The increase in tractors between 1920 and 1925 occurred mostly in the Corn Belt and in the more fertile portions of the Hay and Dairy Belt, in the Hard Winter Wheat Region, and in California. The increase was notable near the large industrial centers, where wages are high, and less notable on the large farms of the Central West, where, however, larger tractors are used than in the East. Few tractors are used in the South, except in central North Carolina and in Texas.

FACTORS AFFECTING THE INCREASE OF PRODUCTION, 1922-1926

First, there was an increase of over 250,000 tractors on farms and probably over 500,000 automobiles, while horses and mules practically disappeared from city streets, (figure 6).[4] Between 1921 and 1926 the number of horses and mules on farms declined by 3,100,000 and in cities the decrease probably exceeded 300,000 (figure 7). This decrease of 3,400,000 horses and mules in 5

[4] The 250,000 figure for tractors is the increase between 1920 and 1925, according to the Census. In the spring of 1929 there were about 850,000 tractors on farms, according to estimates of the Bureau of Public Roads, United States Department of Agriculture.

years released probably 10,000,000 acres of crop land, which was practically all used to feed meat and milk animals or to grow cotton. During the last 15 years the crop land released has probably approached 25,000,000 acres.

Secondly, there was a notable increase in the amount of meat and milk produced per unit of feed consumed. The estimates of the United States Department of Agriculture indicate that about

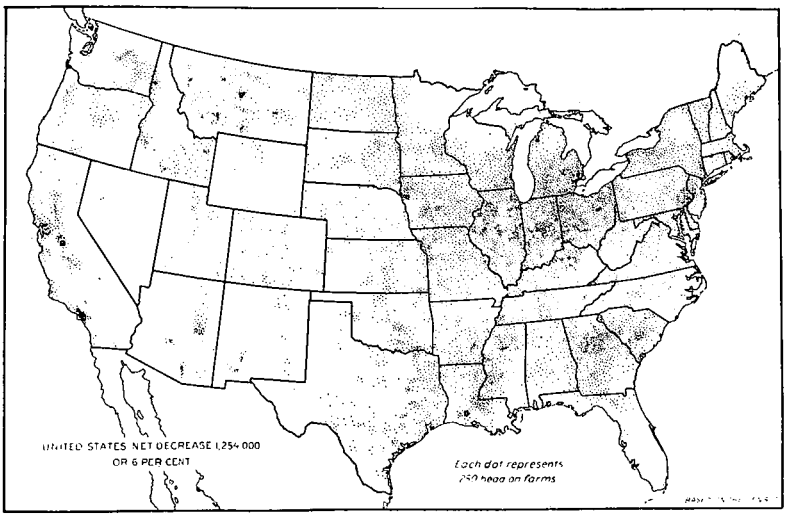

FIGURE 7. DECREASE IN THE NUMBER OF HORSES AND MULES, TWO YEARS OLD AND OVER, JANUARY 1, 1920, TO JANUARY 1, 1925

The greatest decrease in number of work horses and mules between 1920 and 1925 took place in the eastern and central Corn Belt, in the Hay and Dairy Belt and in California, in brief, where the increase in tractors was greatest. But a notable decrease occurred also in Georgia, South Carolina, and in other southern states, which was associated with the decrease in total crop land harvested and can be attributed only partly and indirectly to the tractor and automobile.

4 per cent more cows were kept for milk in the period of 1922-1926 than in the period 1917-1921, but that about 22 per cent more milk was produced; that about the same number of swine were kept in each period, but that probably 20 per cent more pork and lard was produced; that slightly more sheep were kept, but that about 19 per cent more mutton and lamb was produced; that there were about 8 per cent fewer cattle, but that nearly 9 per cent more beef and veal was produced (figures 8 and 9). However, after allowance is made for the decline in the number of cattle on farms,

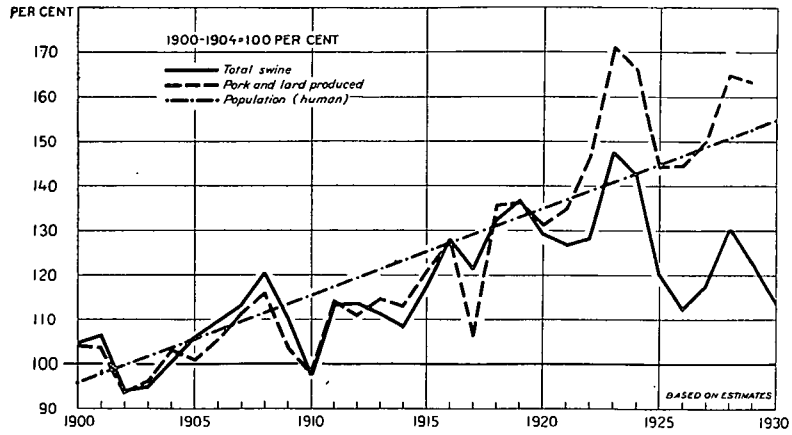

FIGURE 8. SWINE ON FARMS JANUARY 1, COMPARED WITH PORK AND LARD PRODUCED, AND POPULATION, 1900-1930

The production of pork and lard shows no deviation in trend from the number of hogs on farms from 1900 to 1920, that is, production per head on farms January 1, remained practically constant. Then the two lines began to diverge, and by 1923 production of pork and lard per hog on farms was about 18 per cent greater than in 1920, and by 1926 it was apparently 28 per cent greater. The production of pork and lard per person during the past decade averaged more than it did 25 years ago.

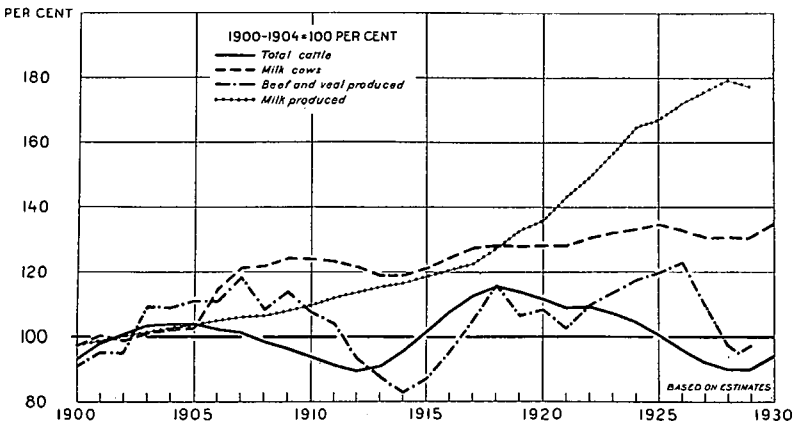

FIGURE 9. CATTLE AND MILK COWS ON FARMS JANUARY 1, COMPARED WITH THE PRODUCTION OF BEEF AND VEAL, AND OF MILK, 1900-1929

Two cycles in the number of cattle and in the production of beef are shown. The first cycle in number of animals began probably about 1896 and ended in 1914; the second cycle probably a year ago. In milk production, there is no cycle, but, instead, a constantly rising production, up to 1928. From 1918 to 1928 production increased much more rapidly than did the number of milk cows.

only a 9 per cent increase in the production of beef and veal per head on farms is indicated.

Increase in production per animal is, of course, greater than increase in production per unit of feed consumed; but, after including the feed released by the decline in horses and mules, it appears that the production of animal products in relation to feed consumed by the animals, increased in the neighborhood of 7 per cent between these two periods 5 years apart.

In the case of dairy cattle most of the increase appears to be assignable to improvement in the productiveness of the cows—principally to extensive slaughter of low-yielding cows; but for beef cattle and swine much of the increase was due to the decreasing number in the southern states, where the animals are less productive, and a stationary or, in the case of swine, increasing number in the Corn Belt and adjacent areas, where the animals are much more productive (figures 10 to 14). In the production of hogs there was also a great decrease in what may be called infant mortality, and improvement in feeding methods and sanitation. In the case of sheep much of the increase per unit of feed consumed was owing to the slaughter of lambs rather than of sheep, young animals making much more gain on the same amount of feed than old animals.

A third factor that affected the increase of production, but less important, was a shift from the less efficient classes of farm animals in the transformation of feed into food, toward the more efficient—principally from beef cattle and sheep toward dairy cattle and hogs. It requires only about three acres of crops fed to dairy cows or hogs to produce as much food as twelve acres fed to beef cattle.

Similarly there was a shift after the World War from the less productive crops per acre toward the more productive, notably from wheat toward corn in the Corn Belt, from corn toward cotton in the Cotton Belt, and from the cereal and hay crops toward fruits and vegetables in California and other fruit and vegetable producing areas.

Fifthly, there was a slight increase in the yield per acre of several crops, but this was the least important factor, accounting for less than 10 per cent of the increase of production. The land released by the decline in the number of horses and mules and the increasing efficiency of livestock in transforming feed into food,

account for fully two-thirds of the increase in agricultural production between the periods 1917-1921 and 1922-1926.

As already noted, expansion of crop acreage, which during the agricultural conquest of the continent was the major factor in increasing production, has ceased to be a factor since the war, the slight increase in acreage since 1924 just about balancing the decrease from 1919 to 1924.

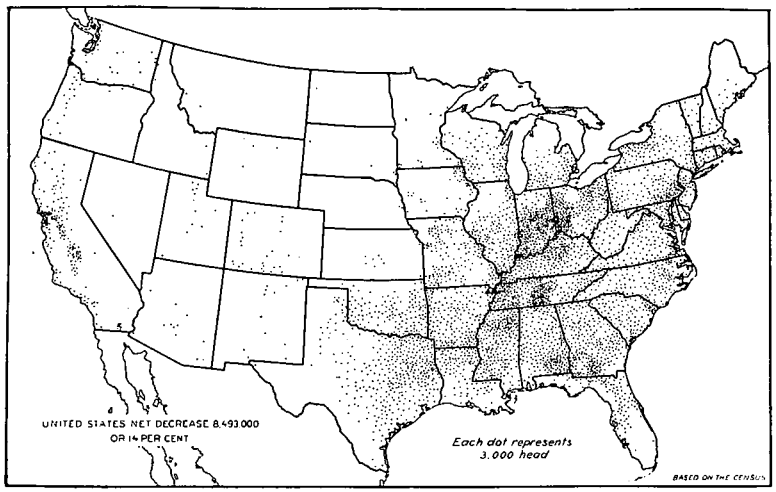

FIGURE 10. DECREASE IN NUMBER OF SWINE ON FARMS, JANUARY 1, 1920, TO JANUARY 1, 1925

The decrease in hogs between 1920 and 1925 was almost confined to the originally forested part of the United States, like that of corn, but extended a little farther to the north and west; a decrease also occurred in California. These are feed deficit areas except the eastern Corn Belt. Despite the 14 per cent decrease in the nation's hogs between 1920 and 1925, there was about 14 per cent more pork and lard produced in 1924 than in 1919, and 7 per cent more in 1925 than in 1920.

STATIONARY PRODUCTION 1927-1930

Let us now note the last period in the curve of agricultural production—1927 to date. For three years the trend of total production has been stationary, or, possibly, declining. The index number in 1926 was 157, in 1927 it was only 150 (the Mississippi flood diminishing production) in 1928 the index was 155, and in 1929, when adverse weather conditions were widespread, it was 151. During the present season of 1930 the drought has been severe in an area extending from Pennsylvania and Virginia to Texas and Missouri. It is too soon to tell whether this stationary condition

of production during the past four years is owing merely to the accidents of nature or in part to economic influences, but the fact that crop acreage has been increasing since 1924 suggests that it is almost wholly owing to adversities of the weather. Certainly it does not imply that American farmers are incapable of increasing production very greatly.

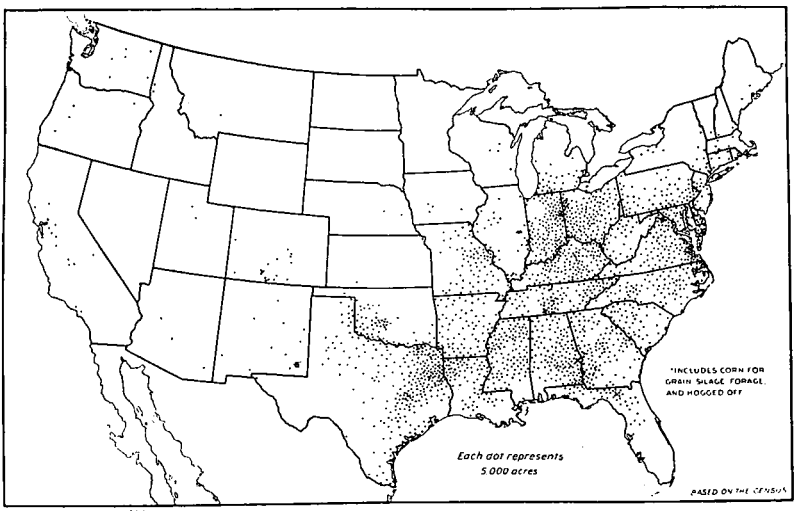

FIGURE 11. DECREASE IN TOTAL ACREAGE OF CORN, 1919-1924

The decrease in corn acreage between 1919 and 1924 was practically confined to the originally forested portion of the United States, where the soils are naturally poorer than in the prairie portion, and was greatest, proportionally, in the southern states. In the Indiana and Ohio portion of the Corn Belt, the decline in corn acreage was only a part of the shift from crops to pasture, resulting in part from the high wages obtainable in the nearby cities.

PRODUCTION PER ACRE AND PER MAN

Although agricultural production is now over 50 per cent greater than at the beginning of the twentieth century, crop acreage is only 20 per cent greater, and the amount of labor employed in agriculture is only about 12 per cent greater. Production per acre has, therefore, increased about 25 per cent, and production per man about 34 per cent. Most of the increase has occurred during the past decade, indeed, since 1921. The increase in production per acre between 1919 and 1929, two fairly normal years, was about 16 per cent, practically none of which is owing to increase in acre-

yields of the crop, while the increase in production per man was about 25 per cent.

THE PROSPECT FOR INCREASE IN PRODUCTION

It is unlikely that production per acre and per man will increase in the near future as rapidly as during the past decade, but it does seem likely that it will increase at as rapid a rate as during the past thirty years. The substitution of tractors for horses and mules

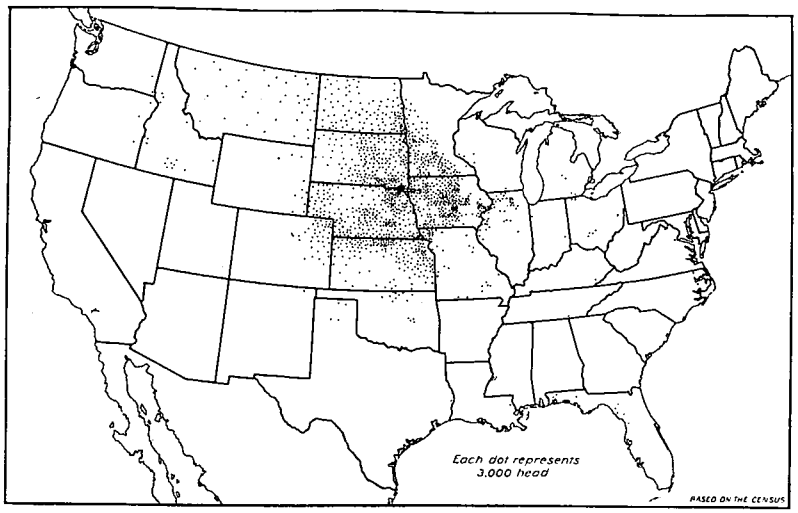

FIGURE 12. INCREASE IN NUMBER OF SWINE ON FARMS, JANUARY 1, 1920 TO JANUARY 1, 1925

The increase in hogs between 1920 and 1925 was notable in the western Corn Belt and in the Spring Wheat Region to the north, where the price of corn is the lowest in the United States. In these states there was a rapid shift from wheat toward corn and oats, while the number of horses decreased and the acreage of harvested crops increased. It will be noted upon comparing this map with figure 13 that the increase in hogs was not quite as widespread as the increase of corn.

is only about 25 per cent complete, and there appears to be no good reason why it may not become 50 per cent complete. Indeed, it must continue for several years since there are not half enough colts being raised to replace the horses and mules that die or become unfit for work annually. For fifteen years, perhaps longer, this release of farm land by the decline in horses and mules appears likely to continue, but by the time the nation's population becomes stationary this factor, probably, will have ceased to be important.

The increase resulting from the greater production of meat and milk per unit of food consumed by the animals will be limited, obviously, by diminishing returns, not only with reference to the feed but also with reference to labor and other costs. But the point of diminishing returns recedes with each advance in agricultural technique. Probably a century ago, when the average dairy cow gave perhaps 2,000 pounds of milk a year, the margin where returns diminished for the best cows was only 4,000 to

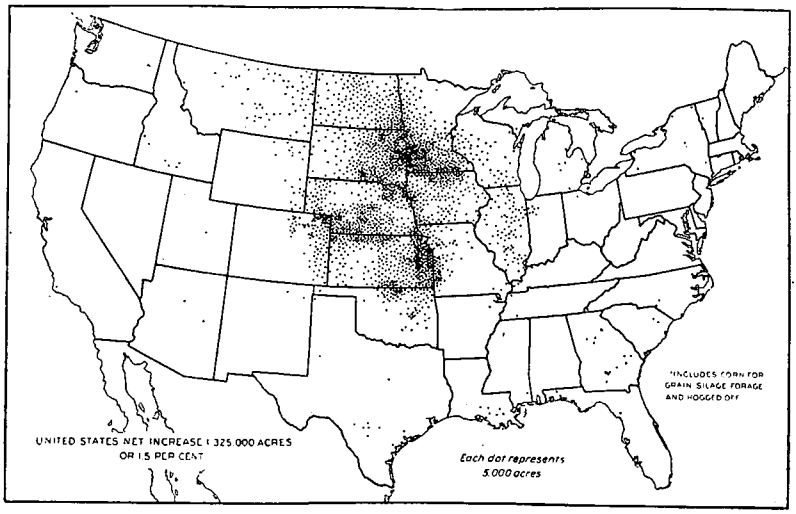

FIGURE 13. INCREASE IN TOTAL ACREAGE OF CORN, 1919-1924

In most of the region where the acreage of corn harvested increased between 1919 and 1924, the acreage of wheat decreased notably, and in the Dakotas there occurred also a considerable decrease in hay acreage. In southwestern Minnesota the increase in corn acreage was in part owing to a drought in 1919, and in part to drainage of land between 1919 and 1924. Partly as a consequence of the geographic shift in corn acreage, the production of pork and lard has been greater than ever before.

5,000 pounds; but now, when the average cow gives about 5,000 pounds of milk a year, the point of diminishing returns is around 14,000 pounds of milk for the best cows, according to the records of over 100,000 animals in cow-testing associations. During the past decade the yearly production of milk per cow has increased probably 1,000 pounds, or 25 per cent, whereas the consumption of feed has increased by only 15 or 20 per cent. Even if this recent extremely rapid rate of progress should continue, there is the possibility of increasing the efficiency of the milk cow in trans-

forming feed into food for many decades ahead. However, the increase in production of pork and lard per unit of feed consumed, which is owing mostly to better sanitation and reduction of the losses by death, probably will soon decline in importance. The same conclusion applies also to the increasing production of mutton and lamb per unit of feed consumed, which is assignable in large part to the increasing slaughter of lambs and the decreasing slaughter of sheep.

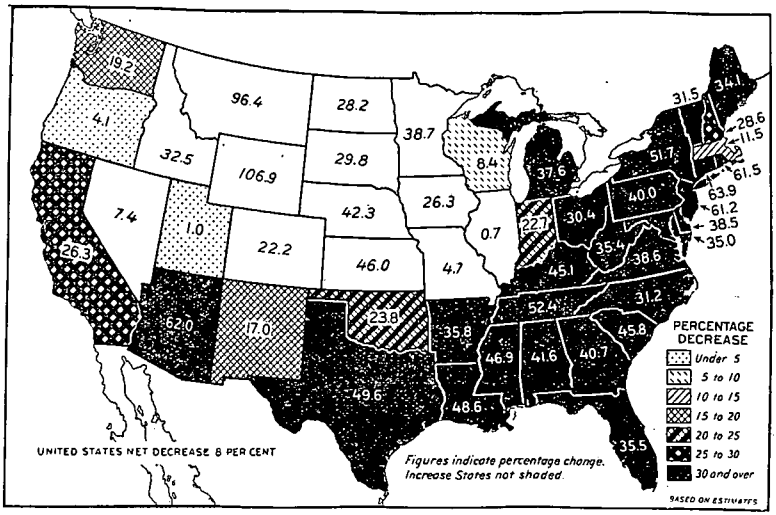

FIGURE 14. PERCENTAGE CHANGE IN NUMBER OF SWINE ON FARMS, JANUARY 1, 1920 TO JANUARY 1, 1929

The percentage change in the number of hogs on farms during the entire period 1920 to 1929 brings out profound geographic shifts in the industry. In the Cotton Belt the decrease in most states exceeds 40 per cent. The decrease is almost as great in Virginia, Maryland, and Pennsylvania, and is even greater in New Jersey and New York. On the other hand, from Missouri to Colorado and northward a notable increase has occurred, exceeding 40 per cent in Kansas and Nebraska, and mounting to about 100 per cent in Wyoming and Montana.

Both the mechanization of agriculture and the improvements in animal husbandry, which factors have been so influential during the past decade in increasing the agricultural surplus, are likely, therefore, to diminish in importance after a few years. Will other factors probably take their place and maintain the increase of agricultural production at much the present rate?

Of course, no one can answer this question with certainty; but in forecasting the future—and economic research must often fore-

cast the future if it is to be of practical value—it will be helpful to consider the factors which in the past have been the dominant factors in increasing agricultural production—the expansion of the crop acreage and higher crop yields per acre.

With reference to expansion of the crop area, there is about three-fourths as much land, now used for pasture or lying idle, which is suitable for crop production as that which is now used for crops—300,000,000 acres more or less.[5] This potentially arable land, of course, is mostly of lower productivity than that already in crops, but a rise in the prices of farm products such as occurred during the World War would bring millions of acres of this pasture and idle land under crop. The increase of the crop area between 1909 and 1919, most of which occurred during the war years, amounted to 45,000,000 acres; and an even greater expansion of the crop area probably would occur again if prices rose to a similar extent, for the tractor is admirably adapted to the task of expanding crop acreage rapidly.

With reference to increasing crop yields per acre, there are equally great possibilities. The use of mineral fertilizers is only in its infancy in the Mississippi Valley states, and even at present prices for farm products it would pay to use more fertilizer than is used. There are reserves of nitrogen in the air and of phosphate and potash in the earth sufficient to supply American farmers for hundreds of years.[6] The increasing importance of animal products in the nation's agriculture is a harbinger also of rising crop-yields. Several years ago it was estimated by a colleague in the Department of Agriculture that the average acre-yield of the ten most important crops, which occupy 90 per cent of the crop area of the nation, might be increased 50 per cent "when economic conditions shall justify the requisite cost of production," and there seems to be no reason to alter this estimate.[7]

Since nearly every invention, nearly every discovery, nearly every improvement in agricultural technique, nearly every advance in

[5] Consists of 34,000,000 acres of idle and fallow plow land, 112,000,000 acres of plowable pasture in farms, probably 50,000,000 acres of sub-humid pasture land not in farms, and 114,000,000 acres of semi-arid dry-farming land. See figure 28 of "Land Utilization and the Farm Problem," Miscellaneous Bulletin No. 97, of the United States Department of Agriculture, 1930.

[6] Guy E. Mitchell, "America's Resources in Nitrogen, Potash and Phosphorus," in Economic Geography, October, 1928, pp. 366-380.

[7] L. C. Gray and others, "The Utilization of Our Lands for Crops, Pasture and Forests," U. S. Department of Agriculture Yearbook, 1923, p. 469.

economic organization tends to increase production, and recalling that the increase in production per acre in crops has been about 25 per cent in the last 30 years—not from higher crop yields alone, but principally from the transfer of the product of 25,000,000 acres of crops from horses and mules to meat and milk animals and from the increasing efficiency in the utilization of feed, attained by these animals—it seems quite possible that an increase of 30 per cent in agricultural production per acre in crops, corresponding to the increase in population, may occur during the next 30 or 40 years, provided a profitable market can be found for the products. It is more likely, however, that there will be some increase in the acreage of crops.

If half of the arable pasture and idle plow land should meanwhile be put into crops, the agricultural production of the nation might be increased by two-thirds without diminishing the present forest area. Population is unlikely to increase more than one-third. Instead of population pressing on the food supply, as was feared a few years ago, the food supply is pressing on population in our nation, and appears likely to continue to do so. Apparently we are not likely to need, for domestic consumption, much more crop land than there is in crops at present, and the problem of disposing of the export surplus seems likely to remain with us. Questions as to how agricultural exports may be increased, and as to what shall be done with the potential crop land, need especially to be studied. Most of the potential crop land—which exceeds in area the present acreage in crops—appears unlikely to be needed for crops for many years, if ever.