This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: American Agriculture, 1899-1939: A Study of Output, Employment and Productivity

Volume Author/Editor: Harold Barger and Hans H. Landsberg

Volume Publisher: NBER

Volume ISBN: 0-87014-041-8

Volume URL: http://www.nber.org/books/barg42-1

Publication Date: 1942

Chapter Title: Agriculture in the Nation's Economy

Chapter Author: Harold Barger, Hans H. Landsberg

Chapter URL: http://www.nber.org/chapters/c4603

Chapter pages in book: (p. 289 - 322)

Part Four

Summary and Conclusions

Chapter 8

Agriculture in the Nation's Economy *

WE HAVE now to summarize the results set forth in preceding chapters and to consider their implications. Over the four decades since 1899 the output of farm products increased by about 50 percent, or at a somewhat slower rate than population.[1] Changes in the composition of this output were reviewed in detail in Chapters 2 and 3; here the briefest recapitulation must suffice. Citrus fruit increased in output more than tenfold; the production of sugar, vegetable oils, milk products and poultry doubled; potatoes and tobacco rose a little more than 50 percent. Cotton and livestock expanded less than 50 percent; grain production was about the same at the end of the period as at the beginning; and the net output of hay fell sharply over the four decades. These movements may be observed in comparative form in Chart 3.

In interpreting the behavior of the production data we found (Chapter 3) that the contraction of exports (in absolute terms and relative to farm output) has played an especially important part in moderating the expansion in the output of the grains, of cotton, and of livestock products. Tobacco, on the other hand, has been much better able to maintain its position in export markets, and its production

* A note on this chapter, by C. Reinold Noyes, Director, appears on pp. 316-21.

[1] Deficient coverage in early years is probably responsible for some downward bias in our index of output, i.e. it does not rise quite as rapidly as it should. On the most extreme assumption possible, i.e. that the output of every product omitted in 1899 was zero in that year, the rise in an index which included these items for the entire period would still be less than 60 percent (see Appendix A). Population rose by 75 percent between 1899 and 1939.

has been hampered to a smaller extent by the decline in foreign trade. To what is the decline in agricultural exports to be attributed? Among various causes the tariff policy of the United States itself is sometimes cited. Certainly the Fordney-McCumber Act of 1922 and the Smoot-Hawley Act of 1930 raised tariff rates on manufactured goods, on many minerals, and on some few farm products that are imported, to levels not previously attained. The consequent discouragement of imports might conceivably react upon farm exports in two principal ways. A rise in the price of manufactures, for example of farm machinery, might raise the costs of farming, and so both diminish the supply of farm products and push their prices to a level at which exportation became unprofitable. But this line of reasoning is tenuous, and seems to have had little applicability during our period of study. In fact the agricultural staples that are commonly exported were in ample supply in most years, and there is little to suggest that their prices were pushed up by high farming costs. The other principal way in which tariff policy may have reacted upon farm exports is through the diminution of the supply of dollars available to our customers who were unable to make sales in the United States. This approach perhaps affords a more promising method of tying up the observed reduction of agricultural exports with domestic tariff policy. At the same time, however, one must recall that for a considerable part of the period under observation exports were to a large extent financed by foreign lending or by the import of gold, so that the connection between total United States imports and total exports from this country must have been a somewhat loose one.

In the future there may possibly arise situations in which the volume of farm exports is immediately related to the level of the tariff. We cannot doubt that in the long run our tariff policy is one of the determinants of the total volume of our exports, for anything which restricts imports must even-

tually restrict exports also. But since the beginning of the century it would seem likely that other factors in the situation were of more immediate importance, at any rate in reducing the volume of *farm* exports. We have already referred, for instance, to the trend toward agricultural protection in Europe, a trend with many different elements, and one which may be explained only to a minor degree, if at all, by the tariff policy of this country. Partly because of this, but partly also as a result of progress in the art of manufacturing, the character of American exports has undergone a drastic change. For example, around 1900 about two fifths of American exports (in value terms) consisted of foodstuffs; in recent years, before the outbreak of the present war, foods comprised only about one tenth of all our exports. In part at least, the decline in farm exports is the obverse of the increased contribution to total exports by the products of manufacturing industry—a shift which would naturally occur as the nation became more highly industrialized.

Whatever its causes, the decline in the share of farm produce absorbed by overseas markets has substantially increased the influence of the domestic consumer in determining the output of agriculture as a whole, and of individual farm products, from one period to another. The fact that some 85 percent of net farm output is destined for human food, most of which is consumed domestically, prompted us to examine, in Chapter 4, the character of the nation's food supply. The main findings of that inquiry were a rather steady decline in per capita intake of calories, and a tendency toward expansion in the consumption of milk products and fresh fruit and vegetables. Such an increased use of the "protective foods" is in accordance with the recommendations of dietary science. On the other hand, both the tentative estimates we have been able to make for per capita consumption of several vitamins and minerals, and the results of other recent studies, suggest that there are still serious nutritional defi-

ciencies in the diet of a large part of the population. Accordingly, the principal scope for the expansion of agricultural output in the future appears to be in the production of larger quantities of the "protective foods." This seems likely to come about partly by spontaneous assimilation, through rising living standards, of lower-income-bracket diets to those already common in the upper income brackets; and partly through the more general dissemination of recent advances in nutritional knowledge. A greatly increased demand in the future for the older staple foodstuffs, for textile fibers, or for tobacco, appears, especially in view of the slowing down of population growth, to be much more problematical.

So much for trends in output. What is to be said concerning agricultural productivity?

In spite of the difficulty of measuring agricultural employment, we can say at least that it was no higher, and probably that it was somewhat lower, in 1939 than in 1899. Total numbers occupied (including women, and children 10 years of age and over) reached a peak some time between 1910 and 1920, and in 1930 stood 3 or 4 percent lower than in 1900; but this movement concealed an increase of about 10 percent in farmers plus adult male laborers (Table 36). It may be supposed that on the average women and children work less hard and less continuously than do adult males. Clearly an index of labor input which took proper account of such differences would move somewhere between the indexes just quoted, and would reveal little change between 1900 and 1930. Data for computing the number of farmers and adult male laborers from the 1940 Census have not yet been released; but in 1940 total numbers occupied fell sharply to a point 16 percent below their level at the turn of the century. It seems probable that other measures of labor input also would be lower in 1940 than in 1900 if we could compute them. Thus, farmers and adult male laborers began to decline after 1920, and in 1940 must have numbered about the

same as in 1900. If suitable account is taken of women and child workers, therefore, employment in 1940 would measure perhaps 5 or 10 percent, but not as much as 16 percent, below its level at the beginning of the century. And if labor input was lower at the end of the forty-year period covered by this study than it was at the beginning, production per worker must have increased somewhat more rapidly than total output, i.e., by more than 50 percent (Table 38). Put otherwise, labor input per unit of output must have declined by at least one third.

If we take a somewhat longer view and carry our indexes back to 1870, we find that output almost quadrupled, while the labor force increased during the seven decades considered by about one third (without regard to changes in its composition). As a result, output per worker nearly tripled, increasing at an average rate of about 16 percent per decade (Table 39). The gain in productivity seems to have been particularly rapid since 1920, but this may result from the increasing proportion of adult males in the labor force.

The prevalence of mixed farming, and the impossibility of obtaining comprehensive data for the labor input associated with individual products, prevent us from accurately distributing these gains in efficiency among different kinds of output or varieties of farming enterprise. But the discussion in the preceding chapter suggests that productivity has increased more rapidly in crop production than it has in dairying or the raising of livestock. Nor is such a result surprising, in the light of the advances in agricultural technology described in Chapter 5. It is plain that in this field the outstanding development of the last forty years has been the exploitation of the gasoline tractor; and it is easy to see that economies in crop labor attributable to the tractor must have far outweighed similar economies in the raising of livestock or the care of milk cows. Moreover, although the mechanization of dairying is capable of lightening in marked degree the bur-

den of caring for milk cows, the evidence adduced in Chapter 7 suggests that up to the present such effects have been largely offset by more stringent sanitary regulation of the dairy industry. Indirectly the tractor has aided dairying by improving the availability of feed. And it is possible that in the future improved breeding methods, and the more general application of mechanical power (e.g.) to milking, may lead to gains in the efficiency of dairying comparable to those already achieved in the production of staple crops.

Trends in output, employment and output per worker in agriculture are in marked contrast to analogous trends in manufacturing industry. Compared with a 50 percent increase in farm production, the physical output of manufactured goods in 1939 was some four times its volume at the beginning of the century. Whereas the output of farm products barely kept pace with population growth, that of manufactures grew far more rapidly. Moreover, while farm employment in 1940 was the same as, or somewhat smaller than, it had been in 1900, employment in manufacturing nearly doubled in four decades. The contrast in the behavior of output per worker is somewhat less striking but still significant: for agriculture the index rose by about 50 percent, while for manufacturing it doubled. If we could compare changes in output per manhour in the two branches of activity a sharper contrast would probably result, for data considered in Chapter 7 suggest that the reduction in the hours of agricultural labor (per week or per year) have been slight, whereas similar reductions in manufacturing are known to have been substantial.

The stationary level of employment and the comparatively mild expansion in output shown by agriculture would probably contrast markedly with experience in several other segments of industry besides manufacturing, were comparable data available. But since we seek to observe the change in the status of agriculture in the economy of the nation as a whole,

our purpose should be to compare farming, not with this or that activity selected at random, but rather with all other industries combined. This can be done only for characteristics that are measurable over the entire economy. For physical output no such comprehensive data are available, but we do have estimates for the total number of gainful workers, and for national income, for the United States as a whole at different dates. The position of agriculture in the economy is illustrated in terms of these measures in Tables 53 and 54. The estimates for the share of income accruing to agriculture are probably subject to a rather wide margin of error in early years, but it has seemed preferable nevertheless to present data for as long a period as possible.

TABLE 53

PERCENTAGE SHARES OF AGRICULTURE AND MANUFACTURING IN REALIZED INCOME, 1799-1937[a]

Year	*Agriculture*	*Manufacturing*	*Other Activities*
1799	39.5	4.8	55.7
1809	34.0	6.1	59.9
1819	34.4	7.5	58.1
1829	34.7	10.3	55.0
1839	34.6	10.3	55.1
1849	31.7	12.5	55.8
1859	30.8	12.1	57.1
1869	24.1	15.9	60.0
1879	20.7	14.5	64.8
1889	15.8	21.1	63.1
1899	21.2	19.6	59.2
1909	22.1	20.1	57.8
1919	22.9	25.8	51.3
1929	12.7	26.2	61.1
1937	12.3	30.3	57.4

[a] R. F. Martin, *National Income in the United States, 1799–1938* (National Industrial Conference Board, 1939), Table 17. Data for 1937 exclude benefit payments. The income totals on which these percentages are based include neither corporate savings nor income produced by government. On this account the percentages shown above for agriculture and for manufacturing run somewhat higher than those given by Simon Kuznets, *National Income and Its Composition, 1919–1938* (National Bureau of Economic Research, 1941), Table 12.

It will be seen that the farmer's share in national income has followed a downward trend for at least a century; by contrast the fraction of income accruing to manufacturing industry exhibits a rising tendency. To a large extent these two movements have been complementary, the expansion of manufacturing being but the obverse of the relative stagnation of agriculture. The percentage of income accruing to "other activities" in Table 53 has not altered greatly.

Figures for recent years compiled at the National Bureau by Simon Kuznets suggest that within the past decade the downward trend in the percentage of income accruing to agriculture may have been arrested, at least temporarily.[2] For example, according to Dr. Kuznets' data, which include benefit payments in agricultural income and differ in scope from the figures in Table 53 in other respects also, no decline occurred between 1929 and 1937 in agriculture's share of the income of the nation. In what measure the recovery of agriculture's share from an all-time low in 1932 is to be attributed to the Agricultural Adjustment program it is impossible to say.

For the distribution of gainfully occupied workers we have estimates by the Bureau of the Census which begin in 1820 and tell a similar story. Here again (Table 54) the share of agriculture has declined and the share of manufacturing has risen. In 1870 more than half the occupied population was engaged in agriculture; in 1940 little more than one sixth.[3] Half the occupied population is now engaged in activ-

[2] Simon Kuznets, *National Income and Its Composition, 1919–1938* (National Bureau of Economic Research, 1941), Table 12, p. 164.

[3] In respect of income shares "other activities" appear not to have altered their importance appreciably (Table 53); whereas it would seem that agriculture has lost workers (relatively speaking) not only to manufacturing but to other occupations also, and the latter change appears to be the larger. As a means of judging shifting importance, Table 54 probably gives the more accurate picture, for the income data we have quoted (Table 53) take no account of income produced by governmental activity, increasingly important in recent decades.

ities other than farming and manufacturing, and the increases have been largest in clerical occupations and in the professions.

The striking decline in the relative importance of agriculture in the economy of the nation must undoubtedly be attributed to the superior attractiveness of other occupations. At the same time one must avoid the conclusion that

TABLE 54
PERCENTAGE SHARES OF AGRICULTURE AND MANUFACTURING IN THE GAINFULLY OCCUPIED POPULATION, 1820–1940

Year	*Agriculture*	*Manufacturing and Mechanical Industries*	*Other Activities*[a]
1820	71.8	28.2	
1830	70.5	29.5	
1840	68.6	31.4	
1850	63.7	36.3	
1860	58.9	41.1	
1870	53.0	20.5	26.5
1880	49.4	22.1	28.5
1890	42.6	23.7	33.7
1900	37.5	24.8	37.7
1910	31.0	28.5	40.5
1920	27.0	30.3	42.7
1930	21.4	28.9	49.7
1940	17.6	82.4	

Source: U. S. Bureau of the Census, "Industrial Distribution of the Nation's Labor Force: 1870 to 1930," and "Trends in the Proportion of the Nation's Labor Force Engaged in Agriculture: 1820 to 1940" (press releases, Oct. 23, 1938 and March 28, 1942 respectively).

[a] Includes government.

since the share of farming in the national income has been consistently smaller than its share in numbers engaged (see Tables 53 and 54) it therefore provides us with a measure of the unattractiveness of agriculture. This is certainly not the case. During the first half of the nineteenth century, at a time when farming did not yet suffer in any important de-

gree from the competition of manufacturing in attracting resources, agriculture's share of the national income was only about one third, despite the fact that it provided a living for more than half of the occupied population. In the case of farming, measurable income per occupied person has probably been below the national average since very early times, yet this state of affairs does not indicate an inferior position in the competition for the economic resources of the nation. Such statistics understate the net advantages of farming for several reasons. First, we cannot take adequate account of income produced in kind. Second, rural occupations probably have a superior appeal for many persons. Third, capital employed in agriculture tends to be owned by those who are themselves engaged in farming, so that the fraction of income accruing to those who do not report themselves as occupied in the industry is smaller in agriculture than it is elsewhere. Finally, agriculture bulks large in several southern states where income per person occupied (in all industries together) is much below the national average.

> Farming has a powerful attraction for large numbers of people, in spite of the risks and hardships associated with it, and the low financial return that it yields to the capital and labor employed. It commonly assures at least a minimum living at moderate cost. It is easy to enter, though for certain types considerable capital is essential. It does not require extensive training, though specialized education and experience both contribute to efficiency and pecuniary success. Children of farmers particularly find it easy to stay on the farm, and adults established in farming often find it difficult to quit. Many like not only to live but to work in the open country, and get very real satisfaction out of cooperating with Nature in making plants and animals grow. Farming is the principal remaining field of independent enterprise other than retail-store keeping, and that freedom is cherished in spite of its practical limitations. Many who have tried urban occupations

> and residence find that these have drawbacks not apparent at first sight. Moreover, developments of recent years have made available to farmers in some countries, at a cost within reach of large numbers, such additions to their traditional standards of living as electricity, the telephone, automobile, and radio, and have lightened their drudgery with mechanical devices for farming and the farm household.[4]

For all these reasons, the fact that measurable income per head is lower in farming than elsewhere can in no wise be taken as proof of the inferior attractiveness of agriculture as a form of economic activity.[5] Nevertheless, although it cannot be demonstrated statistically, we may be reasonably certain that the real return to farming has lagged in competition with other types of activity. Only on the assumption that this is so can we explain, in a system of free enterprise and choice of occupation, the apparently continuous decline in the importance of farming in the economy as a whole.

An agriculture which expands less rapidly than other forms of activity, or which shows actual contraction, has, with only temporary exceptions, been a characteristic of the industrialization of most if not all western countries. In Britain, for example, those engaged in agriculture represented 12.5 percent of all gainfully occupied in 1881, 5.7 percent in 1931. In Germany the corresponding percentage declined from 41.5 in 1882 to 33.7 in 1933. Similar results could be quoted for other European and probably also for some Asiatic countries. It may be objected that in Europe the trend was magnified through the substitution of imported foodstuffs and textile materials for the products of domestic agriculture; in the United States the substitution of imported

[4] J. S. Davis, *On Agricultural Policy, 1926–1938* (Food Research Institute, Stanford University, 1939), pp. 34-35.

[5] Agriculture's smaller share in income than in numbers has also been noted in Germany. See Wilhelm Bauer and Peter Dehen, "Landwirtschaft und Volkseinkommen," *Vierteljahrshefte zur Wirtschaftsforschung, 1938–39,* pp. 411-32.

for domestic foods and fibers has played but a microscopic role in retarding the growth of farming. But it is doubtful if, even in Europe, except perhaps in Britain, the substitution of imported for domestic farm products has been the most important factor in the growth of nonagricultural occupations at the expense of farming. Nor can the drop in the exports of American farm products explain the decline in the relative importance of agriculture in this country, for the latter antedates the former. Declining exports, like the disappearance of the urban demand for horse feed, have intensified a trend which began many decades earlier.

To discover the factors chiefly responsible for the declining relative importance of agriculture as a source of livelihood we must look elsewhere. In the first place, farmers are now relieved of many of the functions which they once performed. The manufacture of butter and cheese and the slaughtering of animals have been largely transferred, within the last hundred years, to nonagricultural establishments. Even more important in recent decades has been the substitution of mechanical for animal power. Time was when the farmer raised both his own horses and the materials with which to feed them: now he buys tractors, gasoline and oil. These transfers of function—mainly from farming to manufacturing—have diminished the number of *agricultural* workers needed to produce a unit of farm output. But we should beware of assuming, merely on this account, that the total number of persons—farmers and nonfarmers—engaged in producing a given product has diminished.[6]

[6] The transfer of cheesemaking from the farm to the factory had been practically completed by 1899. Some slaughtering is still performed on farms, but the majority of animals were already being killed at the factory when our period opened. The production of farm butter has been diminishing, but it is still important: our indexes of output and productivity are so constructed that they take this change into account. In Chapter 7 estimates were given for the saving of labor occasioned by the tractor in the raising and feeding of work animals, but no allowance for this saving has been made in computing our indexes, and in this respect they overstate the rise in agricultural productivity.

When all necessary allowance has been made, however, for qualifications of this sort, it still appears to be true that the proportion of the labor force engaged in agricultural pursuits has declined rather steadily. Now, we should expect those branches of activity in which technological development is most rapid to lose labor, as the years go by, to other branches whose techniques of production have progressed little or not at all—unless indeed products of the one group can be substituted for products of the other group easily enough to prevent this from happening.[7] Prominent among the first group are most of the commodity-producing industries; among the second, those types of endeavor whose business it is to furnish services. In a rough kind of way we may identify the latter group with the "other activities" of Table 54. As employers of labor these activities—and especially educational, medical, distributive and governmental services—have become steadily more important. Data for 1940 have not yet been released: but we may note that although the fraction of the labor force engaged in manufacturing and mechanical industries was higher in 1920 than it had been at any previous Census, by 1930 these occupations also had begun to lose adherents to "other activities." In large part such developments must be viewed as the natural outcome of differing rates of technological advance.

But technological change is not the whole story. It seems likely that agriculture's share of the working population has

[7] Alfred Marshall, *Principles of Economics* (8th ed. Macmillan, 1920), pp. 274-77. However, there is evidence that an opposite relation holds among individual manufacturing industries. For these industries changes in output per worker and in employment appear to be positively correlated. (See Solomon Fabricant, *The Relation Between Factory Employment and Output Since 1899,* Occasional Paper 4, National Bureau of Economic Research, 1941, pp. 16-20; the matter is discussed further in the same author's *Employment in Manufacturing, 1899–1939,* National Bureau of Economic Research, 1942.) No doubt the substitutability among manufactured products is greater than that between such products and other types of good. If the demand for the product of an industry is sufficiently elastic, its employment may clearly increase even in the face of very rapid technological change.

declined for other reasons also. We have seen that among farm products foodstuffs are easily first in quantitative importance. In the United States, judged by value, about 85 percent of net farm output consists of food for human consumption. For purely physiological reasons there is a rather rigid limit to per capita consumption of food in terms of weight, calories and other constituents. For a population with a given age distribution, therefore, we should expect the demand for food to be inelastic, when related to real income, once this limit is approached.[8] The results of family budget studies suggest that this is the case, i.e. that the elasticity in question is positive but less than unity.[9] As long as the elasticity is positive, we would expect some increase in consumer expenditure on food to accompany an increase in real income. But it is not so certain that higher living standards must also involve increased expenditure upon the output of foodstuffs by farmers. For increased expenditure on food by consumers may mean merely that the packaging or processing of the foodstuffs in question has become more elaborate, or it may reflect the purchase of increased amounts of the services associated with food consumption—for example, of restaurants. The tendency for increased food expenditures to take this form suggests that the elasticity of demand for the raw foodstuffs produced by agriculture must be significantly less than the corresponding elasticity as measured by consumer expenditures.

The elasticity which is relevant to the demand for agricultural output is of course one which measures the increase in the consumption of raw foodstuffs, rather than the increase

[8] Elasticity of demand in terms of income is measured approximately by the percentage increase in consumption associated with a 1 percent increase in income.

[9] For example, data collected by the National Resources Committee for 1935–36 yield an indicated elasticity of demand for food, in terms of income, of about 0.5 for the population as a whole (National Resources Planning Board, *Consumer Expenditures in the United States,* Washington, 1939, Tables 19A and 20A).

in consumer expenditures for food, which occurs as the real income of the community rises. We may first of all consider the consumption of such foodstuffs by weight or in terms of calories. In the case of the United States, as we have seen in Chapter 4, rising living standards [10] have been accompanied by an actual reduction in per capita consumption of calories. We should hesitate to conclude on this account that the elasticity of the demand for food, even when expressed in calories, in terms of real income, is actually less than zero, for concurrent changes have also taken place in the occupations and habits of the population, changes related only very indirectly to the increase in per capita real income as this concept is ordinarily understood. Moreover, there probably still exist in the United States some rather restricted groups of people who consume substantially less than their physiological requirements, not of this or that food element, but of food in general, whether measured in pounds or in calories. Yet when all necessary qualifications have been made, it seems an inevitable conclusion that the income elasticity of demand for food in general—in this sense—cannot be significantly positive in the United States today. We may expect, in other words, that a further rise in the standard of living will indeed lead to larger (though not proportionately larger) consumer expenditures on food, but will fail to lead to any appreciable increase in food consumption per capita, measured in physical terms, even if important changes should occur in the character of the food supply. But elasticity of demand is not the only consideration. As the average age of the population continues to rise and occupations become more sedentary, it is likely that we shall see a continuation of the tendency for per capita consumption of food, in terms

[10] Per capita income payments, in constant prices, increased about 10 percent between 1909–13 and 1934–38 (Simon Kuznets, *National Income and Its Composition, 1919–38,* National Bureau of Economic Research, 1941), Table 11.

of calories, to decrease. Similar conclusions would probably hold for other western countries.

Once per capita intake of food approaches its physiological optimum (or maximum)—and we must suppose that for the bulk of the population in the United States this stage was reached many decades ago—we should expect a decline in the fraction of the community's resources devoted to producing food. Only if there were marked changes in the composition of the food supply, or an entire absence of technical progress in agriculture, would this expectation be unfulfilled. But we know that in fact continual advance has characterized agricultural technology; while crop yields per acre have increased only slowly, substantial increments have occurred in output per worker engaged. To be sure, the decline in labor per unit of product has been more rapid in many other sectors of the economy than it has in agriculture; but where the income elasticity of demand for the product of an industry is zero, *any* increase in labor productivity must lead to a decline in its percentage share of occupied population. In the past the farmer has chiefly sold calories, the elasticity of demand for which is low. This goes far to explain the decline in the relative importance of farming that has already occurred. Unless other factors intervene, moreover, the further advances that may be anticipated in agricultural technique appear to insure that the secular decline in the fraction of the nation's human resources engaged in farming will continue.

Unless other factors intervene: but what are the other factors that must be considered in this connection? One has already been suggested—the possibility of a change in the character of the food supply. The rather rigid limitation imposed by physiological considerations upon food intake in terms of pounds or calories does not rule out a shift toward more expensive foodstuffs—those which use up a larger quantity of agricultural resources per pound or calorie. Man does not live by calories alone, and both the foods richest in vita-

mins and minerals and those of superior flavor require in general a larger expenditure of resources per calorie or per pound of nutrient than do the traditional staples in the diet of our ancestors. It is probable that a continued upward tendency in real income per capita will lead to a diversification of diet of this character. We can hardly hope to determine to what extent such a change can be expected to result from advances in nutritional education or medical propaganda, and to what extent it may eventually come about through the reconciliation of diets characteristic of the lower income brackets with those common in the upper brackets. But that such a change is already under way may be seen from the evidence presented in Chapter 4, and especially from the persistent decline in the per capita consumption of cereals.

It was suggested in Chapters 5 and 7 that technical progress has been slower in the production of dairy products and vegetables than in that of crops, and it may well be that the provision of a given supply of calories in the first form requires more labor than in the second. But there are already indications that this backwardness in technique may be remedied before long, perhaps through wider use of milking machines and advances in breeding in the case of dairying, and the all-purpose tractor and the selection of seed in the raising of vegetables. The tendency for dairy and other livestock products to expand faster than crop production, a tendency which, we saw in Chapter 2, dates from about 30 years ago, is likely enough to continue. Yet it does not seem probable that this trend can do more than mitigate in some degree the decline to be expected for other reasons in the demand for the services of agriculturalists.[11]

[11] It has been suggested (J. P. Cavin, H. K. Stiebeling and Marius Farioletti, "Agricultural Surpluses and Nutritional Deficits," *Yearbook of Agriculture, 1940,* p. 334) that raising the American diet to the level designated by the Bureau of Home Economics as "expensive good diet" would call into production some 30 to 40 million acres; such a quantity would constitute a substantial compensation for acreage taken out of producing staples and might be capable of absorbing a sizable fraction of the present surplus farm popula-

A second possible development that might check the secular decline in the relative importance of agriculture is an expansion in the demand for industrial raw materials. The chief industries using farm products are those processing tobacco, cotton and wool; industries making or using starches and oils; and industries manufacturing wine, beer and distilled spirits. The demand by these industries for the products of domestic agriculture depends partly upon the availability of similar materials from abroad, and partly upon the competition of substances not of agricultural origin. The principal domestic products subject to competition from imports are vegetable oils, wool and hides—and among the foodstuffs, sugar. In the case of at least two of these—wool and sugar—domestic output has been powerfully influenced by the availability of imported supplies.[12] The competition of nonagricultural products is felt mainly in respect to fibers; there can be little doubt that rayon has diminished the demand for cotton and possibly, to a minor extent, for wool also. But apart from substitutions of this sort, the elasticity of demand, in terms of real income, for textile products in general is probably not very great, even if it considerably exceeds the very low elasticity we associate with foodstuffs.

---

tion. The assumption is not, however, too realistic. At manhours prevailing in 1932–36—as estimated in various National Research Project studies—a raising of our diet to not quite as high a level, namely that designated "good" (see Chapter 2 above) would, according to estimates made by the authors, call for an additional expenditure of 2.8 billion manhours, or 900,000 manyears at 3,000 hours per man per year. This calculation rests on the assumptions (1) that no compensating reductions in output occur in other parts of agriculture, i.e., that the additions suggested above are *net;* (2) that the proposed changes are accomplished in a comparatively short time interval so that their effect in providing additional labor opportunities will not be seriously impaired by technological advances in just those expanding fields. Furthermore, the conversion of manhours into manyears rests on the questionable ratio of 3,000 hours per year and assumes that none of the additional labor could be performed by agriculturalists not now fully employed. However rough the nature of these computations, they indicate that not too much can be expected from shifts in diet.

[12] See Chapter 3 above.

National Resources Committee data for 1935–36 indicate an elasticity of about 0.9 for clothing, which suggests increased purchases slightly less than proportionate to any rise of income which may occur. It is unlikely, however, that the income elasticity of demand for raw fibers to be used for clothes is as high as this; for we must suppose that increased expenditures for clothing result, in part at least, from a higher degree of fabrication of the article concerned.

To be sure, a large amount of attention has been devoted to the question of new uses for cotton—for example as a base for plastics and even as road material. Indeed it seems obvious that any substantial expansion in the use of farm products as industrial materials must come as a result of technical changes outside agriculture. The more extended use of vegetable oils and of a wide range of corn and soybean by-products by the chemical and allied industries must wait upon the progress of manufacturing technology. Most agricultural products can be converted into industrial alcohol; large quantities of grain will undoubtedly be used for the purpose during the present war. Attempts to manufacture paper from cornstalks have been a failure commercially, whereas the use of flaxstraw in making carpets has apparently succeeded.[13] But there is little sign that potential uses of this kind for farm products offer a field in which they can effectively compete with much cheaper substances derived from other sources. It is possible therefore, though it seems unlikely, that developments of the kind mentioned will arrest the transfer of labor from agriculture to other occupations.

Thirdly, the downward trend in the relative importance of agriculture may conceivably be halted through a revival of foreign trade. As long as the present war lasts, the volume of farm exports will be determined mainly by the size and scope of lend-lease shipments. To date, so far as concerns agricul-

[13] H. E. Barnard, "Prospects for Industrial Uses for Farm Products," *Journal of Farm Economics,* Vol. XX (Feb. 1938), pp. 119-33.

tural commodities, these shipments have consisted largely of food products of animal origin. The export of such staples as cotton and tobacco has fallen to a low level. After the war is over, large quantities of American farm products will probably be sent to Europe and elsewhere during the process of reconstruction. But the question considered here concerns a rather longer view. What are the prospects for agricultural exports in the post-war world? Certainly, with the possible exception of tobacco, the trend in farm exports has been downward for at least two decades.[14] A reversal of this trend has frequently been held to depend on the inauguration of a regime of freer international trade. There can be no doubt that the reduction of barriers, especially by nations that are potentially food-importing, would measurably increase the volume of international trade in agricultural products. The question still remains, how much of these overseas markets would accrue to the American, and how much to the Argentine, the Egyptian, or the Australian farmer? For, by and large, if the tariff barriers of importing nations fall, they will fall for others besides ourselves. It is not certain that the comparative advantage of the United States in respect to the things which it exports, as that phrase is used by students of international trade, is as great as it was formerly; or even, in the case of some products (possibly including wheat) that it still exists. If the advantage of the United States in exporting farm products has declined, such a decline must, like the fall in relative numbers engaged in agriculture, be viewed as the obverse of the growth of manufacturing and of other activities. But this possibility suggests that, even if tariff barriers are substantially reduced upon the return of peace, the revival of farm exports by this country may well be on a rather modest scale.

There remain two other influences to consider—government policies initiated during the past decade, and the demand created by the present war. Since 1933 the original

[14] The evidence on this point was discussed in Chapters 2 and 3 above.

Agricultural Adjustment Act and its successors have applied acreage and marketing restrictions to numerous crops and have distributed substantial Federal appropriations to farmers in return for soil conservation and for other purposes. These measures appear to have raised farm income significantly above the level it would otherwise have reached. However, they have not prevented agricultural output from attaining record levels, nor have they brought to a halt the steady decline in the relative number of persons engaged in farming. There are two ways—and only two ways—in which government policy might conceivably prevent a further decline in agriculture's share of the working population. One is by promoting a still more rapid expansion of output; the other is by halting the rise in output per worker.

Current agricultural policy affects the demand for farm products by promoting research, particularly toward new uses for fibers; by diverting surplus commodities toward, or subsidizing consumption by, lower income groups; and by subsidizing the export of farm products. Within recent years the Department of Agriculture has been active in all three directions. Of these, only the development of new uses for farm products could permanently check the drift away from the land, and few such uses are yet in sight. The diversion of surpluses toward lower income groups, especially under the food stamp plan, is a venture of appreciable size, but its effect upon output is ultimately limited by the potential disappearance of the undernourished. Export subsidies have still more obvious limitations so far as long term expansion is concerned. To date the adjustment programs have tended to emphasize the restriction of output, at least so far as increased farm income might encourage the expansion of staple crops. Even if, as many consider, Agricultural Adjustment has come to stay, its probable effects upon the long term level of agricultural output appear distinctly limited.

It hardly seems possible that our current agricultural

policies will halt the rising trend in output per worker. Whether or not the farmer continues to have a motive for improving his methods and increasing the productivity of his enterprise depends very much upon the mechanism by which his activities are controlled. Under the original Agricultural Adjustment Act of 1933 and under the Soil Conservation and Domestic Allotment Act of 1936 the chief emphasis lay upon acreage reduction, and where this is the principal form of control a strong motive remains for the improvement of yield per acre. It has been argued that some of the early programs "tended to subsidize inefficient and high-cost farming to a significant extent." [15] And on the other side it has been claimed that the more recent soil conservation plans, besides encouraging soil-building and the concentration of crops on the best land, have had some effect in hastening the adoption of superior techniques at other points also.[16] In the cotton and tobacco acts of 1934 control shifted to the marketing quota, and in the Agricultural Adjustment Act of 1938 provision for marketing restrictions was extended to wheat, corn and rice. The same method of control has been applied also to a number of minor crops, particularly fruit and vegetables. Where marketing quotas are in force the advantage of obtaining a higher yield per acre is diminished, but other forms of cost reduction may still appear worth striving for. Evidently, technological advance may continue. In fact there is little reason to suppose that government policy will prevent further increases in output per worker.

We may conclude that the number of persons likely to be engaged in farming in the future is not subject to any appreciable influence by present government policies. Increased rewards to agriculturalists may slow down the drift from the soil, but we may still expect that, as opportunities for em-

[15] E. G. Nourse, J. S. Davis and J. D. Black, *Three Years of the Agricultural Adjustment Administration* (Brookings, 1937), p. 374.

[16] T. W. Schultz, "Economic Effects of Agricultural Programs," *American Economic Review*, Vol. XXX, No. 5 (Feb. 1941), p. 139.

ployment in nonagricultural occupations expand, the fraction of the working population engaged in farming will continue to diminish.

In spite of its obvious current importance, it seems difficult to believe that the present war can have much influence upon the long-term tendencies we have examined. During the first World War the output of many farm products went to record levels. It was a substantial undertaking to feed and clothe large armies and to supply our allies. Today, too, outlets exist (with few exceptions) for all the produce our farms can furnish. Increase in food exports, coupled with decline in imports (starch and sugar), and expanded demand for materials (especially fibers and oils) by industry will insure record agricultural output and income as long as hostilities continue. And when the present war is over, food may be needed by starving populations on the continent of Europe. For a time shortages of fertilizers and machinery, and even of labor, may be expected to restrict farm output in Europe and perhaps in other parts of the world as well, and thus temporarily maintain a high level of exports by the United States. But it seems reasonably certain that within a very few years after the advent of peace the trends discussed in this chapter will reassert themselves. There appear to be no reasons for supposing that current and prospective high levels of farm output will prove any more permanent than did similar levels occasioned by the first World War. The present war may perhaps retard, but it can hardly prevent, further reductions in the fraction of the community's human resources devoted to farming.

Up to this point the distribution of resources between agricultural and other kinds of employment has been considered mainly in relative terms. We have discussed the factors that might be expected to influence the percentage of the occupied population attached to agriculture from one period to another. The trend in this percentage, in the United States as in

most other western countries, has been observed to be a downward one. We have seen that historically the trend is of long duration, and have suggested that—partly for physiological, partly for technological, reasons—it is likely to continue. On the other hand until very recently this downward trend did not imply any absolute reduction in the number of farmers. That peak employment in agriculture is already past seems fairly well established from the data in Chapter 6: between 1920 and 1940 the number of persons occupied in farming apparently fell by about 2 million. If the decline in the rate of population growth continues, and especially if two or three decades hence population increase ceases altogether, a further decline in agriculture's fraction of the labor force seems likely to involve further reductions in the absolute number of persons or families engaged in farming.

In an economy where choice of occupation is free, a reduction in the number of persons attached to agriculture can come about, in the ordinary course of events, only through a decline in its net advantages relative to those of other occupations. During the nineteenth century it was undoubtedly the comparative unattractiveness of farming which prevented the absolute number of those engaged in it from rising as rapidly as those engaged in manufacturing. Governmental policy has tended to raise farm incomes during the past decade; yet the absolute number of persons engaged in farming already shows a marked decline. It is the *relative* advantages that count, and if other occupations were sufficiently attractive even "parity incomes" might not prevent a decline in the number of farmers.

We conclude, then, that the pressure to reduce the fraction of the community's efforts devoted to farming, and thereby also the absolute number of agriculturalists, must reassert itself before the cessation of hostilities has receded very far into the past. Only factors of a rather long range character are capable of alleviating this pressure and obviating the need

for a continued downward adjustment in the scale of domestic agriculture, when this is measured in terms of persons occupied in farming. Possible influences of this sort have already been enumerated: a cessation of technical advance in farming; a substantial shift in dietary habits in the direction of more expensive foodstuffs; entirely new uses for industrial purposes of fibers or other farm products. It is unlikely that technical improvements in agriculture have exhausted their scope, or that further declines in labor per unit of output should not be anticipated. Further diversification in diet appears quite probable, but the possible increase on this score in the demand for farmers' services appears to be somewhat limited. Some alleviation of the downward pressure upon the scale of agriculture may indeed be anticipated from changes in dietary habits, but their influence is hardly likely to be decisive and will probably be felt principally rather in shifts from one type of farming to another than in any increase in aggregate employment in the industry. Some new industrial applications of farm products were noticed in Chapter 3, but the outlook here is too uncertain for accurate appraisal.

As our study progressed, certain long range factors emerged even more clearly from the agricultural picture. Among these factors technical progress, the slowing down of population growth and the inelasticity of the demand for foodstuffs perhaps stand out most clearly. Like other industries, agriculture has been forced to adapt itself to a changing environment. This adaptation has involved a cessation of growth or actual reduction in the output of some products, rapid expansion in the production of others. It has affected diverse farming areas in very different fashion. While agricultural output as a whole is still tending upward, the past four decades have seen farm employment reach a peak and begin to decline. Changes such as these are a measure of adaptation already achieved. The extent to which further adaptation

will be required in the future depends primarily upon the course of long range factors of the kind we have discussed.

Note by C. Reinold Noyes, Director—The first seven chapters of *American Agriculture, 1899–1939,* consist of a somewhat detailed study of the available statistics on the following subjects:

(1) Output of the chief agricultural commodities, together with a chapter on the nation's changing food requirements.

(2) Employment on farms (including self-employment) together with a chapter on changes in technology, farm machinery, etc. The comparison of employment with output figures yields estimates of changed output per worker.

From this very restricted basis the authors then launch into a final chapter which attempts to deal with the vast subject of "Agriculture in the Nation's Economy."

The general conclusion appears to be that aggregate agricultural output will shortly cease to increase and that the trend of the past 20 years toward an absolute reduction in those gainfully occupied in agriculture will continue. The first part of this conclusion is not based on present trends in output, which are still generally upward, but on the expected influence of several trends in demand—first, the recent trend toward the loss of foreign markets; second, the trend in births over deaths pointing toward a stationary population; and third, the recent trend toward the consumption of "protective" instead of basic foods. With regard to basic foods the existing income elasticity of demand is assumed to be zero or negative. The second part of the general conclusion is based on one trend appearing for the first time in the last 20 years—the absolute decline in farm workers—and on another and longer one—improvements in technique permitting fewer workers for a given output. This part is also supported by *a priori* reasoning from, or interpretation in the light of, theory—the theory of "relative advantages"—and by analogy with Western Europe where the authors have detected a "diversion of resources" from agriculture to industry.

This conclusion takes a very positive position on a vital question which has been exercising this country, politically and socially, for the past twenty years. It lends support to the policy of "letting nature take its course" or to the more humane forms of the same policy—the limitation of agricultural production and the facilitation of transfer of superfluous farm population to other pursuits. Moreover, the fact that these arguments and conclusions, while not in themselves novel, are ostensibly the result of a piece of purely scientific analysis might well increase the weight of this support. The question of their validity is therefore one of more than usual importance.

My judgment is that the last chapter of this book—the argument and conclusions—is subject to three serious kinds of weakness in respect of scientific method. In what follows I am concerned, first, with the validity of the methods used by these authors in deriving their conclusions and, second, with the presentation of a different approach, of apparently equal propriety, which leads to precisely the opposite conclusions. In the light of the first I conclude that the conclusions presented in the last chapter are opinions rather than scientific forecasts; in the light of the second I conclude that one opinion is as good as the other.

The three types of weakness in method may be described as follows:

1. It seems inappropriate to proceed on the assumption that the brief trends described in this report are secular and can therefore be used to extrapolate the future. These trends may be no more than swings in long cycles or even parts of movements in historical processes that will shortly come to an end.

2. It seems improper:
   a. To draw conclusions with regard to a large and complex subject from the examination of one sector of that subject only.
   b. To draw conclusions not implicit in the data studied, with the aid of imported assumptions or considerations not examined as to their validity; or, conversely, to omit other conclusions which are implicit in the data but not consistent with those presented.
   c. To treat as trends the net change accomplished by two opposite movements occurring in succession.

3. It seems undesirable to approach empirical studies such as this with preconceived theories, into the framework of which the facts are forced. This is apt to lead to distortion of the facts and to their misinterpretation.

Under 1, above, it should be noted that all of the influences given weight in determining the general conclusion are treated as trends, though several of those which are not given weight are treated as temporary only. Upon what basis is this discrimination made? Is it sound? Under 2a, I would point to the fact that the other two factors in agricultural production, land and capital, are excluded from consideration in the "distribution of resources" to agriculture and, therefore, their influence, if any, is not appraised; furthermore, the period examined is but a small portion of a long historical process in which this temporal sector may play but an inconsiderable part. Under 2b, I would cite first the importation of the population trend, without discussion, and the dismissal of agricultural policy without previous examination. Under 2b, also, two contrary conclusions appear to have deserved consideration, or more than they get, because they are implicit in the data.

The trends of output are still upward, particularly if the influence of the long period of drought years on grains is discounted. It appears that the long drought in the Middle West showed lowered grain yields (Chart 47, p. 281) and some loss of animals in all the years from 1931 to 1937 inclusive. Perhaps to determine the true trend these years should have been passed over and 1940–42 added. The output of grains in 1938 was the fourth highest and of meats in 1939 the highest ever (Table 5, pp. 42-43, above). Perhaps the special effect of the drought years vitiates conclusions based on 5-year averages and ending on the average around 1937. If this trend had been considered, remarks on demand (pp. 291-93) could not have been interpreted as "trends in output" (p. 294). These features of demand may affect output. But since they have not done so as yet it is improper to telescope the two. Again, in view of the food trend (Chapter 4) to products requiring a much larger input of labor (Chapter 7), the three lines (Chapter 8, p. 307) in which this is dismissed as an influence seem to be inadequate consideration. Under 2c, I cite p. 294. In spite of the fact that there was an increase in agricultural employment from 1899 to about 1920 and that the decline since, though slightly greater, has only lasted for about 20 years, there is constant reference to the process, as if it had been going on for a long time.

Thus "drift from the soil" (Chapter 8, p. 312), "the transfer of labor from agriculture to other occupations" (p. 309), the "downward adjustment in the scale of domestic agriculture" and in the "absolute number of agriculturalists" (pp. 314 and 315). Under 3, I refer to the whole view that the "relative attractiveness" of agriculture and industry has determined their respective rates of growth. "The striking decline in the relative importance of agriculture in the economy of the nation must undoubtedly be attributed to the superior attractiveness of other occupations" (p. 299; see also p. 301, end of paragraph, and p. 314). It is that view which leads to all the emphasis on the "relative" measures of agricultural employment, income, etc., in this final chapter, so much of which is meaningless in the light of the actual historical process. It is, of course, true that a nation is well off in inverse proportion to the percentage of its population required to produce its food. That is equally true in regard to all its other requirements—shoes and ships and sealing-wax. But because such economizings are to be welcomed is no reason why they should be expected or treated as a law of nature. Moreover, in the actual historical process, changes in the ratios between agriculture and industry—of output, employment, income, etc.—are largely accidental, due to the fact that the two developments take place under different limiting conditions and are almost wholly independent of each other.

Because it lies behind much of my criticism, and because it has a strong bearing on the conclusions advanced in this study and still more so on the most important "agricultural problem," it may be well to elaborate on this matter of historical process—the other approach referred to above. Growth seems to be taken as a matter of course by our generation. As a matter of fact, in the socio-economic field, it is almost an abnormality. In most periods of history population has been limited by the food supply and the food supply has been limited by available land—except as occasional improvements in technique have increased the yield per acre. When available land was fixed, the food supply (with the above exception) and consequently the population were also approximately fixed. Correspondingly, in most periods of history all other (industrial) production has been fixed, chiefly by the limits of technique (output per worker) and only slightly by the availability of raw materials. Against this background the economic development of the United States appears as an exception to the rule. Here, economic growth has been, in its two chief aspects, the result of two almost unique historical processes stemming from the same root but thereafter almost wholly independent of each other.

These two processes were, or are, the settlement of the United States and its industrialization (Industrial Revolution). The first movement began, on a continental scale, after the Revolutionary War and continued in the agricultural sphere until about 1920, when it appears to have been practically completed—i.e. the frontier disappeared. This movement is ignored entirely in this study, though some trends are shown from 1799 and though the process continued through about half the period under review—that is, from 1899 to 1919. The second movement, industrialization, can hardly be dated, but its most notable effects appeared after 1870, say, and it is continuing today. This movement is referred to occasionally in this study, but its fundamental effects on these trends are not mentioned. There is room in what follows for only a few rough and general statements on these matters.

The development of agriculture in the United States up to 1920 was in large part determined by the unique historical process of settlement. The settlement of a new country consists first—always and necessarily—of settlement on the land to raise food. The analogy of a flow of water over the land is appropriate. The water tends to cover the land before it begins to grow deep. So agriculture covers the land first before other pursuits follow. But some other pursuits (e.g. trade and transportation) tend to follow almost immediately. It is doubtful if the thirteen colonies, or any subsequent settlements, ever showed more than 60 to 70 percent of employed engaged in agriculture. Since agriculture still accounted for 53 percent of the gainfully employed in 1870 it is clear that most of the increase in gainfully employed up to that time was due to settlement of new land. But the rate of settlement was largely governed by acquisition and opening up of new territory, and by extension of transportation facilities, all within the limits made possible by growth of population. In 1850, when the acquisition of new territory was completed, only 15 percent of the land area was in farms as against 50 percent by 1920. As far as the Great West was concerned the process of opening up the new territory only began after the Civil War and was not completed until after 1900. As far as the limitation set by population growth is concerned it would have required the entire population increase from 1790 up to 1870 or even 1880 to settle the enlarged area with the same ratio employed on the farm as at the beginning. It was these delaying factors which made the movement extend over more than 130 years, and only gradually permitted the increase of land in farms from probably less than 95 million acres (present acreage of thirteen colonies) in 1790 to about ten times that in 1920.

The rate of growth in agriculture (acreage, output and employment) was almost uniquely determined by the rate of settlement of new land. Therefore, the rate was almost completely independent of the rate of industrialization and had no connection with trends abroad where settlement was already complete long before industrialization really commenced. It is to be assumed that this growth so far as acreage is concerned will now stop, since settlement is complete. For land is limited in a sense that labor and capital are not. The absolute limit may have been reached in 1920. By reason of the substitution of capital for labor increased productivity per worker might theoretically continue. But, up to 1920, this process involved more land per worker, not more product per acre. Roughly speaking, from 1890 to 1920 acreage per gainfully employed increased from 63 to 85. Page 286 above shows that the increase per manhour, even up to 1930, was all in the form of fewer hours per acre and none in greater yield per acre. The latter changed little until very lately (p. 285). This trend, then, up to 1920 or 1930, represented a movement toward more *extensive* culture—and the added land per worker was new land. How can that continue, if the limit of land has been reached? Will it be reversed? Any further increase in output would appear to require the substitution of *intensive* for *extensive* agriculture, a process which, in most lines, has not yet appeared in this country. Where it obtains it always involves more labor per acre. Can the substitution of capital for labor operate in intensive culture? If it cannot, then any further increase in output will doubtless reverse the past and present trend in output per worker, and therefore necessitate an increase in absolute employment in agriculture, as it

has elsewhere, thus reversing also the recent trend in absolute employment. Hence the historical viewpoint leads to a forecast precisely the opposite of our authors' conclusions, if an increase in output is needed. Whether that does become necessary depends, of course, on whether there is to be *any* future increase in population. That is anybody's guess. On the face of the matter, however, a condition under which the world's richest area, in point of natural resources, continued to maintain a population with a density only from one-half to one-tenth that of the other chief areas that are well endowed, would appear to be a condition of unstable equilibrium. Such a continuance may be very desirable. Whether it is probable or even possible is another question.

During the period of growth of acreage (settlement) increase of major food crops was always possible, but the rate was usually governed by the character of the new land and by the process of settlement itself. For instance, from 1850 to 1890 land in farms increased about 112 percent; but wheat acreage increased about 275 percent. On the other hand, from 1890 to 1920 wheat acreage increased at about the same rate as land in farms—that is, about 14 percent. Again, as other population followed along after the first settlers, subdivision of farms took place and the character of local demand changed. This tended to displace grains and meat in the old sections. The same tendency was enhanced by rapid exhaustion of the soil by "soil-robbers" (e.g. New England and New York). Thus the process of settlement seems to have accounted for much of the changes in the composition of output, until recently, and for the fact that these changes have exhibited no single long-term trend.

The second historical process referred to above, the industrial development of the United States, has been chiefly determined by the equally unique but different movement called the Industrial Revolution. Because developments in the two fields, agriculture and industry, have been principally the results of these two almost entirely independent processes there is no *a priori* reason to expect that the rate of growth should have been similar in both. Comparisons of such rates are therefore almost meaningless, in any scientific sense. They are ratios between two independent variables.

These two movements were also entirely separate in their influence on growth and allocation of population. Settlement without the Industrial Revolution might have increased the population from 4 to 40 million, as noted above. The Industrial Revolution appears to have been responsible for the other two thirds of the increase to 1940. And this accords with the figures for Western Europe where, in the most intense period of industrialization (1810–1910, say) the population increased to about 3 times (200 percent) its former level, although, there, no opportunity for further settlement on the land existed. (Neither was there "diversion of human resources" on any extensive scale abroad. Approximately the same population remained on the land. It was the increase that went into industry.) Thus, after this form of industrialization, countries generally seem to show about one third the proportion of population on the land that existed before. Taking the broad view, it was the process of settlement, which occurred only here, that determined the expansion of agriculture and the growth of population on the land; it was the independent process of the Industrial Revolution that determined the change, here and abroad (Western Europe), from the old to a new ratio of

population on the land to total population. Settlement is now probably complete; industrialization may not be; if industrialization continues to develop, population will probably continue to increase; therefore this one factor in the ratio will probably determine the trend in ratio of population on the land to total population. But whether or not such future industrialization will occur cannot be determined by extrapolation of past time series even of the very recent past.

Of the total increase of population nearly one third was due to immigration in the nineteenth and twentieth centuries. Of this number—some 38 million in all—all but 7 million came over after 1870. Therefore, though immigrants did participate in the settlement process, both before and after 1870, they came chiefly for industrial employment in the period after our industrialization had really got going. The relation of that portion of our growth of population to industrialization was a direct one. The growth was in response to demand for industrial labor and was the chief limiting factor upon the rate of industrialization. However, that immigration for industrial employment was largely responsible for the change in the relative figures between 1870 and 1920. There was no drift away from the land; there was a drift of foreign population to industry. The significance to both agriculture and industry of the reduction of this immigration in 1924 and its near cessation in 1930 has not yet been appraised.

Besides facilitating the process of settlement in many ways (e.g. transportation) and making possible some industrialization of the farm (e.g. power and machinery) the Industrial Revolution relieved the farming population of much manufacturing and, on the other hand, it concentrated almost all agricultural production on the farm. On both sides the last process represents a change in product rather than a change in productivity and should modify estimates of changes in productivity, even after 1899, to a very considerable extent.

From this more inclusive and more fundamental viewpoint the authors' choice of the period to be studied—doubtless on account of availability of statistics—seems unfortunate. Their forty years divides itself into two halves, which in certain respects are in marked contrast to one another. The first half appears to represent the last two decades of the process of settlement. The peak of acreage so far was in 1920; that of employment of males so far was also in 1920. The second half may possibly represent new trends—drift from the farm, etc. But twenty years of troublous times are not enough to settle that question. So far the signs of drift are only marked in the last decade (1930–40) which included the prolonged depression and the prolonged drought. At any rate, from this standpoint it appears clearly unsafe to hitch together trends prior to, and trends after, 1920. The forty years represents a mixture in which the trends in certain respects are in opposite directions. Even though the direction may seem to be the same in some cases, the causes may be quite different. Finally, if there is any chance that these recent trends merely represent swings, or temporary processes, it is clearly unsafe to let them delude us into dismantling any part of our agricultural economy or allowing it to run down. And, on the chance that the Malthusian "law" is still operating under our noses, it may be wiser to tide over, by artificial measures, what may prove to be only an interim period before the pressure of population on the food supply will again begin to be felt.