

## Capital Supply and Family Farms

A PARADOX of agriculture is that for decades and centuries it has furnished capital aiding development of nonfarm sectors without a compensating flow of capital from the latter into agriculture. Yet it is an industry where the firm traditionally is short on capital. The paucity of investment funds is especially great in the poverty sector of agriculture, but the capital-supply complex of the commercial sector also differs greatly from that of the major nonfarm sectors.

Difference between industries in capital supply functions is not in material items such as machinery, fertilizer, seeds, insecticides and other specific forms. At the current level of economic development, these items of physical capital are supplied about as efficiently and freely to agriculture as to other industries, and in pretty much in the same competitive structure. The great difference is in the equity base on which capital funds and credit are supplied to agriculture. Traditionally, equity to which supply of investment funds is tied comes from within agriculture. Capital accumulation in agriculture has been almost solely a function of the industry. Recent studies indicate that no less than 90 percent of investment in agriculture has come from savings of households therein.<sup>1</sup>

As an industry declining in labor force and households, the steady transfer of people means that capital invested in the individual moves

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<sup>1</sup> A. Tostlebe, *Capital in Agriculture, Its Formation and Financing Since 1870*, Princeton University Press, Princeton, N.J., 1957, pp. 3-5.

continuously to urban and industrial sectors. Also, farm plant shares of capital inherited by those who migrate has similar transfer, with persons remaining required to restore a portion of this value of assets from later savings generated within agriculture. Were agriculture an industry expanding in labor force and households and investment of the latter being beyond the supply indigenous to the industry as it was in the period of national settlement, capital funds would be supplied more from outside sectors. Or, if the farm labor and entrepreneurial force came equally from outside the industry, capital flowing out of the industry would only balance that flowing into it.

The nature of the capital supply function as it relates to the aggregate of agriculture does not restrain farm product supply against demand, thus causing pressure towards high real price of food. To the contrary, the capital market, both in respect to physical items and investment funds for the aggregate industry, allows and encourages adoption of new techniques faster than their effect in commodity supply can be digested by the indigenous structure of agricultural factor supply.

In nations at low stages of economic development, supply constraint for investment funds by individual firms and agriculture in total does have important impact on rate of technical advance. But in the United States it does not do so importantly for several reasons. Inputs of agriculture which are furnished from outside of the industry are generally more elastic in supply and less closely tied to equity of the household than those supplied from inside of agriculture. Investment funds are technical complements or limitational inputs with use of the physical capital items furnished from outside of agriculture. If farmers lack investment funds for farm machinery, they cannot purchase or use the latter. For this reason, firms which supply capital inputs to commercial agriculture have aided in expanding the supply function of investment funds for these particular purposes. Hence, capital restraints do not generally limit supply of funds for purchase of farm machinery. Dealer credit is available for fertilizer and seeds even for farmers in the lowest strata of income, but certainly at a high price or interest rate. Similarly, credit for chicks and feed is supplied by firms specializing in the supply of these resources to farmers through contract and integration farming.

The demand for these nonfarm inputs would be greater, and more of certain groups would be used, causing farm technology to be improved even more rapidly, if the supply function of investment capital to agriculture were more elastic. Yet the chain of relationships from (1) supply function of capital facing agriculture to (2) demand function for non-farm inputs to (3) supply function of food products is not of serious consequence to the consumer. Relaxing the capital supply function to cause a more rapid expansion of the food supply function is not a pressing problem for American society. It is much less so than need in expanding the supply of capital to education in order that subsequent increase can take place in human resources developed and supply of skilled and professional labor can be expanded to growth industries. It

might even be better argued that if the supply prices of investment funds and capital of new technology were increased "over the board" for agriculture, the commodity supply function would be restrained against an inelastic demand, and revenue of agriculture would be increased more than costs.

Why, then, is capital supply for agriculture a problem worthy of discussion? It is a problem of important magnitude in several respects. Capital supply phenomena largely cause the low-income sector of agriculture to retain its structure in times and locations when national industrial development otherwise is rapid enough and provides the setting for a much more speedy erasure of poverty. It causes investment for development of the individual to fall below the level desired in terms of national needs, future economic growth and the unexploited capacities of many individuals. It restrains the rate at which adjustment can occur in the structure of agriculture, especially in size and numbers of farms where resources per unit are inadequate for modern-day concepts of equity in living standards. It affects the freedom of some farm families. They are not equally free, with their colleagues of agriculture, to take advantage of technical change produced by the public and to maintain a given share of the industry's revenue. Those who are faced with an elastic supply function of capital with favorable price of investment funds indeed have greater freedom in the market than those who are not so blessed.

To the extent that the former group can increase its output at a sufficiently high rate relative to the increase in aggregate output and the supply price of capital, it can benefit from increase in production technology and food supply even though revenue to the industry declines. Finally, capital requirements for farming under continued economic growth, and the supply conditions which surround them, promise to have impact on institutions with long-standing value orientations. Family farms fall in this category.

### **CAPITAL SUPPLY AND EQUITY IN DISTRIBUTION OF PROGRESS GAINS**

Equity in the distribution of gains from technological progress generated in public research institutions is possible only if farmers have a comparable degree of opportunity to capital. Otherwise, those who lack capital for innovating are left in the backwash of increased output, inelastic demand and diminished revenue. In equations (5.42) through (5.57) we illustrated that while the aggregate effect of increased output, at rate greater than demand growth, is decline in total revenue, producers who increase output by a greater proportion than the industry do gain from the process. Those restrained in innovation and who increase output at rates equal to or less than the industry bear the brunt of losses stemming from technological progress.

As agriculture becomes more commercialized and specialized, and as

factor prices further extend the substitution of mechanization and its attendant scale economies for labor, this gap in opportunity between farm firms will grow. Those operating on a corporate basis, or with financial structure allowing access to supply of investment funds under comparable conditions, have greatest opportunity for gain from technological research. Those starting with low initial equity and dependent on capital accumulation through meager savings of households will be increasingly excluded from gains of publicly or privately produced research. In fact, it is upon this group that the costs of progress, over the total range of gains and sacrifices, fall with greatest weight. With speed in the rate of development and capitalization of agriculture, this burden promises to fall on a broadening group of farm operators. Equity can be restored, of course, through a wide range of policy means including: education, training and related services which give those squeezed out of agriculture the opportunity for comparable gain in employment by non-farm industry; quotas which restrain output of all producers or allow those with least opportunity to receive compensation through sale of their producing rights; credit and educational policy which gives approximate equality of opportunity in capitalizing on the product of public research institutions; and others.

To the extent that credit policy is used for these purposes, it needs to be based more on prospects in productivity, and certain other of the rearrangements mentioned below, than on traditional attachment to owner equities. But just as education which turns surplus labor of agriculture back into the industry is undesirable, so is credit policy which becomes entangled in the nostalgia of pioneer farming and lashes people to agriculture when their best opportunity is outside.

The amount of capital necessary for initiation of farming on a scale promising success is approximately that required in training for the medical profession. Rather than credit policy to place this amount of capital in the hands of every farm youth, capital investment in education to train more for the medical profession is needed, given the rate of return on capital in the two sectors. Similarly, credit policy directed simply to keep middle-aged operators on inadequate units is not desirable when returns to the family would be greater in capital diverted to retraining them for employment and in underwriting migration costs for transfer out of agriculture. The transformation of low-income sectors of agriculture with meager productivity and family income to levels consistent with the over-all American standard does call for important credit aids in long-distressed areas. Only thus can small low-income farms be consolidated into productive units employing appropriate technology.

## **CAPITAL AND FARM SIZE UNDER ECONOMIC DEVELOPMENT**

In discussion of Figure 3.1, we indicated that economic development itself would have called for change in labor/capital combinations, degree of mechanization and farm size—even had all machine technologies been

known from the outset of civilization. This is true because of the increase in price of labor relative to capital in the long sweep that characterizes sustained economic growth. Without full initial knowledge of all physically possible technologies, they still tend to develop and are encouraged by the same set of price forces.

As labor grows in price relative to capital, it becomes more economic to substitute the latter for the former. Hence, there is growing profit in invention and supply of machines to replace manpower. With or without initial knowledge of all possible physical technologies, the different stages of economic growth call for different patterns of farm numbers and sizes and different labor or machine technologies. Suppose, however, that the over-all production function and its marginal productivities and marginal substitution quantities were known for all times as in equation (4.18). The input variables representing labor with "less" mechanization, labor with "greater" mechanization, etc. are known as illustrated in Figure 3.1. Focus thus is not on knowledge of the production function but on the relative prices of the factors which go into it.

In an economy characterized by capital scarcity, population pressure and general labor unemployment, the supply price of capital is high relative to that of labor. Even though the technical coefficients are known for machinery (mechanized agriculture), the least-cost and economically most efficient organization of agriculture leans in the direction of labor technology. With approximately constant scale returns or costs for labor-type technology, agriculture can be organized into smaller productive units without sacrifice in alternative social goals and economy of production. Given similar technical and management skills under labor technology, small farms operated independently can probably be just as efficient as large plantations or state farms operated with many laborers. However, as economic development progresses with capital becoming relatively abundant and labor becoming relatively scarce (agricultural production functions remaining constant and/or being fully known), the relative prices for capital and labor resources turn (Table 7.1) to favor substitution of machinery for labor.

With mechanization and "lumpy" capital inputs involving fixed costs, cost economies are much greater for increased farm size. Hence, with a decrease in the supply price for capital relative to labor under economic development, a transition from a labor technology to larger and fewer farms or a greater machine technology in agriculture represents the transition in structure of agriculture. Too, at a higher level of economic development and industrialization, the presence of increased employment opportunities and other social mechanisms for "producing" distributive and stability ends may be created.

Even without change in technical knowledge, growth of Asian economies to give per capita incomes and factor supply conditions approaching the U.S. level would call for transition from the "reform structures," farm sizes and labor technology which currently denote the social optimum, to an entirely different structure of agriculture. In this sense,

given the production function, the optimum organization of farms in respect to size, numbers, capital requirements and technology in a broad sense is itself a function of economic growth and the conditions of capital supply. A different optimum farm size or technology exists for the various stages of economic growth. In a pure economic sense, this is as much true in communistic as in capitalistic economies. At stages of little capital and large population, labor agriculture is still optimum, even though it is organized into plantations or collective farms. But with growth, wealth and greater capital supply, mechanization becomes more the appropriate structure because it has lower real cost against the supply function of labor.

The extent to which farm size expansion needs to be an important concern in economic development of any country depends largely on (1) the rate of industrialization and the creation of nonfarm employment opportunities, (2) the size of the farm labor force and its potential contribution through migration and (3) the nature of resource economies in agriculture. Under lack of nonfarm employment opportunities and great underemployment of agriculture, national gain from farm enlargement and mechanization to increase labor productivity is small, if even positive. An increase in labor productivity simply results in unemployment for those released from farming. Of course, if farm enlargement not only increases labor productivity but also results in economies of capital, farm size expansion could contribute importantly to economic development even if the labor released has no other employment alternative. Questions of positive-sum utility outcomes and equity then arise unless mechanisms leading to distributive justice are created. Hence, the crucial question arises whether, under the relevant resource supplies and prices and hence the appropriate technology, important scale economies for capital do exist. A "strong hypothesis" is that they are "relatively weak" or nonexistent for the labor types of agriculture found in undeveloped countries, the technologies relevant for the conditions of factor supplies and prices where work force is large relative to the national capital. Economies may exist up to the limits of the typical buffalo, horse, camel or bullock team and associated implements. Effective utilization of these small "chunks" of capital is attained with a relatively small farm size. Larger farms largely are duplication of the land-animal-implement mix used on small units.

Factor prices in the United States are such that continued substitution of capital for labor will continue. Since capital of machines comes in large "chunks," with per unit costs declining over greater acreage, farms will continue to be larger. Already it is physically possible for a million farms, or ever fewer, to represent the food supply function of the nation. The trend will continue in this direction. Capital requirements will grow not only because of the large investments required in the "lumpy inputs" represented by large-capacity machines but also because the potential scale economies are possible only if the operator has the necessary amount of acres, animals and supplies to realize them.

### Firm Demand for Capital and Credit Supply Structure

Given the existing and prospective techniques in agriculture and the relative prices of factors used in production, the individual farm's capital demand or requirement will grow greatly over future years. Even with some further decline in commodity prices relative to factor prices, this will be true because (1) of the larger amount of acres, animals and supplies over which scale economies of machinery and equipment extend and which are necessary to realize major cost advantages, (2) the productivity of many resources such as chemicals is still high relative to their costs for the individual farmer and (3) the suppliers of inputs will increasingly find themselves faced with the need either to increase the productivity of the resource they sell to farmers or to lower its price. A lower price means more inputs per farm, and fewer farms against a highly restrained or inelastic demand for food.

Greater knowledge of farm people, better adaptation of vocational and other education to current-day economic conditions and improved communication mechanisms for nonfarm employment opportunities also will lead further to a greater average capital input per farm. Too, the tendency towards increased specialization in farm management, partly as a result of the more complicated technology of production, also will favor a greater input and output per farm. Capital inputs or demand for the individual farm will grow much more rapidly than those for the industry, largely because the industry will retain a high degree of constancy against decline in number and increase in size of individual units. (See Table 2.8.) Growth in per farm use of capital and attainment of scale economies will tend to cause resource returns of agriculture to compare more favorably with those of other industries. But before this structural change is completed, in magnitudes which appear important, changes may be required in the capital market and in credit supply. Obviously a farm unit using \$200,000 or more in capital, an amount now consistent with the technology and scale economies existing in major types of commercial agriculture, will have to surmount important financing problems.

Tradition in equity base of agriculture, mainly from families supplying labor to the sector, is not paralleled in other major industries. Corporate funds and common stocks draw widely over all sectors of the economy, and not particularly from households supplying labor. Typically, farm businesses have been initiated by the family providing the initial assets or credit backing to a son, each generation of firms starting anew in this process.<sup>2</sup> Inheritances drawn from capital accumulation within agriculture have been the main source of the "down payment" in purchasing land. This source of equity base is much less consistent with the tech-

<sup>2</sup> For more detailed analysis of the "life cycle" of farm firms, see Earl O. Heady, *Economics of Agricultural Production and Resource Use*, Prentice-Hall, New York, 1952, pp. 431-33. Also see papers in E. L. Baum, Earl O. Heady, and Howard Diesslen (eds.), *Capital and Credit Needs in a Changing Agriculture*, Iowa State University Press, Ames, Iowa, 1961.

nology and capital requirements of today than with those of decades back.

Growth of vertical integration may stem as much from these capital developments as from other reasons sometimes mentioned. But vertical integration is only one means for gearing institutional and market mechanisms more closely to modern capital needs and in causing the supply base for credit used in agriculture to be extended to nonfarm sectors. Others need to be investigated. Family corporations and equity financing may be of promise. The entire structure under which credit is provided to agriculture needs to be re-examined. Historically, the farm operator has borrowed funds, beyond his inheritance or individual capital accumulation to finance ownership. But he immediately established a goal of full equity and diverted savings into debt retirement. The goal underlying this procedure has been that of security for old age and retirement. The extension of social security coverage to farmers, the growing knowledge of farmers about nonfarm investments and related developments may remove the pressure for rapid and complete debt retirement.

The corporate firm makes no particular effort to liquidate its indebtedness on an amortized basis. Should credit be extended more to agriculture in a similar manner? Farm operators then might, where appropriate, utilize their savings to extend scale to a level more consistent with modern technology. Gain might well accrue to both farms as businesses and to lending firms, supposing initial loans to have an economically substantial base, under this demand-supply setting. In the absence of major business recessions and in a stable agriculture, borrowed capital should have no less productivity later than today. As corporate firms already suggest, why should debt be liquidated if the funds so obtained have a productivity greater than their price?

In orthodox economic context, farm firms should be encouraged to place their savings in enlarged investment, as long as the marginal efficiency of capital is greater than interest rates. Repayment would occur only after investment had extended to levels where they are approximately equal, and not necessarily then except to the extent that development leads to food prices which decline relative to factor prices.

If young farmers are to be given better opportunity for starting operations, or if established operators are to use the various capital resources in line with their relative prices and productivity, consideration needs to be given methods for extending credit more on the basis of capital productivity. Credit on this basis would allow a use of resources more in line with modern economic structure, as compared to the more conventional security basis of loans. Of course, risks to the loaning firm are no less important than risk and uncertainty to the farm firm in specifying the structure of the credit supply function. They depend on variance in management ability of individual operators as well as variance in price and production functions. Integrating firms have partly gotten around this difficulty by combining management aids or specifications with capital supply, to lessen the uncertainty of decision ability of the farm



operator. A parallel development appears appropriate for other institutions and firms which supply credit.

Forces leading to larger and more elastic supply of investment funds to individual farmers do pose certain questions of policy ends and equity. Increase of the capital supply function to individuals promotes the growth or progress goal in the sense that it leads to greater capital use per farm, encouraged technical improvement, greater attainment of scale economies and smaller resource requirements of agriculture and the freeing of labor for employment in other industries. On the other hand, greater attainment of the progress goal promises to compete with other possible goals such as equity, family farms and, in the short-run, even aggregate level of farm income.

### **POLICY IN CREDIT WITH DEVELOPMENTAL EFFECTS**

Credit policy can be directed towards such distinct ends as progress, equity and other constructs. As a mechanism to promote economic development, the function of credit policy should be to increase the elasticity of supply and lower the price of capital to farmers. Under these conditions, profit incentive is increased and rationing restraint is lessened, thus allowing purchase of inputs representing improved technologies and leading to economies of scale in resource use.

Numerous studies have indicated the impact of the uncertainty-capital complex on size of farms and agricultural practice or organization in commercial U.S. agriculture. Little direct analysis has been made of this phenomenon as it relates to small-scale, low-income farmers of the U.S., or to capital-short cultivators in less advanced agricultures. But certainly it places an even heavier burden on agricultural improvement in the latter cases and generally dampens innovation in technology and expansion of farm size. The "degree of uncertainty," even in the innovation of a new crop variety which does not increase capital outlay, stands to be great for a person whose meager income and food supply makes subsistence precarious in any year. With little or no reserve borrowing capacity in case of crop failure and with ability to predict and forecast new outcomes from innovations driven near zero by (1) lack of mobility to view outcomes on other farms at even short distance and (2) his lack of education, the low-income farmer or cultivator certainly must hesitate in substituting a new variety and method for one which has "proven the test of time in keeping him fed." Chance taking, when income is at the borderline of subsistence, is highly "unpalatable."

Game models tested in underdeveloped and subsistence agricultures against those of developed commercial agricultures would likely show the "strategies against nature" to be in the direction of conservative or Wald minimax types in the former and to be much less restraining in the latter. Perhaps more important are the innovations which involve the use of more capital. Generally it is agreed that Kalecki's principle of increasing

risk is operative in highly commercialized U.S. agriculture.<sup>3</sup> Since the farmer is forced to underwrite borrowing with his own capital, the "degree of uncertainty," quite apart from interest rate or price of capital, reaches the "breaking point" as his equity is spread as a thin base under borrowed funds. Returns from further investment are discounted to zero where possible losses stand to wipe out his own equity and cease the life of his firm. The "breaking point" or discount of prospective returns to zero, for the low-income farmer and subsistence cultivator, relates more closely to the health and life of the household and to family members. The uncertainty restraint in capital use is much more binding here than for highly commercialized operators, even where credit sources exist and the capital supply function is not vertical.

Lifting the major restraint of uncertainty on innovation is difficult under low-income and subsistence farming. Largely, it can be approached from two directions: (1) improving the knowledge of outcomes from innovations, even to the extent of explaining the "worst to be expected" from new techniques, and (2) improving the capital and equity position of farmers. Sufficient progress in the latter would lessen the degree to which certainty for the former needs to be increased. Farmers could then "take some chances" and do more experimentation on their own.

In juxtaposition, the labor supply functions for agriculture in different countries, or farm sectors within a country such as the U.S., with various stages of development are highly similar in *degree* of elasticity and level of prices *relative* to other industries. In contrast, the capital supply function for agriculture is much less similar among countries and farm sectors, with the elasticity being higher and the supply price being lower in developed agricultural sectors relative to less developed farm sectors and countries. In purely theoretical and static context, the greater supply price of capital in less developed agricultures itself calls for a smaller product or yield per acre and unit. Lifting the static cloak to view the setting of decision under uncertainty, there is even further basis for less advanced techniques and lower yields on low-income and subsistence farms than on highly commercialized units.

Public policy to lower the supply price of investment funds has two effects: (1) It effectively lowers the prices of factors, encouraging their use to be expanded, since marginal productivities can be driven to lower levels in matching reduced input/output price ratios; (2) it lessens the cost of factors, thus increasing net income of producers even though they hold factor inputs constant. (Net income also will be increased from expanded factor use as long as the marginal product of the resources is greater than the price ratio.)

Public credit policy was initiated with establishment of the Federal Land Bank System in 1916. It was aimed at the broad commercial sector of American agriculture and undoubtedly had the general and initial aim

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<sup>3</sup> Earl O. Heady, *ibid.*

of increasing net income as in (2) above. This was generally possible, with some segments of agriculture paying interest rates as high as 10 percent on real estate loans while other sectors of agriculture were paying only 5 percent and nonfarm sectors were borrowing at even lower rates. Perhaps this is still the main objective of credit policy and publicly sponsored credit facilities for agriculture. However, a lower supply price of capital to encourage economic development is itself hardly needed for the main commercial sector of U.S. agriculture. Attempt to increase income through subsidy or lower supply price of factors and investment funds logically has the same effect of higher support prices for these purposes.

If we turn back to equation (5.10), we see that the expected effect of lowered value for  $P_z$ , factor or capital price, is the same as increased magnitude of  $P$ , commodity price, namely, an increase in  $Q$ , or output. Reduction in  $P_z$  shifts the supply function to the right while increase in  $P$  causes output to increase along a given supply function. For broad commercial agriculture there is little purpose in subsidized credit price as means of stepping up development of the industry. Rate of progress currently is as great as can be absorbed by growth in food demand and in nonfarm employment opportunities. Credit policy which lessens input price and extends aggregate output bears no promise in increasing the net revenue of agriculture. This is true in the extent that low price elasticity of demand for farm commodities causes total revenue to decline by greater proportion than reduction in costs through lower supply price of capital.

## EQUITY FINANCING

Public credit policy for agriculture, such as through the Federal Land Banks, Production Credit Associations and Farmers Home Administration,<sup>4</sup> thus now has its greatest basis in bringing (1) equity of opportunity to agricultural sectors (2) aid in transformation of the poverty sector of the industry into a commercial sector to provide incomes consistent with greater equality of opportunity and (3) retention of family-based operations. Alone, it can do little to offset the trend to larger farms under economic development. Available to all farmers, it lowers the price of capital even further, encouraging more biological and mechanical inputs per farm, causing farms to become larger and less dependent on labor. Lower supply price of credit, particularly in the poverty sector where effective interest rates are considerably higher than in commercial agriculture, and a greater detachment of the supply of investment funds from equity, can have a relatively significant effect on income for low-income farmers; much more so than in cost savings for larger-

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<sup>4</sup> Initially these were the following legislative acts: the Federal Farm Loan Act of 1914, the Farm Credit Administration of 1933, the Resettlement Administration in 1935, the Farm Security Administration in 1937 and the Bankhead-Jones Farm Tenant Act of 1937.

scale commercial operators who have highly elastic credit supply and low supply price of capital. Too, there is basis for public policy in credit where (1) certain scale economies in supply of this commodity is only thus attained and (2) the market for capital otherwise provides only a loose linkage between farm and non-farm sectors.

Separation of credit supply from its restraint in capital equity of the borrower is not a burden which should be relegated to private suppliers. They, like farmers who demand credit, are faced with the normal uncertainties of the agricultural production process. (Risk facing the farm producer in respect to weather and price also face the firm supplying him with funds to conduct production.) In addition, the private lender faces the uncertainty of the character of the borrower and uncertainty in demand for withdrawal of funds by his supplier. Equity financing in agriculture would lessen capital restraints from these sources.

Vertical integration represents equity financing, with funds coming from private subscription or sale of common stock outside of agriculture, a type of substitute for the same process within agriculture. This opportunity for equity financing of agriculture, through more elastic capital supply from outside the industry, is perhaps one of the largest forces leading to integrated farming. It may grow further because of this reason and because of the pull from the marketing end. In the integration sense, the supply of capital channeled to agriculture is loosened from the upper or institutional limits of owner equity which prevail for funds brought in through the traditional credit route. Substitute for farmer equity, in attainment of a given degree of certainty in supply of capital, is attained by integrating firms which bring in equity funds from outside of agriculture through a complementary supply of management aid and control. This mix of inputs perhaps provides the guide for needed public credit policy mentioned later, namely, the transformation of low-production farms to commercial units, capable of providing adequate income and dignity of opportunity for farm families, through improved supply of both capital and management. Policy mix to provide these ingredients, and approaching a scale for rapid effects, was perhaps represented in activities of the Farmers Home Administration in the 1930's and up to the mid-1940's. However, McConnell suggests that power struggle by farm organizations dissolved a framework which might have, with particular adaptations, speeded the end of the poverty sector in agriculture.<sup>5</sup>

### **Credit for Transformation of Poverty Sector**

As mentioned above, credit is a major problem in converting the chronically low-income sectors of agriculture to commercial operations which can support families at income levels consistent with American capabilities. But important changes in capital, beyond those of land needed for farm enlargement, are required. Often capital invested in old forms,

<sup>5</sup> Grant McConnell, *The Decline of American Democracy*, University of California Press Berkeley, 1953, pp. 84-126.

such as buildings and equipment, is obsolete for these purposes of consolidation and farm improvement. Frequently, the persons migrating to industry or out of the region are those with the most capital and ability for making the transformations required.

Credit for transformation purposes necessarily should be broken far from the equity traditions of the past. In contrast to the historic philosophy of loans under FSA and FHA, credit supplied should have more the goal of developing a self-generating commercial operation, rather than a smaller-scale owner unit, capable only of generating income on the lower edge of comfort. To retain too many farms of the latter scale in the transformation of agriculture can only lead to family incomes which are inadequate when put to the test of economic progress and of opportunities for youth which fall short of their capacities. Notwithstanding these needs, transformation of the low-income sector of agriculture requires an extended time period and an integration of credit and educational services.

As pointed out in Chapter 5, technical knowledge and capital do serve as substitutes over a limited range of the isoquant map.<sup>6</sup> But over a wide range of combinations they are technical complements. These combinations perhaps best explain the fact that extension services historically worked with high-capital farmers—those who thus could profit most from the technical information retailed, as well as being the most “receptive audience.”

Transformation of low-income farm areas to substantial commercial operations requires that a larger supply of both capital and management aids be made available and effective for operators who will and should remain in the industry. There are, of course, older operators of low-income areas who are potential neither in migration or greatly increased tempo in farm operation and whose utility would be lowered if they were forced into either. The attack on poverty structure through an extended mix of capital and management inputs must be directed largely at current and upcoming operators who have promise of managers; with other considerations in equity for those who must, unfortunately, remain underemployed in agriculture as the selected element of a set of low caliber opportunities.

Precedent for this operation does exist in the farm and home planning activities of the extension services, and the credit programs of the FHA. Unfortunately, however, either is inadequate by itself. Summed, they do not quite provide the aggregate of capital and management inputs required for the transformation. The educational aids are not now intensive enough and the credit constraints are still too rigid to allow rapid transformation to more effective commercial farm operations. A sizeable injection of capital is needed in these concentrated low-income areas, whether the goal be one of greater utilization of resources for national

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<sup>6</sup> For other points in this complementarity, see Earl O. Heady, “Basic Logic in Farm and Home Planning in Extension Education,” *Jour. Farm Econ.*, Vol. 38.

progress goals or for providing greater opportunity for the people represented. Capital is needed first in training and transfer of surplus labor to nonfarm activity. Next it is needed to provide the managerial aids and capital necessary for development of larger commercial farm operations. The second is undesirable without the first, since families are otherwise displaced from farms without a promising alternative. The first is insufficient by itself, because it only leaves a void in land and families, with lack of necessary capital to tie them together in a productive manner.

### **PARTICULAR CAPITAL PROBLEMS UNDER CHANGE**

In a highly developed economy such as the U.S., further economic growth gives rise to capital problems in two particular sectors of agriculture. One is in the poverty sector mentioned above. With capital accumulation, or the equity base which provides the maximum restraint in supply of investment funds, coming predominantly from savings of farm households, local industrialization and out-migration are not the full solution to the farm low-income problem. These developments do not place investment funds in the hands of remaining farmers in order that they can enlarge their farms and acquire the physical capital items necessary for efficiency of the farm firm and increased income to the household. Savings and household equity do not provide a sufficient base for the large investment required if farm consolidation is to extend to a level allowing elimination of underemployed labor even for a large number of commercial farms.

The other problem sector is that of areas where major shifts have to be made in the pattern of production in conformance with economic development and regional advantages. Regional adjustments from annual crops to grass and forestry, such as those discussed in Chapters 7 and 14 stand to lessen the demand for capital within the confines of the locations mentioned. Agriculture becomes less intensive in its use of capital in these regions, just as it uses more in other regions where developmental forces lead to greater physical inputs and output. With economic variables free in the market for a decade, America would see some of both: regions with declining comparative advantage, and supply functions relatively higher in the price-quantity plane, using a smaller aggregate of capital; regions favored by the obverse of these conditions and in favorable space orientation to realize higher derived demand for annual crops and fruits and growing populations using more.

But even in regions of contracting agriculture, decline in aggregate capital does not lessen the pressure for investment funds by the individual farm. This is true because shift among crops such as small grains or annual crops to grazing and forestry requires a considerable investment increment by operators remaining to make the transformation. As mentioned previously, these operators not only must obtain investment funds to initiate seedings and plantings but they also must

acquire additional land to develop units which can generate adequate income. In shift to grazing, they must have capital for livestock and funds for household outlays during the several years when income is small under the transformation process. The investment problem is even more severe in the shift to forestry, and few individual operators can make the transformation while remaining as full-time farmers.

In major commercial sectors of agriculture during the 1960's, the complex of capital supply will not restrain commodity supply against the slowly increasing demand. Change over these sectors mainly means larger farms in order that prevailing scale or cost economies are realized. For rented farms, the underemployment of machinery and labor over much of the corn and wheat regions allows major expansion in farm size without a proportional increase in capital, or even with a very modest increment in investment per operator. Under land ownership and purchase, this is much less so. However, the stock of capital and access to investment funds in the concentrated grain producing areas can allow many families to leave agriculture, their units taken over by remaining operators, before capital supply stands to restrict the process of food supply advance. This is possible partly because equity for acquisition of investment funds has arisen with capital gains forthcoming from assets held under inflation. However, the picture may well differ with the next generation of farm operators: Scale of operations and capital requirements for attainment of major cost economies have not only grown but also capital gains from land value inflation promise to provide less growth in the equity base. Capital requirements or demand for investment funds by the firm will be closely intertwined with growth in farm size and scale of operations over the 1960's and 1970's. The supplying of credit may need to break away from certain foundations of the past if entry into the industry is to be kept free to a large number and if trend to larger-scale units is not to be rapid. However, insistence that larger numbers of youth enter farming, sacrificing training and employment in outside opportunity, needs to be avoided if looked upon simply as guaranteeing a nostalgic base of farming and a political strength which has already passed from the hands of agriculture.

## EFFECTS ON FAMILY FARMS

"Family farm" is a term lending itself well to soap-box oratory. Many people discuss it but few can define it, or the definitions are as various as the persons. Early interest and meaning was quite concise: An organization of agriculture operated by individual families, rather than plantations or estates with herds of serfs or subsistence laborers, was preferred. These old plantation systems which prevailed in Europe and in the colonies of Africa and Asia are not now a threat in the United States, although this was considered to be an initial alternative to the family system of land settlement adopted for the United States. (See the Hamiltonian philosophy discussed in Chapter 1.) The alternative was inconsistent with the basic American concept, an attempt at con-

stitutional guarantee of equality in opportunity and dignity in self-expression of the individual. It still is. However, the threat of this semi-slave state has itself largely disappeared, over most of commercial agriculture in the United States, as a function of economic growth. Labor is now too costly relative to capital for this structure of agriculture to be economic as the main national foundation of the industry. The potential of the system can be even further eliminated by investment in education which diminishes the pool of unskilled labor and which provides income and employment opportunity for labor consistent with the level of wealth and economic progress potential of the American economy.

There is not room in the U.S., given present knowledge of technology and capital prices, for an agriculture based on labor as the major input. National income and the forces of distributive justice are too great to ever allow this structure of the industry. The statements above about the strength of forces leading in other directions, are extremes for the moment, but not for the future. The modern-day equivalents of plantations and subsistence labor do prevail: in the structure of sharecropping with labor paid in kind, and in the labor camps of itinerant and imported workers in seasonal employment such as in the vegetable fields of California and selected other areas. But this is the minor structure of American agriculture, and the force of economic growth is in its diminution. Investment of capital in the individual, improved employment services and national economic growth which provides more productive opportunity can lessen the supply and increase the supply price of labor for these purposes. The latter itself, along with minimum wage income, can serve as stimulant to the invention of machine capital which substitutes for lowly skilled labor. The empirical evidence is at hand, for example, in the development and marketing of machines to pick nuts, fresh fruits as peaches, vegetables such as tomatoes and other perishable crops.

Perhaps it is less a construct which is desired and more one which is unwanted that leads to perpetuation of strong suppositions about the family farm. The unwanted construct is that of an agriculture resting on large input of laborers at miserable levels of wage, income and dignity. This potential and threat did exist in pioneer America, with large expanse of land for estates and large potential world supply of labor or immigrants such that many were willing to migrate under indentured servitude. In times of settling the American landscape, proprietorship in agriculture was a main opportunity in freedom of self expression and in reflection of individual capacities of the masses which flowed to agriculture. To have had agricultural structure built around large land units staffed by workers at puny wages would have meant a nation composed largely of serfs.

In contrast, however, current American wealth and industrial growth, and the accompanying large demand for professional and skilled labor, provides potential opportunity for individual abilities other than that of farm labor and entrepreneurship. The factor market itself no longer



leans in the direction of a labor-based agriculture resting on serfdom and a large staff of hired laborers. Relative resource prices can depress this tendency even more as the human investments mentioned earlier are made and lead further to a decline in the supply of unskilled labor of low motivation. As mentioned previously, existence of labor-based, plantation agriculture rests on a large supply of unskilled labor, with low supply price to agriculture and few outside employment opportunities. Trend to larger farms with growing investment requirements is encouraged under factor market changes which alter resource prices and encourage the substitution of capital for labor. Typically, factor prices cause labor to become dear relative to machines and capital. Larger units are needed for realization of the scale or cost economies associated with capital and to provide adequate incomes under supply conditions which lessen profit margins.

Change of U.S. agriculture, in number and sizes of farms, is not yet as great as census statistics would lead us to believe. While farm numbers have dropped greatly and acres per farm, from 174 in 1939 to 302 in 1959, have increased greatly, this change in average farm size has come partly from exodus of many small-scale, low-income units, without a similar change in commercial farms having gross sales over \$5,000. For example, if we had three farms, two of 300 acres each and one of three acres, the average size is 201 acres. If the small one disappears, the average size is immediately raised to 300 acres; the change in farm structure is "overly magnified." Of course, recombination of small units into one which produces more than this value causes number of the former to decline and number of larger units to increase. Factors from this side, leading to an increase in number of commercial farms, offset consolidations which lead to decline in numbers of the latter group.

While census figures do overemphasize the amount of change in farming structure, there has been considerable change, however. The number of farms with gross sales of more than \$10,000 did increase by 160 percent between 1940 and 1960. As Figure 15.1 shows, there has been a definite decline even in farms selling \$5,000 to \$10,000 of product since 1944, with the offsetting creation of more farms selling \$10,000 or more of product. This trend results from both inflation and farm consolidation. (See Figure 15.2.) The trend to mechanization and larger farms gives rise to the major capital problem of commercial agriculture. Under constant dollars and in relation to economic change, the capital requirement per farm is expected to increase from the \$34,000 level of 1954 to nearly \$70,000 in 1975.<sup>7</sup> The latter is an average for all commercial farms selling products in excess of \$2,500 and already is approached or exceeded by state averages of farms in major wheat, feed grain and grazing states. But with change of the same proportions, capital requirements of \$200,000 to \$300,000 will be commonplace for many ordinary family farms by 1975.

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<sup>7</sup> D. B. Ibach, "Economic Potentials of Agricultural Production," In *Dynamics of Land Use—Needed Adjustment*, Iowa State University Press, Ames, Iowa. 1961.

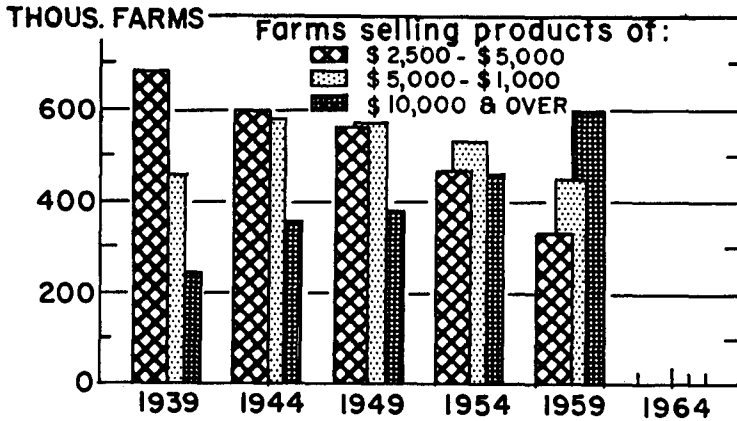


Fig. 15.1. Numbers of Farms Selling Specified Amounts of Product. Northern and Western U.S. (Source: U.S.D.A.)

This gradual trend to larger farms has not dissolved the family farm structure of U.S. agriculture. The proportion of labor force represented by family workers is greater now than 25 years ago. Hired workers as a proportion of all workers declined from about a quarter to a fifth between 1910 and 1960. Machine capital and larger farms have been slightly more effective in replacing hired labor than in replacing family labor. Larger units in acres are needed to realize attainment of the major cost economies of modern machines. Although these capital items do substitute for labor, a minimum or limitational amount of labor is required to operate them. The labor so used typically is that of the farmer and his family. In historic definitions of family farms, these units are as firmly

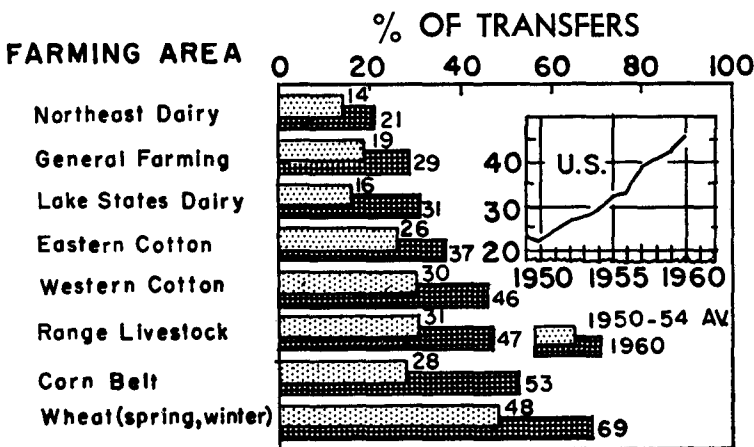


Fig. 15.2. Farms Purchased for Consolidation Purposes, 1960. (Source: U.S.D.A.)

so, or even more so, than in earlier days of an agriculture based more on labor and requiring greater amounts and proportions of labor for harvest and other peak seasonal tasks. (Labor agriculture remains the structure in certain fruits, vegetables and tobacco, for planting and harvesting where machine substitutes have not been developed or relative factor prices do not especially encourage their development and use.) In this sense family farms remain the basic structure of U.S. agriculture, with smaller number to match (1) discrete units of machine capital and their cost economies and (2) the growing productivity of the family labor which uses them.

Change towards fewer and larger farms will continue, but it will not be revolutionary because consolidation occurs chiefly at the end of the age span for established operators. But with factor prices accordingly and the extension of cost economies over more acres and in the absence of rapid inflation and capital gains as source of asset value and equity, initiation of farm firms becomes increasingly complex. This is true because each family farm firm typically has a life cycle in financing and capital accumulation, the firm most frequently being dissolved with the household and the process being repeated with each new firm-household complex. Retention of large numbers of family farms will be increasingly difficult with passage of time due to this set of forces. Developments in vertical integration which do allow diversion of national capital to agriculture through common stocks and equity financing, but by firms from outside of agriculture rather than from within, may increasingly provide the pattern over time as they thus overcome the typical restraint in capital supply to the individual firm of agriculture.

It is possible, in the elements forming the subset of agricultural policy, that an equivalent in equity capital needs to be aided in supply through public mechanisms, much in the manner that public mechanisms are now used to serve as a connecting link in the credit market. This statement rests on the extent to which society can establish a fundamental basis for retaining a structure of family farms smaller than those in prospect under the factor prices and consequent machine technology reached by 1980.

### **Democracy and Family Farms**

Our prediction is for continuance of farm structure based on family farm operation over the 1960's and 1970's but with capital increasingly supplied from outside and continued shift to farms too large to be so classified. Developments of the future will lead only to fewer family farms, and not in their disappearance. Over much of agriculture the need is to upgrade size and resources so that family farms have adequate income. Still, over the 1960's and 1970's, there will be growth of more large, specialized farms which are not family units in the conventional sense.

The structure of family farms, and one we believe to be well estab-

lished and likely of dominance for the 1960's and 1970's, needs to be evaluated as an end in itself, and no longer as an emotional means in insuring democracy and safeguarding individual rights. It is already too late to save American democracy through a foundation of family farms. With only 8 percent of the U.S. population living on farms, and with a large part of this represented by persons whose work and attachments are dominantly in the nonfarm sector, public choices have their major base and specification outside of agriculture. The trend obviously is not to less democracy and opportunity for the mass of individuals as number of farms and farm population declines. Rather than agriculture as a means to guarantee democracy for the remainder of society, the future may require that nonfarm population should better provide and insure the mechanisms of political freedom and economic opportunity for more persons now in agriculture, with wider spread of these basic rights to all groups in the industry.

Large agrarian populations did not prohibit growth of dictatorship and submersion of individual freedom in Eastern Europe.<sup>8</sup> To the contrary, democracy in the American sense was least preserved in these countries, and has been much more so in countries such as Great Britain where farm population dropped to insignificant proportion of the total. Soth reports polls showing farm people to be less willing than city people in upholding basic liberties of the constitutional system, rights of free speech, free press and freedom of religious observance for minority groups.<sup>9</sup> In this setting, agrarian structure and family farms should be evaluated as an end worthy of weighting against other more ultimate ends, rather than as means to safeguard democracy or similar constructs of society.

We believe that the family farm concept and certain, but not all, restraints which surround it, are most important in the sense of mechanisms to provide equity in (1) opportunity and (2) gains from progress; and that policy directed to these ends are more relevant than that which would "keep them down on the farm" simply for a voting majority and in disregard of income level. We believe that family farms must be gauged by how well they can provide opportunities to mesh with individual abilities and capacities of more people from farms.

### Ends in Agrarian Structure

The goals of agrarian structure can be many, but three major ones predominate in social legislation favoring more farms of smaller size. These same three major goals may dominate in developed nations, less developed countries concerned with land reform and in Communist countries where small peasant units have been consolidated into large

<sup>8</sup> Cf. A. W. Griswold, *Farming and Democracy*, Yale University Press, New Haven, Conn. 1952, pp. 1-40.

<sup>9</sup> Lauren Soth, *Farm Trouble*, Princeton University Press, Princeton, N.J., 1957, pp. 23-24.

collective or state farms. But the relative weight given each goal probably differs greatly among countries in these various stages of development and democracy.

The three major goals of agrarian structure and land reform are: (1) Efficiency in the use of resources to produce food from a given collection of resources, or to lessen the amount of resources to meet food needs, (2) equity in the distribution of income and wealth or resources (i.e., to redistribute resources from persons with large holdings and wealth to those with few resources) and (3) attainment of social stability. These three major goals are not independent and universally noncompetitive. Land can be used in a manner to have more farms and a greater amount of distributive justice or political stability. The technology will then be one represented by small farms and large inputs of labor relative to land. If the creation of more small farms causes less food product from given collection of resources, the two alternatives are competitive. Or, competition between ends may result where tenants lack capital for adequate farming after they are transformed to owners. These two forces causing competition between ends in the short run can be overcome by public attack on the supply of knowledge and capital.

But aside from supply of managerial knowledge and capital, the technical nature of the production function is important in prescribing the long-run nature of the food and nonfood production possibilities in using farm resources. Given one set of production elasticities, goals of political stability and distributive justice could be attained without sacrifice in food efficiency. But under other conditions of the production function, the ends are competitive and the community must balance more food from given resources against agrarian structure and small farms.

First, suppose that the production function is, effectively for the relevant resources, of the nature in (15.1) where  $Y$  is output and  $X_i$  is input of the  $i$ th resource.

$$(15.1) \quad \frac{\partial Y}{\partial X_1} \cdot \frac{X_1}{Y} + \frac{\partial Y}{\partial X_2} \cdot \frac{X_2}{Y} + \cdots + \frac{\partial Y}{\partial X_n} \cdot \frac{X_n}{Y} = 1$$

If management and capital resources can be the same in the long run after large holdings are subdivided, the goals of food efficiency and those of distributive justice or social stability are not competitive. The set of production possibilities arising under this condition is illustrated in Figure 15.3A. Starting from a level of food production and an amount of nonfood goals denoted at point  $s_1$ , large farms could be subdivided into smaller units. The result would be movement to point  $s_2$  or to the limit  $s_n$  where other restraints place limits on gains in distributive justice or degree of political stability possible from subdivision of land holdings. The relative value which the community attaches to food or nonfood goals then would be unimportant in specifying the degree of goal attainment to be reached through agrarian structure. As long as a weight or

value greater than zero is attached to these goals, the reform structure denoted by point  $s_n$  should be selected.

Given the technology currently found in many less developed economies, and favored by prices of labor relative to capital, it is possible that constant returns to scale do prevail or are approximated. Aside from managerial and farm practice skills of the operator, cost economies associated with farms of different sizes are probably small or effectively nonexistent for a labor-type agriculture. With high prices for capital relative to labor, labor-type agriculture is the most efficient in many less developed economies and the cost economies associated with mechanized agriculture are unimportant.

With food produced under increasing scale returns, the equal sign in (15.1) replaced accordingly, the production possibility curve denotes

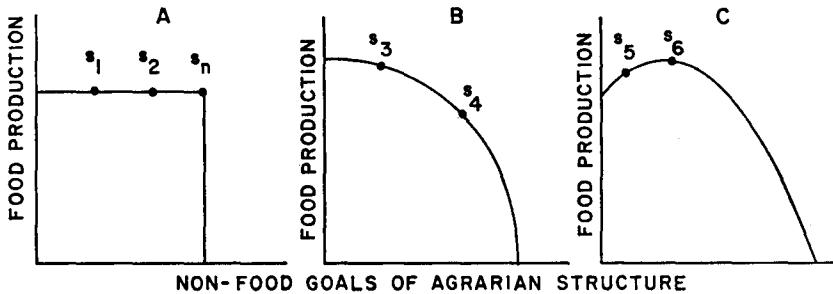


Fig. 15.3. Alternatives in Production Possibilities in Food Production Goals and Other Goals of Reform.

competition between ends, more like Figure 15.3B. (For a function with elasticities only greater than 1.0, the possibility curve is concave.) Agrarian structure to increase number and decrease size of farms, to attain more nonfood goals, necessarily causes sacrifice in food quantity produced from given resources, or requires more resources for given food. Undoubtedly, this condition prevails for mechanized agriculture in a highly developed economy such as that of the United States. Increase of farm numbers by four to allow more farming opportunities would require a smaller output from an equal collection of resources, or would require more resources for given food output.

The community or social value attached to the alternative goals or ends then is important in determining the particular welfare maximizing combination. If the family of community indifference curves has relatively little slope, denoting a high value on food relative to the nonfood goals, or the production possibility curve has great slope, the combination selected might be that indicated by  $s_3$ . But if indifference curves have a relatively large slope or the production possibility curve has little slope, the point (tangency between indifference and possibility curves)

might be  $s_4$ . Obviously, the nature and elasticities of the production function are important, along with the values attached by the community to nonfood ends, in specifying the "type and degree" of optimal agrarian structure.

Given the orthodox production function of the economic text, the production possibility would be similar to that of Figure 15.3C. Over the range of decreasing scale returns, complementarity (positive slope of the opportunity curve) prevails between food and distributive or stability goals. By having fewer large farms, more food would be forthcoming from given resources. The large number of small farms would allow simultaneous attainment of other goals or products which result from this size complex. This situation might prevail especially where large estates or plantations are held by absentee owners only for purposes of inflation hedging, gaming, "attainment of aristocracy," etc.

At the collection of inputs defining constant returns for the food production function, the opportunity curve attains a maximum,  $s_5$ , turning to a negative slope and competition as increasing returns to scale are encountered on the production function. Over the range of complementarity, as in movement between  $s_5$  and  $s_6$ , welfare can be increased regardless of the relative values or weights attached by society to food and nonfood goals. More of both can be attained in a reorganization of agriculture to include more and smaller farms. However, relative values become important, along with the magnitude of elasticities of the production function, in specifying the optimum point on the negatively sloped portion of the possibilities curve.

In the general framework above, even considering alternatives in values or weights attached to different ends, the stage of economic development and factor price relatives which arise have importance in specifying optimum agrarian structure. At low stage of economic development and high price for capital relative to labor, weight is thrown to labor-type agriculture without great scale economies and with more small farms being consistent with optimum structure. At high stages of development and high prices for labor relative to capital, mechanization becomes the base and with the greater scale or cost economies associated with it. The optimum structure, even against a given set of values or indifference curves, is one of fewer and larger farms. But also, when the food supply function moves rapidly to the right and the supply price of food is low, consumers may be so well furnished with food that it has a very low rate of substitution for other products or alternatives in agrarian structure.

This perhaps is the point already reached in U.S. society, with even the city person slightly engulfed in the nostalgia of "the good life on the farm" and some willingness to make investment which protects the small farm. Perhaps, however, it is less this and more the desire of farm persons to take advantage of urban life which leads to fewer and larger units, even among commercial classes of farms. Farm youth especially, in number beyond farming opportunities, wish the employment opportunities and

the greater ability in expression of individual capacities in industry and the "good life of the city," rather than to remain and enjoy the non-pecuniary amenities of the farm.

### And Land Ownership

If the problem of U.S. society were tardiness of the food supply function, need for reduced real supply price of food and greater response of production to price stimuli, then it would be best to encourage fewer and larger specialized farms. These are the units of highly specialized management where resources are less immobilized in family labor and fixed costs and profit maximization are the overriding motives in decisions. There is, of course, some trend in this direction of farm structure. But the fact that the food supply function has progressed with adequacy in terms of consumer benefit, and perhaps overly so in terms of positive-sum utility outcome in the distribution of gains and costs of rapid supply advance, causes society to lack impatience in this direction.

In the vein of family operation, the food supply function also can be advanced under extended farm ownership, providing that capital does not restrain the supply of operators so converted and the supply of materials for advancing technology. Leaving aside problems in time, uncertainty and related phenomena, we can illustrate conditions under which conversion of tenants to owners cannot only increase capital requirements of the farm firm but also can advance the supply function, a need momentarily more pressing in Indian than in American society.

Using a single variable resource for the sake of simplicity, the owner-operator can maximize profit under the condition of marginal product equal to the factor/product price ratio for each resource. Now contrast scale and technology for a share-tenant renting a farm fixed in acreage. If conventions of the rental market call for a  $1-r$  proportion of product for landlord and  $r$  proportion for tenant while the tenant furnishes an  $s$  proportion (or pays  $s$  proportion of the price) of the input  $X_i$ , tenant profit is maximized if the  $X_i$  or inputs are used in the magnitudes of (15.2) expressed as equivalent in (15.3).

$$(15.2) \quad r \frac{\partial Y}{\partial X_i} = s \frac{P_i}{P}$$

$$(15.3) \quad \frac{\partial Y}{\partial X_i} = \frac{s}{r} \frac{P_i}{P}$$

If  $s = 1$  and  $r = .5$ , we have the ratio  $sr^{-1} = 2$ . Hence, for maximum tenant profit, marginal productivity of the  $i$ th nonland resource must be twice that for the owner. The tenant can double the marginal productivity of the resource, given a production function identical to that of the cultivator who owns his land, by decreasing input of the resource. Hence, the optimum technology of farming, as represented by the mix of land and the  $X_i$ , differs for tenant and owner cultivator. Similarly, optimum size of



enterprise or farm is less for the tenant. An industry composed of tenants would have a supply function to the left of that for an industry composed of owners. For example using the production function in (11.7) for both owner and tenant, and indicating corresponding owner supply as  $Q_0$ , the tenant supply function is that in (15.4), a quantity less in magnitude, depending on  $rs^{-1} \neq 1.0$ , than for the owner in (11.9).

$$(15.4) \quad Q_t = \left(\frac{r}{s}\right)^4 Q_0$$

Food prices would be, given a demand function, higher and consumption pattern of families would include a smaller proportion of food relative to other goods and services in (15.4) as compared to (11.9). Or, a higher level of prices would be required to attain a given level of food output and a specific technology and farm size.

Tenure constructs are possible, of course, which place tenant and landlord on the same footing in respect to supply function (as in making  $r=s$ ).<sup>10</sup> Under forces of the market, ownership patterns in the United States have tended towards those which augment the supply function. From 1930 to 1960, tenancy has dropped by half, or from 42 percent in 1930 to slightly less than 20 percent in 1960. (These figures for the U.S. tenancy account for somewhat over 40 percent of farm operations in the major corn and wheat areas, but with some decline over earlier periods.)

### And Capital Requirements

Farm ownership places, along with economic development and factor prices leading to mechanization and scale economies, a heavier burden on capital requirements. Similarly, definitions or legislation which place maximum constraint on particular input categories also may force farming into a position demanding greater capital inputs for a particular food supply. We illustrate this possibility with Figure 15.4. Typically, in terms of labor, family farms are defined in terms of a programming restraint on this resource: total labor input cannot exceed a specified proportion of the family labor supply. 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 restraint limit because they use so little labor. Should they ever approach the limit, the picture would be that suggested in Figure 15.4. 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 of family farms, expansion would follow one of these isoclines, denoting equal substitution and price ratios

<sup>10</sup> For details in this respect, see Earl O. Heady, *op. cit.*, Chap. 20.

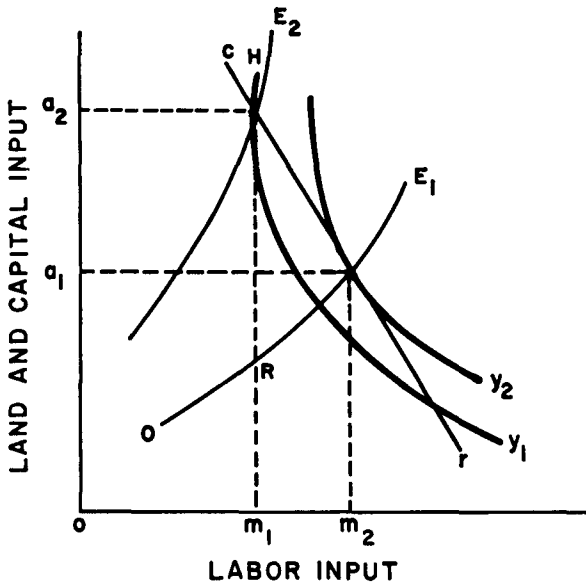


Fig. 15.4. Effect on Capital Demand and Input.

for factors, until the marginal value products of resources are equated with their prices. With limited capital, expansion should progress along the least-cost isocline until the iso-outlay or budget line such as  $cr$  is attained. In the figure, this involves inputs of  $om_2$  of labor and  $oa_1$  of capital and land. Output level is at  $y_1$ . A definition restricting labor input below this level might appear to also restrict land input per farm and allow existence of more farms. However, given the fact that farms generally do not use resources at levels equating value products and prices, a highly restricting definition of labor input can even push the firm to extensification of land use—and to fewer farms.

Suppose that the family farm definition limits labor input to  $om_1$ . The firm has the typical farm goal of pushing resource use and output to a level consistent (1) with a particular standard of living or (2) to the budget line defined by the funds available. If it wishes, or has funds, to attain the iso-investment line  $cr$ , it can follow the least-cost expansion path only to the restraining level  $R$ . Hence, to attain isoquant  $y_1$  it must extend land input up the hybrid isocline  $RH$ . Attaining  $y_1$  in this fashion limits labor input to  $om_1$  but extends land and capital input to  $oa_2$ . Allowing expansion along the isocline  $E_1$ , labor input would be increased to  $om_2$ , but acreage would be lessened to  $oa_1$ , and more farms could exist. Conceptually, and practically if such tight restraints were placed on family farm definitions, the restraint would move the supply function to the left. It would thus help reduce surplus problems. But it would not create more farming opportunities. These restricting definitions do not

pose near-term problems in farming. However, they are mentioned because of the fear expressed 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.

The outcome discussed above was in terms of a rationed input to attain a constraint in family farm definition. Another alternative in checking farm size is use of the pricing mechanism, as is done in a weak manner through taxation favoring family farms (or placing a price disadvantage in land ownership by large farms).

If, for Figure 15.4, the price of labor is increased as a means of restraining its use, and thus to exclude use of hired inputs, the resulting iso-outlay curve takes on greater slope than  $cr$ , causing the optimal resource combination to include a greater proportion of land and capital and less of labor. This would be the expected outcome, for example, in a high minimum wage for that portion of California agriculture resting on seasonal labor. Capital forms substituting for labor would be developed and used, thus resulting in a smaller demand for labor under similar agriculture. Or, agriculture would shift to more extensive crops, with larger and fewer farms and lower demand for hired labor. Similar outcome would be expected with high minimum annual wage for sharecroppers in Alabama and Georgia or the hired workers of cotton plantations of the Mississippi Delta.

If we made the magnitude of  $P_z$  in (4.2) an increasing function of  $X$  for the firm, optimum input of resources (with all resources treated similarly) would decline, of course. Hence, we would expect more farms to exist, in supplying a given output of food. Per firm output would be less but also industry supply would be somewhat smaller and supply price of food would be higher, resulting in somewhat lowered demand and itself a slight restraint on number of firms. Increasing the price of land alone as a function of input magnitude would, of course, restrict size in a spatial sense, shifting agriculture towards more capital and labor in its resource mix.

In a family farm context, assurance of this structure is perhaps best attained, with a degree of efficiency and progress encouraged to give favorably to family income, in a price for credit and capital which incorporates the advantages of scale returns and equity enjoyed by larger units (i.e. putting small farms on the same or more favorable footing in respect to supply price of capital as large farms, rather than in changing the supply price for other factors between the two groups of farms). Where lower supply price of capital to all farmers is public policy, its main accomplishment is that of encouragement to economic development, and an extended supply function and output of food. In the realm of inelastic food demand, the stimulus of lower capital price in greater output may cause a reduction in revenue greater than the savings in costs due to lower credit price. Clearly, in this case, policy lowering the supply

price of capital must be looked upon as policy to benefit consumers, rather than to bring gain to farm producers in aggregate during the short run.

### **Goal Mixture and Capital Needs**

Problems in family farms, food supply advance and investment requirements present a complex admixture of possible means and ends. Promotion of family farming and ownership, by lowering the supply price of capital, can extend the supply function of food causing greater pressure on output and prices and itself place small farms at an income disadvantage. Or, family farm policies can increase capital requirements (e.g. as in Figure 15.4) under a stage of economic growth wherein demand of the individual farm for investment funds is expanding greatly, against relative constancy of the industry. (In the latter respect, see Table 2.8.)

Promotion of family farm and ownership ends will not mainly stabilize or restrain supply of agricultural commodities or vice versa, the two even being complementary under certain conditions. We look upon elements of capital and family farm definition (and the policy needs relating to them) more in relation to means than to ends. As means, policy oriented to them should have its main purpose in equity of: (1) providing greater opportunity in expression of capacities of individuals from farm families and (2) realizing a relevant share of the gains from progress as outlined earlier. We believe that it is farms resting more on the labor of the family and possessing the least of capital which bear the greatest burden of social costs associated with rapid technical development. Larger units, and especially those which expand rapidly with new technology and factor prices, can increase output more rapidly than price or profit margins decline, thus directly realizing gains from economic progress.

The alternative to a particular farm definition and size restraint is not transfer of farm persons to migrant labor camps or infusion of them into a pool of low-paid, unskilled labor. It can and should be an alternative of favorable nonfarm employment with opportunity in home ownership and greater ability for expression of skills and individual capacities. Given the opportunity, developed by capital investment in human resources as mentioned earlier in Chapters 12 and 13, most individuals would probably prefer the latter to life on an undersized farm unit.

The nature of scale returns, or the cost economies associated with farms of different sizes, will determine the extent to which further development and prospective adjustments to improve agricultural structure 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 supporting empirical evidence, that this is not the case. Given the fixed costs associated with modern machinery, substantial cost economies can result from some further expansion of small or modal sized 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, beyond this *point* on the per acre cost function, representing full utilization of labor and machine services in particular seasons of the year, further expansion must come from increase in discrete capital units. In other words, a second power unit must be added, largely as a duplication of the first one. In this sense, with major scale economies largely exploited by each discrete capital unit, there is little difference in per unit costs or resource efficiency whether the farm be of one size, or double or quadruple this size. But just as there is no disadvantage for the smaller unit, there is none for the larger unit. This set of relationships gives room for credit policy assuring equity without general economic sacrifice. Credit supplied, at supply price consistent with scale conditions of the credit market, to allow one farmer to expand to this point assures equity, which is not the case where he is restrained from doing so while another more favorably supplied with capital and credit expands to the quadruple size.

### POLICY MIX NEEDED

Our analysis to this point has indicated that optimum farm policy cannot include a single facet. Instead, to insure economic progress and an equitable distribution of its fruits, a policy mix is necessary, with elements which contribute in preferred magnitude to the miscellaneous set of intermediate ends selected by society and the farm public. The ends often will be competitive and inconsistent if a single over-all policy attack is used. But by using a mix of policy elements, these conflicts can be minimized. For example, credit policy can be used to encourage family farms. But if it lowers price of this factor for all farmers, it is equivalent to decrease of  $P_z$  in equation (11.7), thus favoring an increase in output. Revenue of agriculture may decline, perhaps more than costs, from a reduced factor price.

Developmental policy which makes technical knowledge available to farmers at low or zero price has the same output increasing effect. It can benefit consumers at the expense of producers. Production control which has the effect of increasing  $P_z$  in (11.7) to agriculture, through payment for land which is not used for production, has the effect of decreasing  $Q_s$  in the same equation, thus leading to greater farm revenue but to smaller consumer surplus. Quota systems which restrain output for this purpose may appear equitable to some producers, but not to others, for the reasons outlined in Chapter 14. Public sponsorship of technical advance which has the effects through the market illustrated in Table 5.2 and over equations (7.20) through (7.31) can benefit owners of those resources retained in agriculture but represent cost to those rejected from the industry. Yet, as we have explained in Chapters 11 through 15, education,

compensation and other mechanisms can be used to restore gain to one farm sector where it would otherwise bear cost of progress.

But the purpose of each policy element must be recognized and kept separate from others. Policy to bring opportunity of persons on low-income farms needs to be particular and not confused with other policy efforts. As we mentioned in Chapter 11, policy element aimed at compensation would pay a person according to his judged sacrifice, without upper restraint. Policy to restrain output would look as favorably upon inputs or "output rights" supplied by large producer, as that by small producer, for purposes of improving market price. It would not limit magnitude of participation by large and small operators. Policy aimed at family farms need not be confounded with that for other purposes, and certainly that aimed at developing the unexploited human resources in the poverty sector of American agriculture would be highly retrogressive to their income and farming scale. Capital investment for the better development of human resources in agriculture and to help increase the supply of talented labor is more pressing than capital policy to lower the price of factors and extend food output of farms.