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Economic Development, Agricultural Structure and Farm Problems

THE WORLD has two problems relating to the kinds and quantities of resources used in agriculture. The first is found in underdeveloped nations where the techniques and resources used by cultivators give rise to a low food supply and subsequent malnutrition, disease and consequent social and political discontent. The second problem is found in "advanced" countries where the kinds and quantities of resources used result in overcapacity and relatively low returns.

Basic aspects of the structure of U.S. agriculture relate to these world problems. The growth in output and productivity of resources in U.S. agriculture provide a pattern of accomplishments that developing nations would like to attain. Dramatic evidence of the "success" aspect of U.S. agricultural development is apparent from the following statistics: From 1940 to 1960 total agricultural output in the United States increased 55 percent although total inputs increased only 5 percent. Output per unit of labor increased 210 percent in the same period. One farm worker supplied 10.7 persons in 1940 and 26.2 persons in 1960. During the same period farm output per man-hour increased 210 percent. Increased farm labor productivity permitted many farmers to migrate to urban areas and to increase the real income of society through employment in other sectors. This migration was made possible through substitution of the many forms of capital resources for labor.

Evidence of the second world problem, overcapacity and low relative returns on resources, is apparent from the following statistics for U.S. agriculture: Despite the 129 percent increase in farm labor productivity, real income per farm worker was 17 percent lower in 1960 than in 1946. Moreover, average farm income per worker as a percent of average income per factory worker declined from 66 in the first decade of the 1900's to 47 in the 1951-60 decade. The epochal structural revolution in U.S. agriculture has brought vast benefits to society but all economic sectors have not benefited equally.

The problem of overcapacity and low incomes in agriculture has been one of the major problems in U.S. society over the three decades of 1933-62. Other domestic and international problems have been more intense at times in this period, but few have been more persistent. The problems of agriculture have been superficially reflected in a large

supply of crop and livestock products, and low level of commodity prices and farm income. These quantities must, of course, be gauged in relative terms. They are high or low depending on comparisons with similar quantities and variables in the nonfarm sector, and in comparison with the return on and quantity of resources employed in agriculture. However, the definition of the U.S. farm problem has been so long one of large commodity supply, that particular public policies have persisted accordingly. The nation invested billions of dollars in programs to reduce commodity supply, support or increase prices and improve farm income during the period 1933-62. Even then, the problems of agriculture remained basically unchanged after 30 years. Commodity supply in aggregate was still great relative to consumers' preference and the rate at which society through the price system was willing to award resources employed in agriculture.

While the problems of agriculture are directly those of commodity supply and price, basically they are problems of resource demand and supply. Even more fundamentally, the farm problems stem from technical and economic development where "development" is reflected in the shifting supply prices and productivity of resources.

The two world problems of agriculture, undercapacity and overcapacity, have some features in common: (a) both are associated with low returns on labor resources, the former absolute, the latter relative; (b) both have become the focus of concern by policy makers; (c) both have roots in the resource structure of agriculture; and (d) both are partly characterized by the status of agricultural technology as it is reflected in types of resources used. The resource structure is defined as the over-all framework of institution, behavioral and technological relationships which determine resource employment and hence output, efficiency and income in agriculture. This framework may be systematized into a set of demand, supply and production functions. The parameters (coefficients or elasticities) in these functions may be identified and measured in certain instances, and one objective of this study is to derive quantitative estimates of the parameters in the resource structure of U.S. agriculture.

Although the study is oriented to U.S. agriculture, the resource demand and supply relationships derived for it embody universal relationships which exist in other agricultures. That is, the structure and organization of any agriculture at a given time is largely a function of the values of farmers and the general public, the stage of economic development, the natural resource base and technology. These forces underlying the structure are highly interrelated and it is impossible to analyze one apart from the other. For example, the technology of agriculture is itself a reflection of resource demand and supply. The resource structure, including the supply price of factors, causes the cultivator in India to use bullock power rather than the crawler tractors used by the Kansas wheat farmer. The structure of resource demand reflects the Japanese farmer's use of amounts of chemical fertilizer and seed varieties which produce a larger yield than techniques used

by the Philippine cultivator. Or in synonymous terms, the stage of technology and development of agriculture in any country is a reflection of the resource demand structure, as well as of factor prices.

If we are to know how the level of technological and economic development of agriculture in any country can be modified, we must understand how resource demand can be altered. The kinds of seed, the amount of mechanization and the general practices of agriculture are a reflection of the nature of resource demand and supply for those who make decisions in agriculture. In turn, the structure of resource demand and supply is determined largely by the stage and rate of national economic growth.

RESOURCE DEMAND AND ECONOMIC DEVELOPMENT

The process of economic development may be characterized by changes in relative size and interaction of the farm and nonfarm sectors. A nonfarm sector arises in a primitive agrarian society when transportation, governmental and other services are necessary. In the early stages, the fortunes of the new sector largely are tied to the agrarian economy. The few capital inputs and services supplied by the nonfarm sector in the beginning stage of development may permit surplus production (above subsistence), freeing farm labor for additional production and capital accumulation in other sectors. The process of capital growth and rising productivity of land and labor allows society to devote some resources to improvements in skills and technologies and to production of nonfood and luxury consumer items. Expenditures for food represent an increasingly smaller portion of the national budget, and the relative size of agriculture declines. Hence, the organization of agriculture becomes more a function variable in the nonfarm economy.

The accumulation of capital in the national economy increases labor returns (real income) and productivity. The capital/labor price ratio perhaps is more an effect than a cause of national growth, but for agriculture the situation appears different. For the farming industry, which becomes more capital intensive, prices of capital tend to be a function of variables in other sectors. Furthermore, the effective labor return or opportunity cost for agricultural labor becomes tied more closely with nonfarm wages which are unaffected by farm variables. Consequently, the effective capital/labor ratio and resulting pressures to substitute capital for farm labor tend to become exogenous to agriculture. How these and other interactions between sectors in a growing economy affect resource use and farm size in agriculture depends on the economic structure.

Resource demand and the consequent organization of agriculture is specified largely by the relative prices of resources, technological coefficients and by goals and values. For centuries, labor productivity on farms throughout the world remained low despite opportunities for

farmers to improve techniques through their own judgment and experience. While opportunities do exist for farmers operating independently to increase productivity, rapid advances in output and productivity did not begin until associations and interactions among institutions and economic sectors increased. The initial conditions for the breakthrough largely arose not on farms as such, but from schools and colleges, nonfarm industry and research organizations. The most basic indirect source of the changing resource demand structure in U.S. agriculture has been the large public and private investment in education. This has resulted in new capital forms which substitute for and increase the productivity of conventional inputs such as land and labor. Investment in education also has provided the engineering and other talents of human resources which have enabled private industry to develop the coal, steel, chemical and other basic resources necessary in providing fertilizer, machinery and other inputs to farmers. These same influences not only have been responsible for introducing new capital forms, but also have helped to make these forms available in quantities and at prices favorable to farmers. As capital inputs supplied by industry become increasingly important in agriculture, the private sector is assuming a more prominent role in education through commercial advertising, field demonstrations, etc., which acquaint farmers with new inputs.

Education also helps provide farmers with a management base and broad perspective necessary for the adoption and efficient utilization of new technologies. Whatever the source, the goals and values of farmers have been an important element in determining the resource structure of agriculture. Materialistic goals (perhaps partially arising from the firm-household complex), the desire to reduce cost and increase profits, to accumulate capital for increasing future income or for retiring and the work ethic all are reflected in empirical coefficients of demand elasticities of later chapters. The relatively high quantitative estimates of demand elasticity, marginal propensity to invest and adjustment coefficients indicate a rapid adoption of technology in the form of new and improved capital forms. These goals and values favor rapid expansion in output and productivity in agriculture, and hence are highly consistent with economic growth and development. But when coupled with other farm values which reduce mobility of conventional resources in agriculture (reflected in the low empirical estimates of labor supply elasticity in Chapters 8 and 9) the result is relatively low labor returns in agriculture.

Goals and values of farmers and other segments of society also are reflected in historic public policies affecting the price of resources and knowledge of factor productivity and substitutability. Both of these developments affect the nature of resource demand and the structure of the farm industry. In the first century as an independent nation, through immigration policy, the U.S. public caused the supply to be elastic and the price of agricultural labor to be low. At the same time it provided an elastic supply and low price for land. With restraint on

land supply under near-complete settlement of the public domain, the public increased the supply and lowered the real price of another important production resource, namely knowledge or technique. In so doing it changed the agricultural production function, shifting resource demand through changes in the production coefficients. This was accomplished through public investments in the agricultural colleges and the U.S. Department of Agriculture.

A supply function does exist, both conceptually and effectively, for technical and other knowledge required in agricultural production. Without public subsidy to enlarge its amount and lower its real price, it could still be produced and supplied by the private sector. The rate of advance in the supply of knowledge undoubtedly would have been less, however, without public investment. This would have been especially true at lower stages of economic development when agriculture rested less on capital, and profit incentive for the private sector to produce and communicate technical knowledge (as a complement with the new capital forms it retails) was less or market opportunity was smaller.

Farmers can acquire knowledge at low real price when it is produced and communicated by public agencies. However, it never has zero real cost to farmers since some outlay or opportunity cost is entailed to obtain it. The real cost increases as the supply is smaller or restricted. Relatively, it is much higher in backward as compared to advanced countries. To obtain the amount of technical knowledge available in the county seat to the U.S. farmer, the cultivator of India would have to travel far, and at a much greater sacrifice to his consumption or investment funds. Translation into understandable form for him would add even further to its real cost, as compared to the U.S. farmer who already is literate as a result of greater prior public investment in education. But even in the United States, the supply of technical knowledge is not restricted to that furnished by the agricultural colleges and the USDA. At a price, the farmer can buy newspapers, magazines, radios and television sets; or he can even subscribe to a professional farm management service. All of these provide him a source of technical knowledge at a relatively low real price because the stage of economic development has allowed widespread public education which facilitates reading and the use of these media. They would have small value and a restricted market without farmer literacy.

Further technical knowledge is provided in another form by U.S. private industry, but is a much lacking source in less developed countries. This source often is overlooked by the foreign specialist who visits the nation to determine the secrets of U.S. agricultural development and rapid farm improvement. If only the comparable public facilities for research and education on agricultural improvement were duplicated in backward countries, the upsurge in farm technology and structure would not parallel that of this country. The private sector provides knowledge as a joint product with the agricultural resources and materials it sells. It calls this knowledge to the attention of farmers through salesmen, newspaper and billboard advertising and

numerous other media. This knowledge, as a joint product with the materials being retained, comes at a high or low real cost depending on the price of its "joint material." A decline in the real prices of important biological resources has accompanied their upsurge in use over the United States since 1940. In the "joint sense" above, knowledge itself thus comes at a lower real cost to the farmer.

Even if knowledge had been always complete in respect to technology and the production function, we would expect economic growth and relative change in factor prices to bring a gradual transition in the structure of agriculture. Or, given the same and complete knowledge of the production in all countries regardless of the stage of economic development, we would still expect different structures of agriculture to prevail over the world. In less advanced countries where capital supply is short and labor supply is long, with prices of these resources in opposite position, agriculture would rest more on labor technology than capital even if technical knowledge were complete. Since labor technology does not give rise to marked scale economies or cost advantages, farm units are expected to be small. With transition to larger supply and lower relative price of capital in a more advanced economy, labor supply and price relative moving in the opposite direction, we expect capital to be substituted for labor. However, scale economies or cost advantages with greater volume typically accompany mechanical forms of capital. Hence, not only is the capital/labor ratio of farming expected to grow with economic development and change in relative factor prices, but also farm units are expected to be larger. These developments are expected under economic growth, even if all technical knowledge were known "once and forever."

INPUT SUPPLY AND ECONOMIC DEVELOPMENT

The nature of the resource supply function to agriculture has had an important impact on rapid increase in agricultural labor efficiency and also on the differential rate of labor returns in the farm and nonfarm sectors. Yet shifts in the composition of the national economy as development takes place could proceed without giving rise to problems in resource returns and family income. The real level of commodity prices, resource returns and farm family incomes could rise, both absolutely and relative to the nonfarm economy, under certain resource supply conditions. If supply elasticities of resources were zero or very small, these results would follow expansion of commodity demand under population growth and economic development. Considering technical knowledge also to be a resource of zero or low supply elasticity, new knowledge would not flow readily to agriculture and technical change would be slow or nonexistent (in all economic sectors because of low food supplies). More resources of conventional or known forms, such as heavier fertilization rates, could be used; but new resource forms representing innovations in technology would take place only

slowly or not at all. Or, if knowledge per se were of high supply elasticity, but new resource forms such as tractors, new crop varieties and insecticides had very low supply elasticities, the same would hold true: Prices of these resources would be extremely high, and few would be used in agricultural production. Only limited opportunity would exist to increase the use of these inputs in farming; consequently the supply of agriculture products would increase slowly, if at all. Output might increase but only along a given supply curve, with the commodity price necessarily spiraling to meet growth in demand for farm products. Supply elasticity of farm commodities would be extremely low in the long run and a given demand increase would be accompanied by proportionately greater increase in the farm commodity price. With resource supply conditions for nonfarm industries being the opposite of that above, the farm commodity prices would rise relative to prices of nonfarm commodities, and terms of trade for agriculture would be increased.

Income-wise, farming would be a favored industry under these conditions of resource supply. The real income of persons in agriculture would rise relative to incomes of nonfarm persons who own an equal collection of resources. The consumer sector, excluding agriculture, would fare less well. A greater proportion and an increased absolute amount of its budget would be allocated to food, in contrast to economies where supply elasticities of major farm inputs are high and technological change is rapid. Given permanence of this supply condition in agriculture, the fortunes of farm families would not accumulate as favorably over generations. In the long run, the price of resources would parallel their return. With competition, the income gain at one period in time would, with distributed lag, be capitalized into resource values and a given farm investment would return little more than an alternative investment. Yet persons owning farm resources would realize capital gains and their incomes and wealth gradually would move upwards.

The lot of U.S. agriculture has been largely the opposite of this imagined state. Resources such as knowledge and new capital forms such as fertilizer, tractors, improved machinery, higher yielding crop varieties, ration improvements, insecticides and others have had high supply elasticity. Too, the supply of investment funds and credit has been sufficiently elastic to allow additions of these capital innovations in agriculture. Because the capital items have been highly productive, profitable and available, the food supply function has shifted rapidly to the right.

These conditions of high resource supply elasticity and an increase in the farm commodity supply do not themselves predestine agriculture to overcapacity and depressed farm income. Given high supply elasticity for all agricultural resources, food supply would increase and output and commodity prices would fall, but the price system would quickly bring resource adjustments necessary for marginal value productivities and returns of resources to be comparable with those of

other industries of similar competitive structure. Still, as we show in Chapter 3, where some resources have high supply elasticity but others have extremely low supply elasticities because they are specialized or value-oriented to agriculture and depreciate slowly, the following occurs: Output will move ahead rapidly in the short run, perhaps more rapidly than demand if supply elasticity is sufficiently high and supply price is sufficiently low relative to marginal value product for the one group of agricultural resources. Given a high level of economic development, with high per capita income and low price elasticities of food demand, aggregate farm income will decline. The marginal value productivities and imputed returns to resources of low elasticity will decline and remain low as long as these redundant resources remain in agriculture.

Under conditions where the elasticity of supply of all resources to agriculture is sufficiently elastic, however, technical change and rapid movement of the supply function to the right need not permanently depress resource returns. With sufficiently high supply elasticity and resource mobility, value productivities and income per resource unit would quickly adjust to levels comparable to other economic sectors lacking monopoly profits — for all resources.

We begin to see, then, that problems of income in agriculture have their more basic origin in resources. But we must look still further. Economic development also is an element of this complex. It is largely through national economic growth that capital increases sufficiently in supply to be furnished agriculture at low real prices and to serve as a large-scale substitute for land and labor. Relative decline in the price of capital places increased economic premium and pressures to substitute it for the conventional resources. Under these economic conditions, technical research also is favored in the private sector, establishing new and higher rates of substitution of capital for labor and land. Together, the development of (a) new production functions and knowledge of increased marginal rates of substitution of capital for labor and land and (b) a lower real price of capital, cause the structure of agriculture to turn in the direction of smaller dependence on land and labor.

Capital accumulation in agriculture gives rise to a larger nonfarm sector to process and supply inputs to farming. The basic science and methodology of these input-furnishing sectors often are more related to technical and scientific developments in nonfarm sectors than to agriculture. The science and technology of developing and producing tractors is more akin to that of the automobile industry than to farming. Technology in fertilizer and insecticide industries is more a branch of the chemical industry than of agriculture. The antibiotics of livestock rations are related more to the drug sector rather than to agriculture. Increasingly the scientific technology even of the production and supplying of new seeds falls outside of the "purely farm sectors." To an extent, this also is true for livestock inputs such as baby chicks and the breeding technology underlying their improvement. Discoveries in

these input industries, as they grow under development and further technical knowledge, allows supply prices of inputs to be kept low relative to prices of farm commodities, labor and land. The demand for capital items grows accordingly and agriculture comes to rest more on this resource.

FACTOR SUBSTITUTION AND ECONOMIC DEVELOPMENT

Relationships among economic development, factor supplies and resource prices are illustrated through comparison of agricultures in countries at different stages of economic development. India and the United States fall nearly at extremes in the spectrum of economic growth; Mexico, Japan and France fall at intermediate points within the range of structure and development.

Agriculture of India rests largely on labor technology; labor inputs constitute over 80 percent of all inputs, and capital inputs are small. Paucity of capital inputs not only limits the substitution of mechanization for labor, but also restrains substitution of fertilizer, insecticides and similar biological capital forms for land. Farm units are small (i.e., the agricultural firm has demand for only a small amount of land), as is generally true in economies at low stages of development where the supply price of capital is high relative to that of labor, and farming is based on labor technology.

In contrast is the United States where the price of labor is greater, and the supply of capital, including both knowledge of it and its physical forms, has greater elasticity. While comparable figures are not available for India, Table 1.1 indicates the change in the combinations of resources for U.S. agriculture under national economic growth, changing factor prices and relatively rapid farm technological advance. These figures refer to decades after national economic development and technical development of agriculture had already gained some momentum. A century prior to 1910, dependence of U.S. agriculture on labor was even greater, with nonland capital inputs amounting to as little as 5 percent of aggregate inputs. By 1910, labor still represented 75 percent of total farm inputs. By 1960, labor had dropped to 30 percent of total inputs, with an accelerated rate of decline in proportion of total inputs represented by labor after 1940. Labor may constitute no more than 10 percent of total inputs by 1980, with total capital comprising 90 percent and nonland capital comprising 80 percent. The response of labor to changed conditions of returns and employment alternatives have been somewhat sluggish in the short run. Important substitutions have been made in the long run, however.

Capital is, of course, not an internally homogeneous input category. Items within the category differ physically as much as do the tripartite of land, labor and capital. The capital forms now in use have little resemblance to those of decades past; very few forms remain unchanged as substitution has taken place. A major change taking place

Table 1.1. Percent of Total U.S. Farm Inputs Represented by Capital, Labor and Land, 1910-60*

| Year | Labor | Capital | Land | Total |
|------|-------|---------|------|-------|
| 1910 | 74.6 | 16.7 | 8.7 | 100.0 |
| 1915 | 72.6 | 19.0 | 8.4 | 100.0 |
| 1920 | 70.1 | 21.6 | 8.3 | 100.0 |
| 1925 | 69.3 | 22.7 | 8.0 | 100.0 |
| 1930 | 65.8 | 25.9 | 8.3 | 100.0 |
| 1935 | 66.7 | 23.7 | 9.6 | 100.0 |
| 1940 | 58.6 | 32.3 | 9.1 | 100.0 |
| 1945 | 52.5 | 38.6 | 8.9 | 100.0 |
| 1950 | 41.8 | 49.3 | 8.9 | 100.0 |
| 1955 | 35.0 | 56.5 | 8.5 | 100.0 |
| 1960 | 30.1 | 61.4 | 8.5 | 100.0 |

*Basic data from Economic Research Service, USDA. For the series represented, see USDA Tech. Bul. 1238, 1961 and USDA Stat. Bul. 233. 1961.

within the capital category, one also stemming from economic development and its impact on the supply price and productivity of resources, has been the substitution of capital inputs produced in the nonfarm sector for those formerly produced on farms. (See Table 2.4, p. 20.)

The basis in resource prices favoring a shift from a labor-oriented agriculture to one resting on capital is further suggested by Table 1.2. The first five rows show the change in real price of selected capital items relative to labor price by decades from 1910 to 1959; the sixth row shows the real price of fertilizer in relation to land price while the seventh shows the real price of fertilizer in relation to all farm

Table 1.2. Index of Price Relatives for Particular Categories of Inputs, Selected Periods, U.S. 1910-19 = 100*

| Price Relative | 1910-19 | 1920-29 | 1930-39 | 1940-49 | 1950-59 |
|---------------------------|---------|---------|---------|---------|---------|
| Short-term interest/labor | 100.0 | 67.0 | 94.0 | 32.8 | 18.9 |
| Machinery/labor | 100.0 | 91.0 | 133.2 | 66.7 | 66.8 |
| Fertilizer/labor | 100.0 | 78.0 | 87.8 | 42.9 | 29.9 |
| Land/labor | 100.0 | 78.8 | 87.8 | 58.9 | 48.9 |
| All capital/labor | 100.0 | 66.4 | 101.5 | 61.9 | 51.5 |
| Fertilizer/land | 100.0 | 98.1 | 100.1 | 77.0 | 61.0 |
| Fertilizer/products | 100.0 | 97.4 | 116.0 | 66.1 | 56.6 |

*Price of resource in numerator divided by price of resource in denominator in each period, with 1910-19 = 100.

commodity prices. A tremendous change took place in these price relatives and agricultural technology after 1940, and favored a rapid and near-revolutionary change in the resource mix of the industry. Measured against the price of labor, the real or relative price of all capital categories has declined markedly since 1910. Similarly, the price of inputs such as fertilizer have declined relative to land price

RESOURCE STRUCTURE AND QUANTITATIVE ECONOMICS

We have attempted to describe how "failure" elements of low income and "success" elements of high productivity and capital accretion have their origins in the resource structure of agriculture. If resource demand and supply are favorable to rapid adoption of productive capital inputs, opportunities for growth in output and productivity of resources is large. But if opportunities for adjusting redundant labor resources out of agriculture are low because of values, specialized training or other reasons, the returns to farm labor may be low indeed. The above discussion essentially is a set of hypotheses about the parameters in the structure of agriculture. The quantitative estimates of structural parameters in later chapters provide more concrete knowledge about the resource structure. The purpose of this study is to identify, interpret and explain the developing structure and organization of agriculture.

The organization of agriculture is a reflection of parameters in the structure of agriculture. The organization is defined as the numbers and sizes of farms which make up the industry, the size of the labor force and the amount and composition of capital used. To explain why a particular organization has been attained, or to predict the organization which might emerge, it is necessary to know the demand functions for resources by the firms which make up agriculture. The size and number of units is a function of the farm firm demand for land. Similarly, the size of the labor force in agriculture is explained by the demand of each individual farm for this resource, with the aggregate demand for firms being that of the industry. The total amount of capital used also is a function of the variables which effectively enter into the resource demand functions of individual farms and the industry. Hence, the structure of agriculture is a term more or less synonymous with the concept of resource demand in the industry. To understand or predict the quantity and mix of the many resources which are or will be used, it is necessary to have knowledge of resource demand functions in agriculture. The demand function for a particular resource obviously is interrelated, through resource prices, technical coefficients and substitution rates, with the demand function for other resources.

Analysis and prediction of resource demand functions do not, by themselves, fully explain the quantity and mix of particular resources employed in the industry. Resource employment is explained as much

by the conditions under which resources are supplied to agriculture as by the conditions which determine the demand for resources. Hence, an analysis of the structure of agriculture must deal with the conditions of factor supply to agriculture, as well as with conditions of resource demand. While in this study major emphasis is given to aggregate resource demand functions for the agricultural industry, some analysis is necessarily and appropriately made of resource supply. For some resources such as hired labor, it is difficult to analyze demand apart from supply. But other important cases of identification also arise. In chapters dealing with refined empirical estimates, regression models are applied accordingly. For resource markets where prediction of supply is not necessary in identifying demand functions, or where complex estimating systems are not possible, single equations, least-squares techniques are used to estimate factor demand functions. In other cases where demand functions for particular resources cannot be identified apart from supply functions, or where demand for one factor cannot be explained apart from other factors, various types of simultaneous equations estimates are used. However, the major emphasis is on estimation of resource demand functions using relatively simple empirical techniques.

This analysis was initiated as more than a mechanical attempt to estimate demand functions of agricultural resources. Interest extends beyond this purely statistical routine to an analysis and interpretation of the conditions surrounding the structure of agriculture, both in respect to trends in the amount of mix of resources used and that in prospect. Hence, analysis also is made of data which are not incorporated into the refined estimates of some later chapters. Too, the form of data available for analysis of agricultural structure, largely time series data, gives rise to limitations in regression analysis and predictions. Accordingly, data in other forms and representing less formal empirical methods are used wherever useful and appropriate.

Predicting and interpreting the structure of agriculture is only an intermediate end in analysis. A more ultimate end is to explain how the supply and demand conditions surrounding agriculture relate to returns on resources and to income of the industry. At this level of ends, in the means-end chain of analysis, fundamental interest also relates to adjustments which must be made in agriculture if its income is to be made more favorable, or if its structure can be brought into more consistent juxtaposition with the developmental stage of the nation.