PART IV

The Labor Resource



Chapter 9

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OR two decades agricultural economists have emphasized that changes are needed in the structure of the agricultural industry. Largely, the needed adjustments call for changes in production economic phenomena: in the magnitude of agricultural output, in the composition of the output mix, and in the combination of resources used. In major sectors of agriculture, production adjustments are required to provide fuller employment for much of farm labor and to raise marginal value productivities of agricultural resources and farm family incomes to the same level as those of other industries. General agreement exists on the two major qualitative adjustments required: (1) reduction in the magnitude of the labor input in agriculture and (2)contraction of aggregate output in line with secular demand changes. But while the long-run direction, the qualitative aspect, of required adjustments is apparently known, information about the quantitative aspects of the problem is lacking. By quantitative aspects, we mean the length of time required to solve the agricultural surplus problem by adjustments of the type commonly suggested, and the extent of the adjustments needed. How much contraction is required in the agricultural labor force to affect aggregate output significantly? How large must farms become if proportions of labor and capital are to be changed sufficiently to raise resource productivities to norms characterizing economic efficiency? Are further moderate decreases in the agricultural labor force likely to aggravate the surplus problem before it diminishes? In what sectors of American agriculture will specific quantitative adjustments of the type conventionally suggested, bring about "near-term" relief? Currently, definitive answers for these questions are not available. But solutions are often prescribed as if they were. Given the great lack of empirical data, we make no attempt to provide exact answers to the questions posed. Mainly, exact answers must await further research. The purposes of this conference are to summarize existing findings and to provide promising hypotheses as guides for further research in solving the major farm problem of the United States. Our paper is geared accordingly.

CHANGE IN THE LABOR FORCE AND AGRICULTURAL OUTPUT

It is well agreed that, relatively, income of agriculture is low

because growth in output has outpaced growth in demand over the past decade. Furthermore, since agriculture obviously has a surplus labor force, it would seem that returns on resources in agriculture, in the long run, can be best put on a par with those in other industries by maintaining a growing number of nonfarm employment opportunities and by reducing the total farm labor input and population in agriculture. The solution of the agricultural problem, therefore, appears simple: Reduce the labor force, shrink output enough to equilibrate agricultural supply and food demand, and, as a consequence, raise resource returns. This pat solution, in about the cause-effect sequence outlined, is retailed widely, apparently as the immediate solution of the farm problem. I have no question about the long-run accuracy of the suggested adjustment and earlier-made similar suggestions.¹ I do, however, question whether the farm problem can be solved in a period of less than ten to fifteen years through this type of adjustment. Contrariwise, in important segments of American agriculture, a reduction per se in the farm population and total labor input promises to increase farm output.

Two of the more dramatic changes in American agriculture over the past 20 years have been; a decline of 33 percent in the total labor input and an increase of 38 percent in the total output. Obviously, some fairly marked reductions in the labor force have taken place without causing agricultural output to decline. As will be explained later, these changes were possible because of the great surplus capacity, or underemployment, of specific capital and labor resources in agriculture. In fact, if simple empirical inferences were to be drawn from trends of the past two decades, the conclusion would likely be: Further reductions in the labor force and in the number of farms will take place while output of farm products will increase. Regression and correlation coefficients for the data of Figure 9.1 need not be derived to make such predictions. Figure 9.1 is not presented as a naive model containing all variables which explain increases in agricultural output. Obviously, numerous other variables affected output during the period. Two of importance were: (1) greater inputs of certain capital items (representing known techniques) such as farm machinery, livestock numbers, fertilizer in particular areas, etc., and (2) inputs of particular capital items (representing newly developed techniques) such as the host of new crop varieties, insecticides, antibiotics, livestock breeds, and other innovations introduced during the period. But along with these changes other developments, (a) decreases in the farm population and labor force and (b) decrease in farm numbers and consequent increase in farm size, also brought about increased output.

A reasonable hypothesis is: the net effect of further reduction in the labor force, and of consequent increase in farm size for concentrated agricultural areas, will be to augment agricultural output for several years more before this labor decrease alone causes output to diminish

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¹Cf. Heady, Earl O., Economics of Agricultural Production and Resource Use, Prentice-Hall, New York, 1952. Chaps. 24 and 25.



Fig. 9.1 - Index numbers of farm output and total farm employment, United States, 1936-56.

in major areas of commercial agriculture. While we have started empirical studies directed at these phenomena, no mass of data now exists. The observations presented are those obtained from initiation of a field study and from other sources.

Families leave farming mainly because of natural causes (health, age, retirement, and death) and economic forces (higher monetary or real income in other occupations). Farm consolidations, which take place as families leave agriculture because of economic forces, present opportunities for increasing output of field crops particularly for these reasons: Relative income disadvantage is greatest for those operators who possess the smallest amount of managerial skills.² As

²This fact, although self-evident, has been illustrated many times via farm record and survey summaries. The writer and others have completed two recent studies, indicating the income differential between farm income and nonfarm wage rates for farmers with various amounts of capital and managerial levels. See Heady, Earl O., and Mackie, Arthur B., "Plans for beginning farmers in southwest Iowa with comparison of farm and nonfarm income opportunities; Dean, G. W., Heady, Earl O., and Yeh, M., "Improving farm family incomes on Shelby-Grundy-Haig soils: A comparison of income opportunities" (Iowa Agr. Exp. Sta. bulletins in progress).

labor leaves agriculture, some farms are consolidated with neighboring units. The operator who remains in agriculture and expands acreage, by renting or buying the farm vacated, generally is one with a brighter farming outlook. He has greater managerial ability and possesses the capital, or can borrow it, to operate the added acreage with the technical efficiency employed on his previous unit. He puts the vacated land into rotation, adds fertilizer, and uses improved varieties or other practices which increase per acre yields. The total capital inputs for using these practices on the combined farms is increased, although the total capital input, including machinery investment, may well decline. From a survey of farms in one township of western Iowa in the spring of 1955, the writer found that out of ten farms being consolidated with others. eight were previously operated by tenants who had shifted to nonfarm occupations. These eight farms had been cropped almost continuously with grain, and in 1954 fertilizer outlays on these farms averaged \$43. Moreover, assessment records indicated the 1954 crop yields on these farms were a third lower than the township average. Buildings were badly deteriorated. In contrast, the eight farms annexing the eight previously operated by tenants now in nonfarm employment had yields in 1954 a fifth greater than the township average, although the soil association was similar throughout the township. Operators of the farms being annexed more than doubled the outlay of fertilizer on the added units in the first year. Four of the farms being consolidated were contour planted for the first time. Seedings were started on three farms in 1955 and planned for others for 1956.

On 7 of the 10 farms being annexed, it appeared that yield levels would be increased. Only two of the annexing farms increased power units in 1955, and one had switched from 2-row to 4-row planting and cultivating equipment. Three expected to hire harvesting services. Obviously, however, the total machinery investment on the 10 combined farms would be less than that of the 20 separate farms. While investment in fertilizer and seed would be greater after consolidation, it would be more than offset by the reduction in total machinery and building investments. Generally, buildings such as dwellings and machine sheds, would be left to deteriorate without replacement or would be sold from the farms.

While the same is too small for broad generalizations, it provides a firm hypothesis of some near-term prospects in output as farm population is lessened and farm size is increased. These same possibilities exist over wide areas producing food and feed grain. Given the current surplus capacity of labor and machines, the labor force might be decreased by as much as 50 percent on many farms in corn and wheat areas without reducing output of field crops — the products most persistently in surplus. In isolated geographic regions, population decline and farm abandonment have led to a less intensive agriculture. Notable in this respect are regions, such as New England and the Southeast, where land left idle is soon covered with a rapidly growing stand of trees. A relatively rapid increase in woodland acreage in isolated areas during the past two decades indicates that with growth of industry and favorable job opportunities, an exodus from farming is not inconsistent with a more extensive agriculture. Yet extensification has not been of sufficient scope to arrest trends toward a greater output, often in the very same areas. Farm population could possibly be decreased by a third of the 1955 level without reducing crop output in the Corn Belt and in Great Plains specialized wheat areas.

A reduction in the labor force per se is not likely to bring about higher farm income through the market mechanism (i.e., through a reduction in supply). But it can increase resource productivity and average family income from quite another direction, namely, through fewer farms with higher ratios of capital to labor and lower per unit costs of output. Eventually, however, the types of extensification to be mentioned later for industrial areas, along with the trends in population and demand mentioned in earlier papers, may help restore balance between output and consumption.³

COST ADVANTAGES

The main opportunity for increasing income through adjustments in the labor force stems from changes in farm size without proportional changes in other inputs, rather than in changes of a true scale nature. While the number of research studies completed recently is small, several indicate that an increase in acreage or livestock numbers beyond that of the average farm can result in some reduction in cost per unit of output, particularly if more up-to-date farming techniques are used. A few scattered examples include those of Fellows, Bishop, Scoville, and Heady.⁴ Other inputs do not increase in proportion to farm size because in many producing areas the family labor force, particular machines, or other capital items have surplus capacity on farms of typical size.

The modal farm in the Corn Belt likely could increase to 240 acres with the power and labor on hand. We have analyzed several Iowa benchmark situations which throw some light on this possibility. Data are given in Table 9.1 for one soil association, indicating that a 160-acre farm, the typical size in most of the Corn Belt, has a supply of labor and machinery which would allow an acreage increase of more than

³An alternative force in an exodus of labor, but not great enough to turn the upward surge in aggregate farm output, is this: In some areas of very depressed agriculture, families with low incomes must depend on the more intensive cash crops such as corn, wheat, and cotton. Meager incomes do not allow them to invest in grass, longer meadow rotations, and trees. They cannot wait three to thirty years for the investment return, even if it is profitable in the long-run, since income is needed for today's living. As persons in these circumstances leave agriculture, remaining operators who have or can obtain the necessary capital can invest in adjusted land use which represents a less extensive agriculture.

⁴Fellows, Irving, <u>et al.</u>, "Economies of scale in dairying," Conn. Agr. Exp. Sta. Bul. 285; Bishop, C. E., "Underemployment of labor in southeastern agriculture"; Scovill, O. J., "Farm size and costs in Nebraska," USDA Tech. Bul. 931; Heady, Earl O., <u>et al.</u>, "Farm size adjustments in Iowa and cost economies in crop production for farms of different sizes," Iowa Agr. Exp. Sta. Bul. 428.

50 percent, without a proportional increase in variable outlays, and with very little increase in machinery investment. In obtaining these figures, we first computed the optimum organization for a 160-acre farm with the typical supply of labor, building space, and tractor and machinery capacity. Then we removed the restriction on acreage, but retained those on labor, machinery and tractor capacity, and buildings. Acreage was expanded to the limit allowed by labor in critical months. Hog litters remained constant because of limited building space, but cattle increased with the increased forage. If building restrictions are removed, hog litters also can increase, even though total acreage increases to 270 acres. Litters can be increased by multiple farrowings scattered in noncritical labor months. Obviously, the enlarged farm remains a familytype farm; it uses nothing but family labor, except for a little exchange

Item	160 acres	270 acres
Family labor supply in critical months		
Мау	375	375
June	375	375
Sept.	300	300
Oct.	300	300
Nov.	300	300
Family labor used in critical months		
Мау	156	375
June	100	375
Sept.	115	300
Oct.	243	300
Nov.	215	300
Acreage ^a		
Row crops	73	122
Small grain	24	42
Hay and rotation pasture	24	42
Permanent pasture	33	54
Number livestock		
Litters hogs	15	15
Cattle fed	32	80
Costs		
Total variable costs	\$6,221	\$12,718
Total fixed costs	2,125	2,372

 Table 9.1. Increase in Acreage Allowed by Family Labor Supply and Typical Machinery Complement on Shelby-Grundy-Haig Soils in Iowa

^a Of the 160 acres, six acres are devoted to roads, waste, and lots. Ten of the 270 acres are so used.

or custom labor at harvest. The situation is similar for other Iowa soil associations analyzed. A great deal of similarity is found in the several situations, namely, that acreage can be expanded to about 240 crop acres with the family labor and machinery base typically available on a 160acre farm. The possibilities would seem to be similar for farms of modal size over the Corn Belt, Great Plains, and other major field crop areas.

Patterns of Expansion and Capital

Figures quoted have been for farms of modal sizes. If a sizeable proportion of the labor force is withdrawn from agriculture, units of this size or smaller especially need to be consolidated into larger family farms, to allow an increase in the capital/labor ratio and the value productivity of labor. While larger farms also can and do expand, labor productivity is generally higher on these units. The greatest need is for expansion of smaller units which generate insufficient income and which result in great underemployment of labor. From the standpoint of both labor productivity and income distribution, consolidation of two or more undersized units would be preferable to having a large farm annex a small one. However, two major difficulties stand in the way of any optimum pattern of consolidation based on these criteria. One is the spatial characteristic of the farm firm. While an industrial firm can haul bricks and steel for a thousand miles in expanding size, a farm cannot do similarly with land inputs. Generally, a contiguous acreage, or one relatively nearby is preferred for consolidation. If a small farm being abandoned is contiguous to a large one, it is more likely to be added to the large unit rather than to another small unit at some distance. The other difficulty of consolidating two small farms is capital. Operators of larger units more often have the capital for adding acreage. Families with few assets who operate small acreages are less able to bid for consolidation, even though their labor is highly underemployed. More typically, in an area of industrial growth, families turn to part-time farming rather than to farm expansion as a means of augmenting income.

In areas of concentrated small, low income farms (for example, sharecropped units) the obstacle to farm size expansion is more apt to be lack of capital than spatial considerations. Adjustments required to bring about balance in farming include making funds available to prospectively efficient managers as well as attracting some operators into nonfarm employment opportunities. For extreme situations, a considerable upgrading of managerial ability also may be required.

GAINS AND SACRIFICES OF FARM GROUPS

Reductions in the labor force which result in farm consolidation can

facilitate desired adjustments in the resource structure of remaining farms. As some families leave agriculture and others, therefore, are able to expand acreage, the ratio of labor to land and capital can be increased on the combined or expanded unit.

Where acreage and some capital items are added to a relatively fixed family labor supply, both the logic of production economics and the many years of farm management surveys and record summaries suggest the following expected results from farm consolidations: If resources which have elasticities of less than 1.0 are decreased in quantity, their marginal productivities will be increased. Given the type of production function in (1) below, conventionally fitted to the farm resource categories of labor represented by X_1 , capital by X_2 , and land by X_3 , the marginal product is that indicated in (2). By defining k as in (3), the marginal product of labor can be redefined as in (4). Obviously, this latter ratio will increase as X_1 decreases.⁵ Hence, marginal productivity of labor must increase.

(1)
$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}$$

(2) MP of
$$X_1 = \frac{\triangle Y}{\triangle X_1} = \frac{ab_1 X_1^{b_1} X_2^{b_2} X_3^{b_3}}{X_1} = \frac{b_1 Y}{X_1}$$

$$k = b_1 a X_2^{D_2} X_3^{T_2}$$

$$\mathbf{MP} = \frac{\mathbf{k}}{\mathbf{X}, \mathbf{1} - \mathbf{b}}$$

Empirical production function studies generally show the elasticity of labor to be less than 1.0. Therefore, they indicate, as an average, an opportunity to increase marginal labor productivity by decreasing the magnitude of input.

However, each farm is an individual unit, and aggregate changes in the labor force require organizational changes in the structure of farming before labor productivity can be materially increased. A decrease in the aggregate labor force by ΔX_1 , will not change inputs on each farm by this proportion. Rather, labor productivity will increase as farm units are expanded, as some people leave agriculture, and as remaining farm families are able to utilize unemployed labor. The family with 15 months of labor, but with enough volume to use only (say) seven months

 $Y = aX_1 + bX_2 - cX_1^2 - dX_2^2 + eX_1X_2.$

With the marginal product of labor being

$$MP = k - 2cX_1$$

where k is defined as $k = a + eX_2$, the marginal product of labor obviously increases as X_1 is decreased in magnitude. Production functions fitted to farm samples typically have been of the algebraic forms shown. Samples of small farms might give average elasticities greater than 1.0, although empirical studies to date have not shown this.

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⁵We have used an algebraic form which can be manipulated easily for illustrative purpose. Retaining the same condition, an elasticity of less than 1.0, the results are similar for other functions. For example, suppose the quadratic form below for the two resources, labor (X_1) and capital (X_2) .

effectively, will be able to employ this excess labor and to increase annual earnings of labor accordingly.

In terms of the present farm problem, this structural change in agriculture needs to extend far enough to allow real returns on capital and labor resources comparable with those in alternative employment opportunities. The term comparability refers, of course, to resources for which transfer opportunities exist or can be created. Considering the values, ages, and other considerations of many persons now firmly established in agriculture, many will (and perhaps should) remain, even though dollar or real returns are not equated. Widespread research is needed to indicate the size of farms and quantity of capital necessary to allow comparable returns. However, simple juggling of capital/labor ratios does not guarantee equal returns to all farmers. Managerial skills are equally important. Studies for Marshall and Muscatine soils in Iowa, two types comparable with much of the soil in the Corn Belt. indicate that able managers can readily attain equality of resource earnings with 240 acres and livestock production of sufficient scale. But a poor manager cannot equate real income with alternative employment opportunities even by operating 320 acres. Data of this type are needed for each farming area which has an adjustment problem. Only then can we predict the size of the labor force and the number of farms and farm families which will produce family and resource returns comparable with those of other economic sectors. Until more information is available, speculations about changes in resource ratios have little concrete meaning in terms of educational programs, governmental policies, or adjustments in community structure.

Groups Affected

We are now at the point of recognizing three particular groups that may be affected by adjustments resulting in sizeable reductions in the labor force. First is the group which moves from farming to nonfarm employment. To the extent that these persons possess little capital and operate inefficient units, transfer to employments of higher real incomes can increase their welfare. Second is the consolidating group which remains in agriculture. To the extent that they expand farm size and increase volume of sales and reduce unit costs relative to any decline in product prices, they also will gain from a reduction in the labor force. Third is the group which both remains in agriculture and is unable to expand farm size. Their relative welfare may be depressed further if product prices continue to decline because of continued growth in output. If time could be telescoped and this group could be inventoried, we would expect to find that it includes farm families unable to adjust because of age, health, skills, capital limitations, lack of knowledge, or similar considerations. It is to this group especially that compensation

needs to be directed if society is obligated to redress losses stemming from economic progress.⁶

FAMILY FARM PROSPECTS

If we are not concerned about refinement in definition, the type of adjustments outlined in this paper need not undermine the family farm. Generally, these adjustments would strengthen the position of the family farm, in the sense of providing returns on resources used in farming equal to those used in other industries. A system of family farms is unlikely to persist over time, unless it can provide equality of resource returns. Previous analyses suggest that equality of returns is indeed possible for family farms operating with sufficient capital and on a sufficient scale.⁷ The term sufficient scale is consistent with family farming for most types of American agriculture. Modern machinery has generally meant that the labor of the farm family can be used to operate more acres, often with a reduction of hired labor even for seasonal operations such as harvesting. If the "degree of family farming" is denoted by the proportion of the total labor input furnished by the family, the strength of the family farm has not declined with a reduction in the labor force and an increase in farm size. Hired workers represented 25.2 percent of the total labor input in 1920 and 23.2 percent in 1956. These figures are, of course, for the aggregate structure of agriculture. In localized areas - parts of California for example - nonfamily farms have increased greatly. However, this does not appear to be the nearterm prospect for the major part of commercial agriculture, nor the necessary result of adjustment to bring about balance in agriculture.

The nature of scale returns, or the cost economies associated with farms of different sizes, will determine the extent to which prospective adjustments to improve agricultural balance will strengthen or weaken the position of family farms. The family farm structure would be threatened if scale or cost economies extended over large acreages. We believe, and have some supporting empirical evidence, that this is not the case.⁸ Given the fixed costs associated with modern machinery, substantial cost economies can result from some further expansion of small or modal size farms. However, because variable costs of the agricultural firm eventually dominate total costs, cost reductions per acre eventually become minute as acreage continues to expand with a given power and machinery unit. When this point has been reached, no great cost advantage is realized by a larger unit. Generally, after this point on the per acre cost function representing full utilization of labor and machine

⁶Current control and price subsidies might be interpreted to mean that society believes technical progress has been too rapid in agriculture; therefore, it should be retarded and compensation paid.

⁷Cf. Wilcox, W. W., "Efficiency and stability of American agriculture," Jour. Farm Econ., Vol. 30; Heady, Earl O., and Strand, E. G., "Efficiency within American agriculture," Jour. Farm Econ., Vol. 37.

⁸See Heady, Earl O., et al., op. cit., Iowa Agr. Exp. Sta. Bul. 428.

services in particular seasons of the year, further expansion in size must come from increase of machine units. If the limit on crop acreage for a two-plow tractor is 240 acres in the Corn Belt, costs will not be substantially, if any, lower on a 480-acre farm which uses two-plow tractors. From the standpoint of cost economies, the larger unit would have no great competitive advantage over the smaller unit.

We believe that the structure of costs explained above is essentially that which exists in the Corn Belt and Great Plains. Our own studies in Iowa show that per acre costs decline substantially up to a crop acreage of 240 or slightly greater. Costs for 240 acres are lowest with a twoplow tractor and its usual complement of machines. For larger farms, and considering the need for some surplus machine capacity in years of unfavorable weather, larger acreages usually require either another tractor or a larger tractor. With two tractors, or a larger tractor, the slope of the unit cost curve is even greater for small acreages. However, since the mathematical limit of acre fixed costs is zero, the mathematical limit of acre total cost is the variable cost per acre. Hence, with the same crop techniques and with approximately equal variable costs per acre, a farm with either a three-plow tractor or two two-plow tractors has no great advantage over a farm with a single two-plow tractor. Quantitatively, our Iowa studies of cost functions show this to be generally true.⁹ With this tendency of the per unit cost function to flatten out as it approaches the limit of constant variable costs per acre, a family farm of efficient size has no particular disadvantage. But at the same time, larger farms have no particular cost disadvantage. Historically. the complex of uncertainty, capital rationing, and related institutional factors have restricted the size of the farm firm. In the absence of corporation or equity financing schemes in agriculture (which do not appear very probable) these factors will continue to limit farm size. Perhaps any trend to larger-than-family farms will result more from the pattern of capital or asset distribution than from scale or cost economies. Larger holdings are not inconsistent with constant scale returns (the case mentioned above where power and land units are eventually duplicated).10

The large hired-labor farm with a big force of migratory workers (as found in parts of California, the Mississippi Delta, or Connecticut Valley) does not threaten to become the dominant unit in American agriculture. Among the reasons are lack of extreme seasonal labor requirements and of cheap migratory labor. Further, the "farm philosophy" of the Midwest would likely make it unacceptable. Farms which remain can be family units, but fewer will be needed. A logical hypothesis is that, in the absence of an extreme range of economies to scale, there can be more family farms if overly strict definitions or legislative restraints are not attached to them. Typically, the restraint defined for

⁹Cf. Heady, Earl O., et al., op. cit., Iowa Agr. Exp. Sta. Bul. 428.

¹⁰Perhaps this is the reason that large units often are found in labor types of agriculture. Scale returns tend to be constant in farming where labor is the predominant input.

the family farm is labor supply; total labor input cannot exceed specified proportions of the family labor supply.¹¹ Hence, an absolute limit is attached to the per firm use of this resource. In the main, farms in the United States do not approach this limit because they use so little labor. Should they ever approach the limit, the picture might be that suggested in Figure 9.2. The positively sloped curves are isoclines denoting points of equal slope on successive product or income isoquants. Accordingly, they are expansion paths, indicating the proportions in which land and labor should be combined to attain each output or income level at minimum cost. In the absence of capital rationing and restricting definitions, expansion would follow one of these (say, I_1) denoting equal substitution and price ratios for factors, until the marginal value products of resources are equated with their prices. A definition restricting labor input below this level then would also restrict land input per farm and allow existence of more farms, with the relative numbers of farms hinging on the slope and curvature of the isocline. But given the fact that farms generally do not use resources at levels equating value products and prices, a highly restricting definition of labor input might push the firm to extensification of land use - and to fewer farms. For example, suppose that the definition limits the labor input to om_1 . The firm has the typical farm goal of pushing resource use and output to a level consistent with (a) a particular standard of living or (b) a budget or isocapital line defined by the funds available. If it wishes, or has funds, to attain the isoquant ST, it can follow the least-cost expansion path only to the restraining level R. Hence, to attain isoquant ST, it must extend land input up the hybrid isocline RH. Attaining ST in this fashion limits labor input to om, but extends land input to oa₂. Allowing expansion along the isocline, I, labor input would be increased to om,, but acreage would be lessened to oa₁, and more farms could exist.¹² While possibilities of these restricting definitions do not pose near-term problems in farming, they have been mentioned because of the widespread fear expressed in farm groups, namely, that the adjustments being forced by the market mechanism may encourage corporation farming and strangulation of the family unit - unless manpower per farm is limited by strict legislation.

PRODUCTS OF LAND WITH HIGH INCOME ELASTICITIES AND SPECIALIZATION OF FARMING

Fear also has been expressed by agriculturists that trends in our progressing economy threaten to destroy large segments of our national farming heritage. Alarmists point to the amount of land withdrawn each

¹¹Ackerman, J., and Harris, M. (eds.), Family Farm Policy, The University of Chicago Press, 1946. Numerous family farm definitions by various writers in this collection of papers restrict size by labor input.

¹²Also, value products of resources would be more nearly in line with factor prices. For details on this point, see Heady, Earl O., Economics of Agricultural Production and Resource Use, Prentice-Hall, New York, 1952, pp. 379-81.



Fig. 9.2 - Effect of family farm definition.

year from agricultural uses, for airports, superhighways, factory sites, and residential areas. This fear is not economically logical. Capital in the form of new technology has become a very productive substitute for land. This trend will continue if society and private firms continue their relatively large investment in agricultural research and information.

Jubilation, rather than anxiety, should meet this reallocation of the land resource from food and fiber products to other goods and services demanded by a society growing progressively in income and wealth. The reasons are numerous: First, withdrawal of land from production of food and fiber can help diminish the magnitude of the farm problem by curtailing output. Second, these shifts in land use characterize economic progress. As noted elsewhere in this conference, income elasticities of demand for food are low. But in contrast, income elasticities must be extremely high for the land products and services mentioned above. Through land prices in the open market, consumers are indicating that marginal utility for services of land is greatest when some of this resource is shifted from food production. Through the voting mechanism, they voice a similar opinion as appropriations are provided for airports, roads, and parks. Obviously, there is no "higher use" for land than this in a mature and wealthy society whose anxieties stem not from lack of food but from transportation snarls, shorter work weeks, congested living conditions, and related phenomena.¹³

Types and Locations of Farms

Contrasting trends in types of farms may be expected as economic

¹³We might say, for the benefit of the conservation devout, land will indeed be preserved for the millennium if it is covered with a dome of concrete for these currently "higher uses."

growth continues and adjustments are made in agriculture. On the side of commercial family farms, more specialized products in larger amounts can be expected. In line with the product and factor prices expressed in the market, technical developments such as multiple farrowing of hogs, bulk tank cooling of milk, improved rations and brooding facilities for poultry, and others, will encourage farms in a balanced agriculture to be more specialized and to employ more specialized management. Agriculture will be highly competitive. The intensity of the current adjustment problem stems partly from the great upsurge in understanding and application of innovations over the past two decades. The rate at which innovations are adopted, except those which the majority find prohibitive because of capital requirements, is now much greater than in prewar days. As one Midwest extension specialist emphasizes: The first generation of extension educators dealt with farmers who were not even the equivalent of high school freshmen. The current generation deals with persons who are more than the equivalent of the college freshman.

In line with these trends and the related cost functions, we would expect an increase in the number of dairy farms with 60-80 cows per man, broiler farms with 80,000-100,000 birds, and perhaps hog farms specializing in either the production of feeder pigs or market hogs. The ability of the farm to substitute for part of its labor input by buying prepared feeds and similar custom services will encourage this trend.

But at the same time, a progressive economy will continue to express high utility for those types of farming often described as <u>part-time</u> and <u>residential</u>. To the extent that the great virtue of <u>farm living</u> is lessened by fewer and larger family farms, this virtue can be increased by more of these non-commercial farms. Certainly, those intangible and spatially oriented values of country life can be retained by development of more farms of the latter type — a trend which is indeed increasing.

Here is a further clue to possible spatial adjustments in agriculture: To the extent that aggregate output conforms more nearly to demand through (a) change in farm numbers or types and (b) withdrawal of land from commercial uses, the adjustment will come largely in areas of industrial and population concentration. As an indication of the longer run trend, the amount of land in farms for the four states of Massachusetts, Connecticut, Rhode Island, and New York declined by 25 percent between 1920 and 1950. Any slackening of upward trends in farm output, from adjustments to balance agriculture with population and economic growth, will come from shifting land use in the agricultural-industrial transition areas, rather than from withdrawal or extensive use of land in concentrated agricultural areas. This front, with land devoted more particularly to residences, trees, etc., will move further westward into the Corn Belt with consequent output-contracting tendencies. Within concentrated agricultural areas where land is retained in farming, some reduction in physical volume of output can be brought about as land is shifted to those products associated with a more extensive agriculture

and having a higher income elasticity of demand than the products which they replace. These within agricultural shifts will or should be in fringe locations defined largely by comparative advantages which relate to soil and climate. Examples are shifts from wheat to grass and beef in fringe areas of the Great Plains, or from annual crops to woodland in more of the Southeast and New England.¹⁴

The shifts discussed in this paper can or will not be rapid, as in shifting factories from wartime to civilian products. Demeter, the Goddess of Agriculture, is not likely to wave a new parity formula over the farm industry, transforming it overnight into the structure suggested. Also, more research is needed to indicate direction and magnitudes of possible adjustments. However, until these quantities are known, we reaffirm the outline above as our hypothesis of the farming structure for a balanced agriculture.

¹⁴These propositions in respect to extensification shifts in transition areas may appear to be in conflict with the notions presented earlier, namely, that a smaller labor force will not cause a reduction in aggregate output. We only point out the regions where agriculture may be expected to become less intensive. We do not predict that these trends will be of sufficient magnitude to offset output trends in concentrated farming regions.

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Discussion

R. HEADY accepts the widely advocated solution for the farm surplus problem, which, simply stated, is: Shrink output by reducing the labor force on farms enough to balance supply and demand for food and fiber and in consequence raise net incomes of farmers. But he hastens to make clear that he expects this adjustment to become effective only in the long run. In the short run, say in 5 to 10 years, he now sees little likelihood of relief from the farm problem through this type of adjustment.

Instead, recent studies lead to the conclusion that in important sectors of American agriculture a reduction in the labor force would increase farm output. We thus appear to find ourselves in about the same dilemma as a task group of the President's Commission that was set up to find new and large-volume uses for farm crops. This task group pondered over its recommendation that cornstarch be used in insecticide and defoliating formulations. They could foresee that success of the project might work against the basic concept of crop-surplus reduction, for conceivably the starch-based sprays might play such havoc with insects that the annual harvests of many crops would be increased much more than the 10 million bushels of corn utilized in the sprays.

How a decrease up to 50 percent in the farm labor and an expansion in farm size together increase farm income, particularly in the Corn Belt and Great Plains, is explained by Dr. Heady about as follows:

As labor leaves agriculture, part of the farms are consolidated with neighboring units. The operators who remain on farms and expand their acreages either by renting or by buying the farms vacated generally have greater managerial ability and possess otherwise unused equipment and labor to operate the added acreage with improved efficiency. They put the vacated land into a rotation of crops and add fertilizer and other practices that increase yields per acre. The modal 160-acre farmer in the Corn Belt usually can increase his holdings to 240 acres with the labor and power on hand. Thus, the chief opportunity for increasing income through adjustments in the labor force arises from changes in farm size and nonproportional changes in other inputs rather than from changes that are of a true scale nature. The adjustments, therefore, are complex and varied, depending on the structural changes needed on different farms.

DISCUSSION

A few examples of studies are cited to indicate that increasing the size of the average farm can result in some reduction in cost per unit of output, particularly if modern farming techniques are used. Although Dr. Heady refers to the paucity of studies that deal specifically with size and economy of scale, I believe information from many recent studies supports the hypothesis that a surplus capacity of labor, machines, and management is available on many farms in the Corn Belt and wheat regions which can be employed on larger farms to increase resource productivity, lower costs per unit of output, and raise net farm incomes. Studies of labor-capital substitution shortly after World War II, when farmers were investing heavily in machinery, reached the cogent conclusion that most operators of cash-grain farms in the Corn Belt had too little land rather than too much power and machinery.

Dr. Heady implies, if he does not actually advocate, that changes in the structure of agriculture of the kinds mentioned would provide real incomes comparable with those obtained from employment of equal resources elsewhere and would contribute to the solution of the surplus problem in important sectors of agriculture. In other words, those farm families who adjust the size of the farm and the system of farming enough may expect to reduce costs relative to any associated decline in prices of farm products.

That I am in agreement with the above conclusion is a matter of previous record. In a discussion of postwar agricultural problems in the Corn Belt in a paper presented at the annual meeting of the American Farm Economic Association in 1945, I said that "Net returns to Corn Belt farmers can probably be maintained more effectively by helping them to produce abundantly in balanced systems of farming and at lower costs, than by efforts to maintain high prices by restriction on output. And the results are more beneficial to human welfare."

If we agree with the foregoing approach to the solution of part of the farm problems in the Midwest, we must also agree with Dr. Heady that widespread research is needed to indicate the size of farms and the amounts of capital necessary to provide comparable returns to those who can manage additional resources. His warning that simple juggling of capital-labor ratios does not guarantee comparable returns is also pertinent. Studies are needed of how managerial ability may be developed and used effectively in carrying out the program of adjustments on the farms that expand in size.

Thus, we have covered the part of the problem which we conclude might be managed as a "self-liquidating" program. But even in the Corn Belt and the wheat regions, as Dr. Heady recognizes, there is the large group of farmers who choose to stay in farming and are unable or unwilling to expand the size of their operations. How to prevent the relative welfare of this group from being further depressed if prices of farm products continue to decline because of still more innovations and a stepped-up program of adoption by progressive operators is a big part of the rural problem, and it is not confined to the so-called low-income farm areas. Dr. Heady mentions compensation from public funds for this group. If time and his topic had permitted, no doubt he would have explained that he was not thinking solely of grants or payments to supplement incomes for this group. I think he would concur in the proposition that much more research is needed to gain a better understanding of the problems in this group and to provide a basis for development of educational and leadership programs to guide them in more productive use of their resources.

In regard to the potential dangers of a "farm consolidation" program, which Dr. Heady discusses under the heading of "Family Farm Prospects," I agree that the "large" farm operated with many hired workers or contract services does not now threaten to become the chief unit in Midwestern farming. New developments in technology, however, may tend to extend the range of economy of scale in some parts of the farm business. In the level parts of the Corn Belt we are finding new ways to specialize in production of corn without damaging the soil. In hog production, the use of antibiotics and other disease-control measures may eventually lift the ceiling on scale of operations. In cattle feeding, mechanical feeders and self-feeding arrangements greatly reduce labor requirements. But the instances in which these developments may result in corporation farms are likely to continue to be relatively few.