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Part One

Introduction

Chapter 1

Agriculture as a Segment of the Nation's Industry

SLIGHTLY more than thirty million persons, nearly 25 percent of the population of the United States, live on farms. Some of them work at nonagricultural occupations, but nearly ten million, or about one third of the farm population, are apt to be actively engaged, at one season or another, in agricultural production. In 1940 one out of every six gainfully occupied persons in the United States tilled the soil or tended farm animals, although many of these were working only intermittently, for example at harvest time. The average number of persons actually employed in agriculture throughout the year is difficult to determine exactly, but it is probably of the same order as the average number employed in manufacturing (9.8 million in 1937), and must be very much larger than the average for any other single industrial division. Judged by its contribution to national income, however, agriculture is much less important than manufacturing: in 1937 it contributed only 9 percent to the income of the nation as a whole, whereas manufacturing accounted for 23 percent.¹

Still more striking is the contrast in the size of the productive unit. Manufactured commodities are derived from fewer than 200,000 establishments, some of them very large indeed, whereas there are in the United States over 6 million farms, the average size being about 160 acres. To be sure, the scale of agricultural operation is far from uniform. Farms vary from the acre or so cultivated by the part-time agricul-

¹ Simon Kuznets, *National Income and Its Composition, 1919-1938* (National Bureau of Economic Research, 1941), Table 12.

turalist to the ranch embracing several hundred sections in a single pasture; from the farm that changes hands every year and boasts no permanent equipment to the domain with an investment of over \$100,000; from the patch worked by the tenant with one mule to the 10,000-acre plantation.²

In the cultivation of the soil there is discernible scarcely any tendency toward that growth in the size of the entrepreneurial unit which has characterized other types of industry. True, in 1900 only 0.8 percent of all farms exceeded 1,000 acres, and only 24 percent of all farm land was concentrated in such holdings, whereas by 1935 the percentages had risen to 1.3 and 29 respectively.³ But the increase appears to have been concentrated in the Pacific, and especially the Mountain states where many new large farms were established.⁴ There is little evidence of the consolidation of existing farms in other parts of the country: indeed the increase during the same period in the proportion of very small farms (under 20 acres) might appear to indicate an actual disintegration of existing holdings. The smallest size groups, however, are covered rather spasmodically by the Census, and in any case include many farms cultivated by tenants who exercise no real entrepreneurial control independently of their landlords. All things considered, the scale of agricultural operations in general appears to have undergone little change since the turn of the century. The number of producing units remains very large compared with most branches of manufacturing or mining. This generalization applies even to the more specialized types of fruit and vegetable production where concentration of control has alone made any real progress.⁵

² E. W. Zimmermann, *World Resources and Industries* (Harpers, 1933), pp. 159-60.

³ *Statistical Abstract of the United States, 1940*, p. 642. Most of the change appears to have occurred between 1925 and 1930.

⁴ A. L. Meyers, *Agriculture and the National Economy*, Monograph 23 (Temporary National Economic Committee, Washington, 1940), Table 6.

⁵ *Ibid.*, Table 7.

The fact that agriculture is still, relatively speaking, a field for small-scale undertakings has precluded any significant incursion of corporate enterprise. Although farms are sometimes owned by corporations (often unwillingly, as the result of mortgage foreclosure), the number subject to corporate operation as well as ownership is extremely small. Corporate control is, however, exercised indirectly in some specialized lines of production and in a few regions by processors contracting in advance—as much as a year or more—for the individual farmer's output or part of it. Such arrangements reduce both the number and the extent of the entrepreneurial functions normally attributable to the farmer. Though he may still own the farm, the farmer is subject to company control in the execution of his plans and in some cases is an employee in all but name.⁶ Situations of this sort are common among sugar-beet growers, many of the fruit and vegetable farmers on the Pacific Coast, and some other groups dealing largely in truck crops. Nevertheless, for the agricultural picture in the large, such phenomena represent deviations from the norm. Farming is still conducted, in overwhelming degree, by individual entrepreneurs, roughly half of whom own the land they cultivate.⁷ And of farm output as a whole, perhaps one fifth is sold through cooperative marketing associations;⁸ the remainder, except that consumed on the farm, is placed on the open market or (in the case of fruit and vegetables) sold to canners under contract. In recent years less than 10 percent of this output has been exported.

⁶ *Violations of Free Speech and Rights of Labor*, Hearings before a Subcommittee of the Committee on Education and Labor, U. S. Senate, 76th Congress, 3rd Session, Pt. 62 (Washington, 1940), pp. 22773-815.

⁷ Of all farm operators in 1940, 50.6 percent were full owners, 10.1 percent were part owners, 0.6 percent were managers and 38.7 percent were tenants. However, four out of every ten farmers owning their farms reported mortgages. The average equity held by the farmer in such cases was 57 percent of the value of the farm.

⁸ Such associations marketed \$1,684 million of products in 1938-39 (U. S. Department of Agriculture, *Agricultural Statistics, 1940*, Table 809).

Perhaps what distinguishes agriculture most sharply from other segments of industrial activity is the fact that it furnishes not only a living, but a complete way of life. The factory employee, even the professional man or civil servant, keeps more or less fixed hours and lives away from his job: he "goes to work" each morning. Even a storekeeper runs his shop during a more or less definite period of the day. On the other hand a farmer and his family live with—and on—the job; for them the farm is both home and workshop. The hours they work vary with the season and with the crop or type of livestock, but are largely outside their control. Often, also, isolation throws the members of a farming community together in a manner unknown to those who follow urban pursuits. On this account agriculture possesses a sociological interest quite unlike that of other vocations. And there is still another peculiarity of agricultural activity. For a large number of farmers the production of agricultural commodities is not carried on as a means of making money, but rather as a mode of existence. Where production is undertaken primarily for consumption by the farm family itself, the farmer may live almost entirely by this means—on a subsistence basis—or he may use his agricultural activity to supplement other forms of income, such as a pension or wages from a nearby factory. The noncommercial farmer has no counterpart in any other sphere of economic activity. Partly because of the prevalence of farming of this character, in which the produce is consumed on the farm itself, but also because of the very large number of small farms, only half the nation's farms were responsible, in 1929, for the production of almost 90 percent of all farm products *marketed*; the other half—especially farms in the South—contributed the remaining 10 percent.⁹

⁹ O. E. Baker, *A Graphic Summary of the Number, Size, and Type of Farm, and Value of Products*, Misc. Pub. 266 (U. S. Department of Agriculture, 1937), p. 68. The same study reveals that almost 30 percent of products sold were in that year contributed by no more than 250,000 farms.

From a more technical viewpoint also agricultural production has certain characteristics all its own. In the first place it is highly seasonal as to its absorption of labor and materials and its output as well. This is notably true of crops, and especially of crops whose geographic distribution is narrow and whose tolerance of climatic variations is small (e.g., cotton and various fruits); but it applies also, though in less degree, to livestock and dairy production. In the second place, the output of a single season depends in large measure upon the accident of weather. In this respect, too, livestock and dairy production are somewhat less sensitive than crops: as may be seen from Chart 5, the fluctuation from year to year in the series for livestock, milk, poultry and wool is less violent than in the case of other branches of agriculture.

Finally, the demand for agricultural products is, in the aggregate, highly inelastic, for the *total* amount of agricultural products purchased by the public will not be reduced (or increased) to any important extent by a rise (or fall) in price, though for individual products the reverse may be true. Considered from another angle, since the public buys fairly fixed amounts of agricultural products, unusually large supplies can be disposed of only if the price is reduced severely, while short supplies will sell at high prices because buyers will seek eagerly to secure their customary quota. For the individual farmer, the price of his crop is determined in the competitive mechanism of the market, which he as an individual cannot hope to influence: his withdrawal from the market will not raise the price, but will proportionately reduce his receipts. In the short run, therefore, a fall in price will discourage output appreciably only in the extreme case in which prices are so low that harvesting costs exceed prospective receipts; in such circumstances the crop may be left to rot unharvested. For the operator who hires little labor this point is rarely reached since he will continue to work, however low the reward for his own efforts, so long as he is

at least reimbursed for materials used. Incidentally, the farmer's status of self-employer goes far to explain why he has always been reluctant to give up his vocation. Even from one season to another the farmer may fail to react easily or quickly to price changes. Inertia, in part the result of technical conditions, may impede or prevent adjustments which would be achieved readily enough in other industries. In the case of many crops both prices and production fluctuate notoriously from year to year, frequently showing marked inverse correlation.

These are some of the considerations which must be borne in mind by anyone attempting to interpret the behavior of agricultural output. Almost in a textbook sense, agriculture has been "the last surviving stronghold of pure competition."¹⁰ But it is also a sector of the economy in which the adjustments we have been taught to associate with a competitive market are peculiarly difficult to achieve in any smooth and orderly fashion.

THE BOUNDARIES OF AGRICULTURE

In contrast to manufacturing, which constantly discards old and adopts new activities, the boundaries of agriculture have changed little throughout history. If any trend is discernible, it is the gradual transference of agricultural functions to industry—breadmaking from the farm oven to the commercial bakery, buttermaking from the home churn to the dairy plant, slaughtering from the farm to the packinghouse, spinning from the wooden wheel to the textile factory.¹¹ In this way the functions of agriculture have been whittled down to the growing of raw materials exclusively. Farm processing of

¹⁰ Meyers, *op. cit.*, p. 9.

¹¹ Breadmaking and clothmaking are on a slightly different footing from the other activities mentioned, since they were functions of the farm household (as well as of the urban household) as consumer rather than as producer or seller.

food or fiber, in many instances even for home use, has become the exception rather than the rule.

This change in the character of agricultural operations to some extent vitiates long-range comparisons, for agricultural production has a narrower and more specialized meaning than it had a hundred years ago. Even at the turn of the present century agriculture had been stripped of most of its processing functions, with the exception of the production of butter, three fourths of which was still made on farms in 1899.¹²

Apart from the transfer of processing from the farm to the factory the content of agriculture has scarcely changed. The principal functions are still the growing of some sixty to seventy crops to provide food and industrial raw materials and the raising of livestock for dairy products and for slaughter.

Although it is simple enough to define agriculture, it is a more difficult matter to measure the volume of output which must be termed agricultural. Perhaps the most important reason for the introduction of further qualifications is the fact that basic data on output are derived in the main from Census canvasses. These, in turn, are confined to holdings classified as farms by the Census authorities:

A "farm," for census purposes, is all the land which is directly farmed by one person conducting agricultural opera-

¹² E. E. Vial, *Production and Consumption of Manufactured Dairy Products*, Technical Bulletin 722 (U. S. Department of Agriculture, 1940), pp. 6-7. Little more than 5 percent of all cheese was made on farms in 1899. Slaughter too was at that time carried on mainly in commercial establishments, and the transfer from farms has continued since then:

Number of Animals Slaughtered on Farms as Percentage of
Total Number Slaughtered ^a

	1899	1939
Cattle	8.3	4.3
Calves	17.5	8.5
Hogs	26.7	20.7
Sheep and lambs	4.2	3.1

^a *Agricultural Statistics, 1940*, Tables 475, 498, 533.

tions either by his own labor or with the assistance of members of his household or hired employees. The term "agricultural operations" is used as a general term referring to the work of growing crops, producing other agricultural products, and raising domestic animals, poultry, and bees. . . . Do not report as a "farm" any tract of land of less than 3 acres, unless agricultural products to the value of \$250 or more were produced on such tract in 1929. . . .¹³

From the outset, therefore, we must disregard all crops or livestock raised in places not considered farms, since they are not accounted for in available production statistics. This limitation is more serious in some fields of activity than in others, and probably most disturbing in the attempt to estimate the output of vegetables,¹⁴ since a large amount of vegetables entering the market originates in gardens in urban, and more especially in rural, nonfarm areas. Poultry and milk cows also are kept to some extent in establishments not classified as farms.¹⁵ Furthermore, as the above excerpt from the Census instructions indicates, lower limits are placed upon the acreage and value of farms whose output is recorded. These limits—three acres and \$250, respectively—have applied since the Census of 1910; in 1900 no lower limit was set in terms of either acreage or value of products. The effect of the restriction has been found to be small,¹⁶ and it is mentioned here only to define unequivocally the *area* treated in this book as "agriculture."

We have followed the Bureau of the Census with respect to its definition of a farm by size and value of products, but have further delimited the scope of "agriculture" by disre-

¹³ *Fifteenth Census of the United States, 1930, Agriculture*, Vol. IV, p. 952.

¹⁴ See pp. 129-32 below.

¹⁵ The last Census year in which animals not on farms were the subject of a special canvass was 1920.

¹⁶ J. D. Black and R. H. Allen, "The Counting of Farms in the United States," *Journal of the American Statistical Association*, Vol. 32 (Sept. 1937), pp. 439-63.

garding certain activities included by the Census. The Census considers as farms nurseries, greenhouses, hatcheries and apiaries, even though it is doubtful to what extent enterprises of this sort were actually covered prior to 1930. Difficulties of statistical treatment rather than conceptual considerations have led us to omit not only such establishments, but also fish hatcheries, stockyards, fur farms, etc., which the Census likewise excludes.¹⁷ For the same reason we have excluded forest products, although the Census reports their value when forestry is conducted in conjunction with other farming operations. Although almost 20 percent of all farmland is woodland, gross farm income from forest products contributes only 1 to 2 percent of the total. Regionally, of course, there are wide differences; many farms in the Piedmont section, in New England, and in the Northwest derive a considerable part of their income from forestry. Moreover, changes in the pattern of Southern agriculture have evoked increased attention to farm forest problems. But data on production and prices are almost nonexistent, partly because so much of the lumber cut is farm-consumed. It should be noted that maple sugar and sirup are not ordinarily regarded as forest products, but rather as a form of crop production: unlike lumber, therefore, they are included in the present study.

Finally, agriculture has to be distinguished from mining, manufacturing and other nonagricultural pursuits.¹⁸ This is not always as easy as it sounds. Where the operations of an entire enterprise fall on one side of the line or the other, there is no special difficulty. But where two or more types of

¹⁷ *Census of Agriculture, 1935*, Vol. III, p. 12. The Census counts such places as farms, if farming operations are carried on, but does not collect data on nonfarm activities.

¹⁸ Manufacturing production is treated in Solomon Fabricant's *The Output of Manufacturing Industries, 1899-1937* (National Bureau of Economic Research, 1940). Mr. Fabricant's study of manufacturing is continued in *Employment in Manufacturing, 1899-1939* (National Bureau of Economic Research, 1942); and output, employment and productivity in mining, and in transportation and public utilities will be the subject of further volumes which the National Bureau hopes to publish shortly.

activity contribute to the production of a single enterprise, even of a single product, a rather intricate accounting problem arises. In such endeavors as fruit drying or the production of cane sugar, the line of demarcation between the agricultural operation and the manufacturing process remains more or less arbitrary.

THE MEANING OF AGRICULTURAL OUTPUT

There remains the question as to what portions of agricultural production as here circumscribed we seek to cover in our measure of output. Agricultural products fall naturally into two broad classes: (1) crops and (2) livestock and livestock products. Crops may be grown for a variety of purposes: to be consumed in the farm household; to be fed to livestock; to serve as seed; to be sold to other farmers for the same variety of purposes; to be sold to nonagricultural consumers either for direct consumption or for processing into goods consumed both on and off farms, at home and abroad. Livestock is raised either for the products derived from it (milk, eggs, wool, leather) or for direct consumption as meat; the distribution may be similar to that of crops, except that quantitatively much less is fed to livestock (milk fed to calves is practically the only instance). Since output consumed on the farm itself during the production process reappears as other output at a later stage, it is appropriate to exclude the amount consumed in this manner. Consequently the definition of farm output turns mainly upon the deductions from gross output which are necessary to measure the production of a single enterprise or of the industry as a whole.

Output may embrace—in its broadest connotation—the entire harvest of a given crop; it may be confined to the portion sold; or it may be regarded even more narrowly as the amount sold to people other than farmers. For a study that

centered on changes in the fortunes of a particular crop, the entire amount harvested (which we call gross output) would no doubt be the appropriate measure.¹⁹ But if we are interested in farm output as a whole, the duplication implicit in such a treatment becomes an insurmountable obstacle to accuracy. Milk, for example, would represent merely feed that has been processed by a "feed-milk converter," i.e., a dairy cow. It is obvious that crops (and milk) fed to livestock would be counted twice over if we were to include them both in the "raw" stage and again in the "converted" stage. Consequently we have defined output as consisting of those products which are not consumed in further processing within agriculture but are available for consumption elsewhere.²⁰ This is the "net output" which alone figures as a constituent of our output indexes.²¹ In it we include products sold to non-farm purchasers, products used by farm families as consumers rather than as producers,²² and those not yet disposed of for sale or home consumption. Additions to inventory, in other words, are treated as output. The latter point assumes im-

¹⁹ Since net output is obtained from gross output by deducting feed and seed requirements, the difference between the two measures is most marked in the case of the grains, and particularly corn and oats: four fifths of the gross output of these two crops is excluded from net output. With hay the same situation applies. The quantitative relationship between gross and net output in the case of the grains and hay is further considered below, pp. 47, 50n and 139-40.

²⁰ As will be seen from the notes in Appendix A, duplication was not always eliminated as completely as the authors would have wished.

²¹ Thus the index for crops excludes feed and seed; the index for livestock products excludes milk fed to calves. The problem could have been solved also by measuring the gross output of crops (excluding only seed), and deducting feed (as well as milk fed to calves) in computing the index for livestock products. An identical index for agricultural output as a whole would have resulted, although the calculations would naturally have required a different weighting system in combining crops and livestock from that used in this volume. The work would have been more intricate, and the method does not appear to possess advantages over that actually adopted.

²² This distinction is one of the fundamental concepts used in measuring income and will be preserved here. The value given to this portion for purposes of index-number weighting has been taken as the price of the portion marketed.

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portance mainly in the case of livestock,²³ where output thus consists of the number of animals slaughtered or sold for slaughter, plus or minus the increase or decrease in the number on hand on farms over the year. Let us illustrate by an extreme example: if in one year no sales of hogs are made, but all newborn hogs are added to the existing stock, production, so far from being zero, must be treated as equal to the net addition to existing herds.²⁴ Crops not harvested, or those given away for charity are, of course, excluded from output.

SCOPE AND ORGANIZATION OF THE STUDY

The foregoing definitions of farming and of farm output may serve, in some degree at least, to delimit our subject matter. The aims of the book—to assemble indexes of total agricultural output and of its constituent parts, to explain their movements as well as the shifting pattern of output, and finally to compare the behavior of output with changes in the volume of agricultural employment—fall naturally under two heads. Part Two (Chapters 2 to 4) deals with output; Part Three (Chapters 5 to 7), with employment and its relation to output. The former opens with a discussion of the new index of agricultural output, presented annually since 1899, and of indexes for the output of some fifteen major groups of farm products. These will be found in Chapter 2, which also contains a discussion of trends in farm output, and comparisons of experience before and after the first World War. However, in undertaking a rather thorough analysis of the behavior of farm output, and of the factors which influenced it from one period to another, we found that in some ways our index numbers concealed more than they revealed and that special discussion of the peculiar circumstances surrounding

²³ Crops may also be stored on farms, but here additions to inventory are automatically included, since we rely on harvest data.

²⁴ For further discussion, see notes to Table A-1, Appendix A.

individual commodities was needed to complete the picture. Accordingly, in Chapter 3 individual products are considered separately and an attempt is made to offer explanations, in terms of demand and supply, for their differing fortunes. Among the various sets of factors influencing agriculture from the side of demand three are of primary importance: the utilization of farm products by industry, the export situation and the domestic demand for foodstuffs. Because the last of these is of greatest quantitative significance and at the same time most interesting from a sociological aspect, it is accorded separate treatment in Chapter 4, which is given over to an analysis of trends in domestic food consumption.

In Part Three we consider employment and productivity. Chapter 5 contains a review of the history of technological advance in farm machinery, and of developments in plant improvement and animal breeding. Our main interest here is naturally with economies in labor, increases in yield, and the growing substitution of controls and indicators for the otherwise uncontrollable or unpredictable forces of nature. Chapter 6 is devoted to a discussion of the validity of the available estimates of farm employment. In Chapter 7 output and employment, linked by technology, are brought together in an analysis of changes in productivity during the forty-year period; here an attempt is made to distribute changes in productivity among products and types of farming enterprise.

The broad conclusions that have been reached in the preceding chapters are assembled in Part Four (Chapter 8). Here, following an evaluation of existing trends, the discussion is projected into the future with an appraisal of the outlook for American agriculture.

