18.

Prospective Resource Structure and Organization in 1980

MOST PERSONS with a close interest in agriculture would like answers to the question, "What will be the level and rate of change in demand for various farm resources during the next two decades?" Such information would be useful for firms supplying inputs to agriculture. This knowledge also is relevant for educational units and rural institutions and enterprises associated with agriculture. Somewhat similarly, the future structure and organization of agriculture will suggest guidelines for farm policy. The magnitudes of production, demand and supply elasticities largely will determine whether agriculture can adjust to the forces of economic growth without severe income sacrifice in an unrestricted market framework. But remedial policies to correct income and other inequities cannot be formulated in terms of farm variables alone. The appropriate policies also depend on values of farmers and consumers, and on national rates of employment and growth. The long-run projections made in this chapter are intended to provide useful background information for decisions which must be made in a national and internal environment favoring change in the structure and organization of agriculture.

STRUCTURE AND FORECASTS

The structural equations estimated in earlier chapters are less useful for making long-run than short-run forecasts, and are used sparingly for the analysis which follows. Other quantities, methods and judgments also must be employed to evaluate the upcoming structure of agriculture. If we had been able to include all relevant variables relating to future structural changes in specifications of resource demand and supply functions, the task of projection might have been simple. However, numerous variables falling outside the realm of time series measurement will have important bearing on the future resource employment pattern and structure of agriculture.

Some of these variables, generally instrumental variables which will be determined by the public and policymakers, will take on much larger magnitudes than in the past. One example is education and vocational guidance in rural areas. The more intensive emphasis being placed on gearing these social activities to economic change will likely have greater impact in agricultural labor supply quantities and elasticities with respect to commodity prices and farm and nonfarm labor returns than did concentration and investment in vocational agriculture and 4-H activities in the past. Similarly, the nature and extent of public investment and programs in creating new knowledge of technology and farm resource productivities will have tremendous influence on farm resource demand and structure. These variables will be determined by the public "outside the system" of measurable variables available in time series analyses. They will, however, have an important impact on the types and quantities of resources employed in agriculture.

Action programs relating to production control, price supports, surplus disposal and even aids in international development which affect exports of U.S. farm products will have some impact on the resource structure and organization of agriculture. The number and sizes of farms, the magnitude of the farm population and labor force, the amounts and proportions of durable and operating inputs will be affected by these numerous institutional, social or instrumental variables. Similarly, the acreage devoted to food and fiber crops, or the conventional mix of these, as compared to the acreage devoted to recreation and forestry, will be partly determined by these variables whose magnitude or nature are (a) decided largely outside of the market mechanism and (b) not expressed statistically as time series observations.

Even a particular and major set of variables which are, ex post, reflected in time series statistics will greatly affect the resource structure and organization of agriculture but cannot themselves be predicted with great certainty. Here we refer to those variables relating to the rate of national economic growth. Even if we had been able to formulate and quantitatively derive a general-equilibrium and simultaneous-equation model of agriculture reflecting all relevant supply and demand relationships of the industry, and to link these appropriately to the structural relationships of the dominating nonfarm income wage and employment variables, our projections might be inaccurate because we cannot be certain of national growth rates over the 1960 to 1980 period.

TYPES AND PURPOSES OF PROJECTIONS

Numerous types of forecasts are possible. The most desirable for public decisions, policy formulations and private choices would be a set of unconditional long-run forecasts predicting the magnitude of the dependent variables, all predetermined and instrumental variables, and those "purely dependent variables of agricultural structure."[1]

[1] Cf. Ferber, R., and Verdoon, P. J. Research Methods in Economics and Business. Macmillan. New York. 1962. Chap. 10.

Obviously, the relatively simple models of previous chapters do not allow this complete set of unconditional forecasts. The procedure in previous chapters was to make conditional short-run forecasts where we assumed certain magnitudes for the independent variables, or those which were considered to be predetermined relative to the particular variables being projected. In all projections it becomes almost impossible to differentiate entirely between conditional forecasts and judgment forecasts in the sense that assumptions must be made if complete models cannot be formulated and estimated for unconditional forecasts. This is due to paucity of data and the high intercorrelation of variables constituting the structural system of agriculture.

Long-run projections must be interpreted in respect to their intended purpose. One objective of long-run projections might be to answer the question, "If quantities continue recent trends, what will be their level in 1980?"

A second estimate of future quantities might be based on input requirements necessary to meet expected demand for farm output. These requirements might be based on the "fairly predictable" magnitudes: population and per capita food consumption in 1980. If productivity also could be predicted with accuracy, the resource requirements then could be computed in relation to output needs.

A third approach is to estimate the most efficient input level and combination for producing the output that would clear markets at prices providing satisfactory returns on farm resources.

The respective approaches might be broadly characterized as "what is likely to be," "what needs to be" and "what optimally ought to be." The last two approaches have normative elements; the first is basically positivistic. The methods obviously are related and cannot be entirely separated.

Normative considerations, based on values of the public relating to structure of agriculture, have had some effect on parameters of the past (although our simple models and specifications were only sensitive enough to measure these indirectly) and will likely do so in the future. For example, society may decide that the number of farms projected for the future is too small, and enact legislation which more nearly preserves Jeffersonian concepts and restrains growth in farm size. In this case, prediction of farm numbers and population from past trends would be above the target.

On the other hand, educational and vocational guidance in rural areas may be intensified in preparing farm youth for more rapid growth in off-farm employment. In this case, our projections of farm numbers and sizes may fall below the target. But in any case, normative considerations and value judgement will affect the magnitude of instrumental or policy variables and the parameters which attach to "purely structural variables."

But just as the quantitative analyst who relies only on positivistic analysis and predictions encounters discomfort because of the above changes, individuals who expect certain policy restraints and institutions to preserve or attain a particular farm structure also are likely to be frustrated. Agriculture is now such a small portion of the national economy, and the forces of economic growth fall too strongly on it, to allow a purely normative specification of structure. The pull of factor prices under economic development mentioned in earlier chapters serves as an illustration. Unless farmers organize more completely to raise bargaining power, the issue of what agriculture ought to be will be determined increasingly by the dominant nonfarm society. At the moment, public indecision on agricultural policy and farm structure arises because conflict in concept of "what ought to be" has not yet been reconciled among the various groups with economic and value positions relating to agriculture.

All three approaches outlined above are used in projecting the organization of resources to 1980. The method used in the following section is related to normative concept of what ought to be for maximum economic efficiency. However, we prefer to present the projection in terms of what could be and do not imply what should be. Even though a given organization represents an economic optimum, it may not be optimum from a sociological or political standpoint. The section is followed by a more positivistic estimate of what the combination and level of resources is likely to be in 1980.

POTENTIAL IN STRUCTURE AND ORGANIZATION

Under high employment in the national economy and the absence of war, rates of change in respect to labor force and farm numbers and sizes will be largely maintained in relative magnitude. There are several bases for this assumption: (a) the institutional and policy forces mentioned previously and related to greater intensity and modernized direction of education and vocational guidance for rural youth, (b) the growing economic literacy among farm and related publics which give them increased understanding of the national economy and its interaction with the farm sectors under growth, (c) the great likelihood that the agricultural extension service will bring even greater knowledge and basis for decision to farm communities and (d) the growing competition and commercialization of agriculture under existing and prospective technology and resource prices.

The potential for change is still great. Referring back to the proportion of low-income persons in agriculture (Chapter 2), it is obvious that the number of families and the size of the farm labor force, especially in the low-income sector, must decline by a continued large proportion if real per capita incomes are to be raised near the level of nonfarm sectors. The potential also is great for change in the distribution of total farms and their contributions to the nation's food supply function. Converting data related to Table 2.5 to a 1954 price basis and including all farms, change in number of farms of different sales volume from 1939-59 is given in Table 18.1. Farms with less

Table 18.1. Number of Farms Classified by Economic Class (1000 farms)
(Value of Sales at 1954 Constant Prices)

Value of Sales	1939	1949	1959*
Under $2,500	4,185	3,295	1,638
$2,500 to 4,999	1,015	882	618
$5,000 to 9,999	585	721	654
$10,000 and over	312	484	795
($2,500 and over)	1,912	2,087	2,067
($5,000 and over)	897	1,165	1,448
All farms	6,097	5,382	3,705

*Would include approximately 232,000 additional farms with sales of less than $2,500, if definition of a farm had been the same in 1959 as in earlier years.

than $5,000 in sales (61 percent of all farms) had only 13 percent of the nation's total farm sales in 1959. The slack capacity or underemployment of labor and machine resources on farms with sales of $5,000 and over (39 percent of all farms) which produce 87 percent of national sales, could easily take over this 13 percent share. Under these conditions only 1.4 million farms would exist. But the decline could go much deeper, with the certainty that remaining farms could produce the nation's food supply and current exports at low price and with some surplus.

If the farms with less than $10,000 in sales were organized to produce the same sales volume per farm as those with over this amount in 1959, the following changes would be possible. The 2.2 million farms (with sales of less than $10,000) producing the 29.1 percent of sales could be reduced to 322,000, if they produced the same volume as farms with $10,000 and greater sales in 1959. Adding the 795,000 of the latter group with the 322,000, it is obvious that 1.1 million farms already could produce the 1959 level of output. With the 50 million acre reduction in cropland projected by the USDA for 1980[2] and with the projected trend in per acre and animal yields, based on already existing knowledge as indicated by studies such as those of Rogers and Barton,[3] these 1.1 million farms could readily produce the nation's 1980 food supply.

However, considering the degree of unexploited cost economies

[2]Land and Water Policy Committee. USDA. A land and water resource policy for the United States. (Mimeo.) Washington, D.C. 1962.

[3]Barton, G. T., and Rogers, R. O. Farm output, past changes and projected needs. USDA Agr. Inf. Bul. No. 162. 1958; Rogers, R. O., and Barton, G. T. Our farm production potential, 1975. USDA Agr. Inf. Bul. No. 233. 1959; Barton, G. T., and Daly, R. F. Prospects for agriculture in a growing economy. In Center for Agricultural and Economic Development. Problems and Policies of American Agriculture. Iowa State University Press. Ames. 1959. Also see Shrader, W. D., and Riecken, F. F. Potentials for increasing production in the Corn Belt. In Center for Agricultural and Economic Development. Dynamics of Land Use — Needed Adjustments. Iowa State University Press. Ames. 1961.

currently existing on model-sized farms,[4] with some measure of underemployed labor on these same units, the number of farms to produce the 1980 food supply, with scale of operation approaching but still short of minimum cost, is around .75 million. (If all commercial farms declined at the 1954-59 rate in each subsequent census period, the number of commercial farms would be 680,000 in 1979.) If a like number of part-time and residential units were to exist, producing only a trivial portion of the nation's farm sales, the potential number of all farms is only 1.5 million. The potential labor force associated with this number is only 3.5 million persons, at the level of productivity existing on farms with sales over $10,000 in 1959. The potential in labor force could go as low as 2.8 million, if only farms providing $10,000 or more in sales were to exist.

Associated with this potential would be a considerable increase in farm operating inputs and a shift of nonreal estate capital inputs to a greater proportion of operating items and a smaller proportion of durable inputs. If the potential number of farms for 1959 had existed, input of durable capital might have been somewhat less than the 1959 actual figure. However, in terms of 1980 potential in farm numbers and sizes discussed above, the potential in durable inputs would increase somewhat over the 1959 level, but not nearly in the magnitude of potential operating inputs.

These figures revolve around the potential structure of agriculture explained above. They are conservative potentials, with the full potential being for an even smaller number of farms. It is toward these potentials which actual trends migrate. Hence, we now turn to selected long-run projections, estimated in the <u>simplified conditional forecast</u> and positive framework discussed earlier.

ESTIMATED RESOURCE ORGANIZATION IN 1980

The following estimates of resource quantities, efficiency, farm size and numbers are intended to reflect what the 1980 resource organization is likely to be, based on past trends, judgments, and on structural relationships analyzed earlier. The approach basically is positivistic, but again we emphasize that the various approaches are

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[4] For example, see the following indications of cost economies not exhausted on farms of the most typical or modal size in major producing areas: Heady, Earl O., and Krenz, R. W. Farm size and cost relationships in relation to recent machine technology. An analysis of potential farm change by static and game theoretic models. Iowa Agr. Exp. Sta. Bul. No. 504. 1960; Heady, Earl O., <u>et al</u>. Farm size adjustments in Iowa and cost economies in crop production for farms of different sizes. Iowa Agr. Exp. Sta. Bul. No. 428. 1954; Fellows, Irving. Economies of scale in dairy farming. Connecticut Agr. Exp. Sta. Bul. No. 285. 1956; Barker, Randolph A., and Heady, Earl O. Economy of innovations in dairy farming to increase resource returns. Iowa Agr. Exp. Sta. Bul. No. 478. 1961; Scoville, O. J. Farm size and costs in Nebraska. USDA Tech. Bul. No. 931. 1952; Hurd, Edgar B. Wheat-pea farming in Washington and Idaho, 1935-53. USDA Circular No. 954. 1955.

related. Data show that trends in input quantities tend to be consistent with criteria of economic efficiency, although the adjustment to the optimum is slow for many resources, as is apparent from foregoing chapters. The projections which follow are based on the assumption that these optimizing forces will continue to operate in the future about as in the past. Of course, this "normal" rate and direction of adjustment could be upset by a major change in government programs, war, depression, extended drought, discovery of radical new technology, etc. We abstract from such phenomena and attempt to measure what, based on available information, is likely to be the 1980 resource organization, not what could be or should be the organization. Basically the projections are extensions of past trends, particularly those of the 1950's. It follows that with such "naive" techniques, projections are likely to be realized only if the future basic economic structure, or the rate of change in structure, does not deviate markedly from the past.

We make the judgment (assumption) that national growth rates and public policies from 1960 to 1980 may change but will be somewhat comparable to those of the previous 20 years. Projections depend on a somewhat unpredictable foreign demand. To accommodate the volatile export market, two levels of exports are assumed. This procedure of projecting two estimates is used in other instances also, where trends are unstable.

The 1980 projections of resource quantities, efficiency, farm size and numbers in this chapter supplement the many short-run projections made throughout the book. While the short-run predictions made in earlier chapters were structural, the long-run predictions are based generously on "naive" techniques. The structural equations of earlier chapters, providing the basis for short-run projections from prices, technology and other explanatory variables, are not well suited for long-run estimates and are used sparingly.[5] Structural equations are rigid, and predictands are a function of predictors related by fixed and single-valued elasticities or marginal coefficients. While constant coefficients and linear approximations are adequate in the short period analyzed and for short-run extensions, they cannot be expected to hold for long periods in the future. Furthermore, many of the structural equations contain lagged dependent variables. These equations generally predict with great accuracy in the short run, but errors accumulate and accurate estimates cannot be expected for long-run extensions.

Finally, distant projections from structural equations must be based on assumed levels of prices and other independent variables chosen because they are truly exogenous (or predetermined) and economically relevant, not because they are easily predicted in the future. Consequently, the error in predicting the explanatory variables, coupled with other complications, often may result in less reliable forecasts from structural equations than from simple extensions of the

[5]Structural models should be kept up to date and extrapolations ordinarily should not be carried more than two years into the future according to Klein, Lawrence R. A Textbook of Econometrics. Row, Peterson and Company. Evanston, Illinois. 1953. p. 265.

predicted trend. Some direct long-run predictions are made from preceding structural equations, but uses of the equations mainly are indirect. In many instances, results from earlier chapters are necessary in establishing judgments or assumptions of future quantities, since simple past trends are inconsistent or too volatile for useful forecasts.

The subsequent extrapolations are based essentially on past trends, the assumption being that the underlying structural change will not be large. The naive, simple extensions of past trends are supplemented with estimates based on requirements. In some instances, requirements are quite highly predictable, e.g. from a stable trend in population, low price and income elasticities for food and a somewhat fixed per capita consumption. Given resource productivity and fixed output requirements, resource quantities thus are "set." We would expect deviations from these resource levels to be corrected by the price system, although substitutions within the input aggregate might be notable.

Past trends are extended, in most instances, from 1950-60 data. This period was selected because much of the instability in quantities and prices caused by the Depression and World War II was dampened or dissipated by then, giving a more stable and predictable trend. Also, there are advantages in extending recent trends in a farm structure that has changed greatly in the recent decades.

Four algebraic forms for extrapolating the quantity, Q_i, with time, T, are (18.1) to (18.4).

$$Q_i = a + bT \tag{18.1}$$

$$Q_i = a + b\sqrt{T} \tag{18.2}$$

$$\log Q_i = \log a + bT \tag{18.3}$$

$$\log Q_i = \log a + b \log T \tag{18.4}$$

The simple linear equation (18.1) forces a constant absolute annual change, b, in Q_i and can be useful for projecting a rising trend. But it is less useful for extending a quantity which decreases, since a negative input is not meaningful. The square root function (18.2) rises or falls at a decreasing rate, and therefore gives a more "conservative" projection than (18.1). Exponential equation (18.3) forces a constant percentage rise or fall in Q_i. The equation is useful for extending "biological quantities" such as labor or population; but also, it does not become negative over an extended time period. The constant percentage change implies growing absolute increments with a rising trend and declining absolute quantity decrements with a falling trend. Equation (18.4), similar to (18.3) since Q_i does not become negative, allows more flexible rates of change than (18.3).

AGGREGATE OUTPUT, INPUT AND PRODUCTIVITY

Output requirements projected to 1980 range from 48 billion to 52 billion 1947-49 dollars (Figure 18.1). The higher requirement, based on a 1980 national population of 260 million, is from (18.3) using 1950-60 data. The estimate is 44 percent above the 1960 level, and is based on a predicted 1.75 percent annual rate of population growth.[6] Per

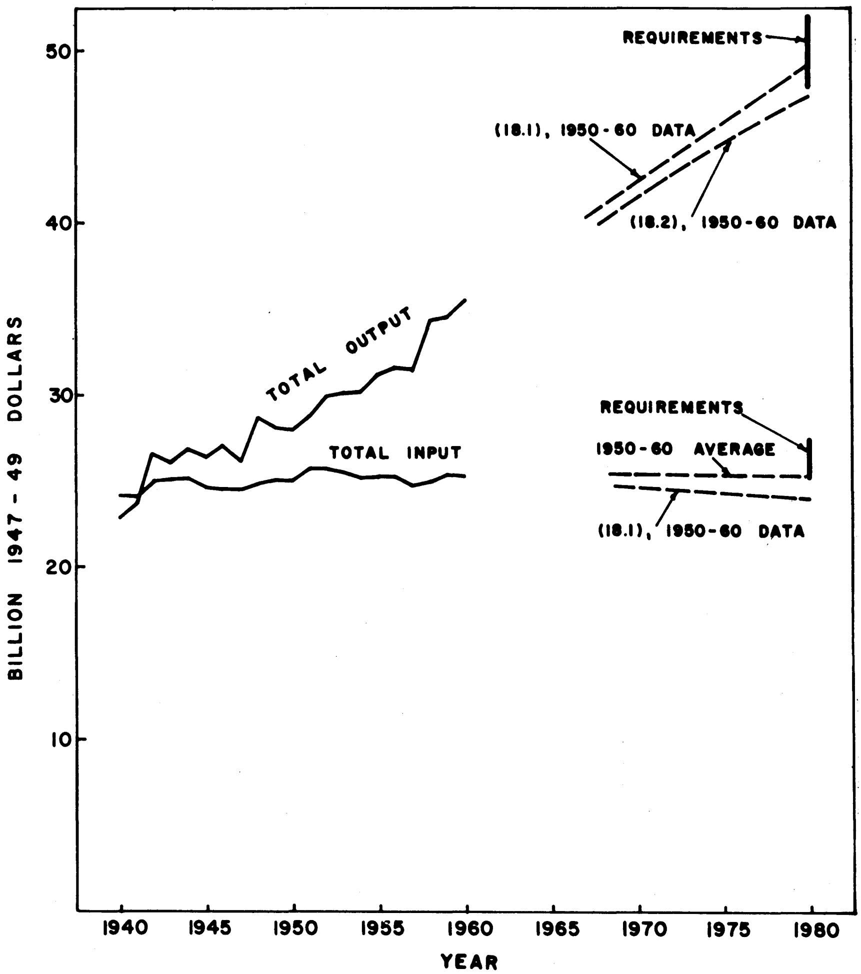

Figure 18.1. Aggregate farm output, input and productivity for 1940 to 1960, and projected to 1980. (1940-60 estimates from: USDA Stat. Bul. 233. Revised 1961; and USDA Tech. Bul. 1238. 1961.)

[6]Other population estimates for 1980 are in: Koffsky, Nathan M. Potential demand for farm products. In Iowa State Center for Agricultural and Economic Development. Dynamics of Land Use — Needed Adjustments. Chap. 3. Iowa State University Press. Ames. 1961.

capita disposable income is projected to grow about 2 percent per year, and to be 50 percent higher in 1980 than in 1960.[7] Assuming that the aggregate income demand elasticity for food will be only .10 in 1980, the large increment in income per capita alone increases farm output requirements only 5 percent. The higher output requirement is based on the rather optimistic assumption, for this prediction, that exports will be 22 percent above the 1960 level. For 1980, net addition to all farm commodity stock is set at 500 million 1947-49 dollars, considerably below the 1960 level. The resulting sum, $52 billion of farm output, is 50 percent over the 1960 value and is slightly over one USDA estimate.[8]

The lower projected output requirement in Figure 18.1 is based on a U.S. population of 255 million in 1980, exports 22 percent below the 1960 level, and other assumptions given above. The lower requirement of 48 billion 1947-49 dollars of farm output in 1980 is 35 percent greater than the 1960 farm output.

Input requirements are based on a linear extension of the 1950-60 trend in resource productivity corrected for weather (Figure 18.2).[9] The predicted 1960 productivity index is 170 (1947-49=100) and is 35 percent greater than the index in 1960. The indices of livestock production per animal unit and crop production per acre are also predicted to be nearly 170.[10] This projection is a simple extension by (18.2) of the 1950-60 index of livestock efficiency and is a linear projection of crop production per acre after removing weather effects. The total percentage increase is least for livestock efficiency because the 1960 value is greatest.

Based on output requirements and on predicted productivity in Figure 18.2, the aggregate resource requirements for 1980 are between 25 and 27.5 billion 1947-49 dollars. Figure 18.1 suggests that these output and input requirements are approximately met by extending 1950-60 trends. The nearly 50 billion dollar output indicated by a linear extension of the trend is approximately the mid-range of projected requirements. To meet requirements, it may be necessary to reverse the 1950-60 downward trend in aggregate inputs according to Figure 18.1. If the productivity measure is correct, the level of inputs need not change appreciably, however, and the current aggregate level of inputs may be nearly adequate to meet needs of 1980. Of course, major changes within the aggregate of output and input must occur. Changes

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[7] See also Knowles, James W. Growth prospects for the American economy. In Iowa State Center for Agricultural and Economic Development. Dynamics of Land Use — Needed Adjustments, op. cit., Chap. 2.

[8] USDA. Land and Water Policy Committee. Land and water resources — a policy guide. Washington, D.C. 1962.

[9] Weather index from Stallings, James L. Weather indexes. Journal of Farm Economics. 42:180-86. 1960. The index of weather was set at the 1950-60 mean, 104.5 with 1947-49=100.

[10] Alternative and somewhat lower projected annual increments in crop yields are presented in Barton and Rogers. Farm output, past changes and projected needs, op. cit., p. 43. See also footnote 19 of this chapter.

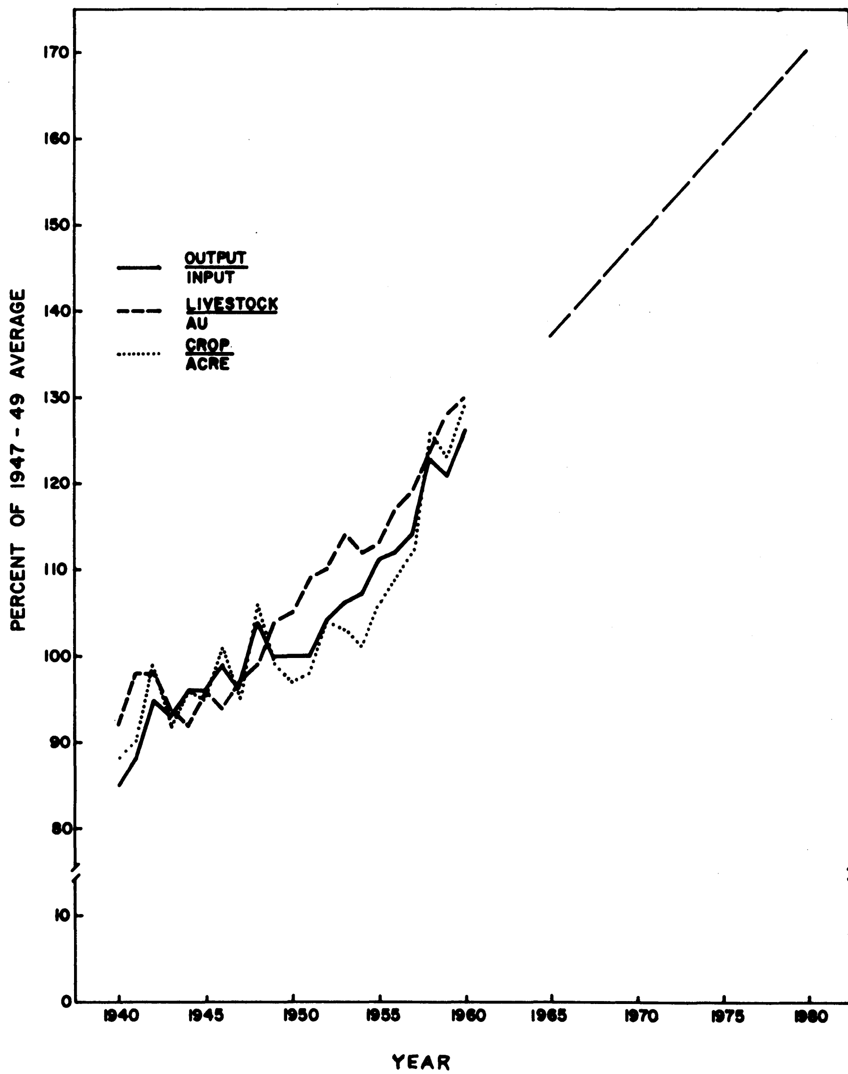

Figure 18.2. Aggregate output per input, livestock output per animal unit and crop output per cropland acre from 1940 to 1960, and projected to 1980. (1940-60 estimates from: USDA Stat. Bul. 233. Revised 1961.)

within the output category are discussed elsewhere.[11] In the following section we discuss changes within the input category.

Output O in 1980 is predicted from the supply equation (18.5) (cf. equation (16.3)) to be 48.2 billion 1947-49 dollars.

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[11] Koffsky, op. cit., p. 45.

$$(18.5)\quad O_t = -12{,}710 + \underset{(8.6)}{32.0}(P_R/P_P)_{t-1} + \underset{(32.3)}{123.1}\, S_{pt} + \underset{(19.6)}{259.0}\, T'$$

$$R^2 = .99$$

The "parity" or commodity/input price ratio P_R/P_P is set at the 1955-59 average, the stock of productive assets at 117.1 billion 1947-49 dollars (see Table 18.2) and the productivity index T′ at 170 (Figure 18.2). Standard errors are in parentheses below the coefficients. The predicted output, $48.2 billion, is about the minimum requirement in Figure 18.1. A slight increase in S_p of T′ could greatly affect output, but it may be noted that since a one-unit increase in the short-run price index P_R/P_P raises output only 32 million 1947-49 dollars, a large adjustment in prices is predicted to be required for raising output by (say) one billion dollars in the short run.

RESOURCE PROJECTIONS

For farm output requirements to be realized with only a small increase in total input, major changes must continue to occur in farming specialization, management, institutions and especially within the aggregate input category. These latter changes generally represent continued substitution of the more productive for the less productive inputs. In fact, for the 1980 productivity projections to be realized, it is essential that these substitutions do occur. Tendencies for continued increase in levels of the more productive resources are apparent in the following projections to 1980 of labor, durables, operating inputs and various components of these resource categories.

Farm Labor in 1980

Extending 1950-60 trends by (18.3) and (18.4), sizeable reductions in farm population and labor force are forecast for 1980 (Figure 18.3). In the two decades after 1960, hired labor is predicted to decline 30 to 35 percent, family labor 45 to 55 percent. These ranges are not confidence intervals, based on probabilities, but are only point estimates from the trend extension. The 1980 point estimates are extended smoothly backward in Figure 18.3, but these extensions have no meaning for (say) 1965 and may not be consistent with projections for that year in foregoing chapters. The projections suggest that the farm labor force will decline from 7.1 million in 1960 to 4 million in 1980, a 44 percent decline. More than 3.1 million farm workers would have to find jobs in other industries, however, because of net additions to the farm labor force by an excess of births over deaths.

In an alternative procedure, we estimate the number of workers required in 1980 to be 3.6 million. This result is based on the compound

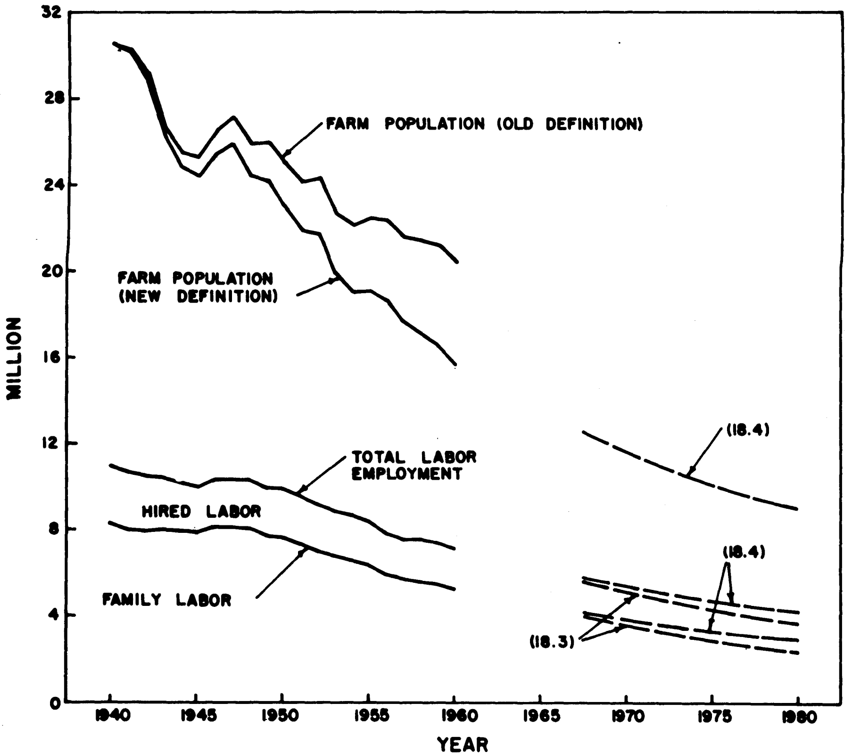

Figure 18.3. Projections of farm population and employment to 1980. (1940-60 data from: Economic report of the President. 1961; and USDA. The farm income situation. July 1962.)

interest formula assuming annual increases in output and output per man-hour to be 1.8 and 5 percent, respectively.[12] The "required" labor force, assuming the same ratio of man-hour requirements to labor force in 1980 as in 1960, is 49 percent below the 1960 number and is a slightly greater decline than projected from employment trends. The results suggest that for labor efficiency in agriculture to increase at the rapid rates experienced in the past, sizeable numbers of farm workers will need to find employment outside agriculture. To reduce the labor force by 44 percent in 20 years, annual employment must decline by an average of nearly 2 percent per year. According to

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[12] The number of man-hours, M_{80}, required in 1980 is given as

$$M_{80} = M_{60}(1 + r_0)^n(1 - r_m)^n$$

where M_{60} is man-hours required in 1960, r_0 is the rate of increase in output and r_m is rate of increase in labor efficiency. The time, n, is 20 years. This procedure, based on the compound interest model, was used by Johnson to project man-hour requirements to 1975. Cf. Johnson, Stanley S. A Quantitative Analysis of Demand for and Supply of Farm Labor. Unpublished Ph.D. Thesis. Library, Iowa State University. Ames. 1961.

Table 18.2. Projected U.S. Stocks of Productive Farm Assets to January 1, 1980 (Billion 1947-49 Dollars)*

Asset	Actual 1940	Actual 1950	Actual 1960	Projected 1980	Percent Increase (1960-80)	Source of Projection
Real estate†	58.2	63.4	71.1	74.0	4	Based on 30% increase in buildings and improvements nearly offset by a 4% decline in cropland used for crops.
Livestock	12.9	13.1	14.8	17.2	16	Based on 52% rise in livestock production and a 31% increase in production per breeding unit.
Machinery	4.1	8.6	10.2	11.5	13	Linear extension of 1952-60 trend.
Other	8.1	10.8	11.9	14.4	23	Average 23% increase in cash for operating purposes and in feed inventories.
Total of above	83.3	95.9	107.8	117.1	9	
Total				127.8	19	Extending 1950-60 annual data by equation (18.2)

*1940 to 1960 data from USDA Agr. Inf. Buls. 214 and 247. 1959 and 1961. The above data for 1940 to 1960 are unrevised. The unrevised asset totals for 1960 and 1961 are 107.8 and 107.6; the revised data for the same years are 108.1 and 108.0.

†Does not include the farm dwelling.

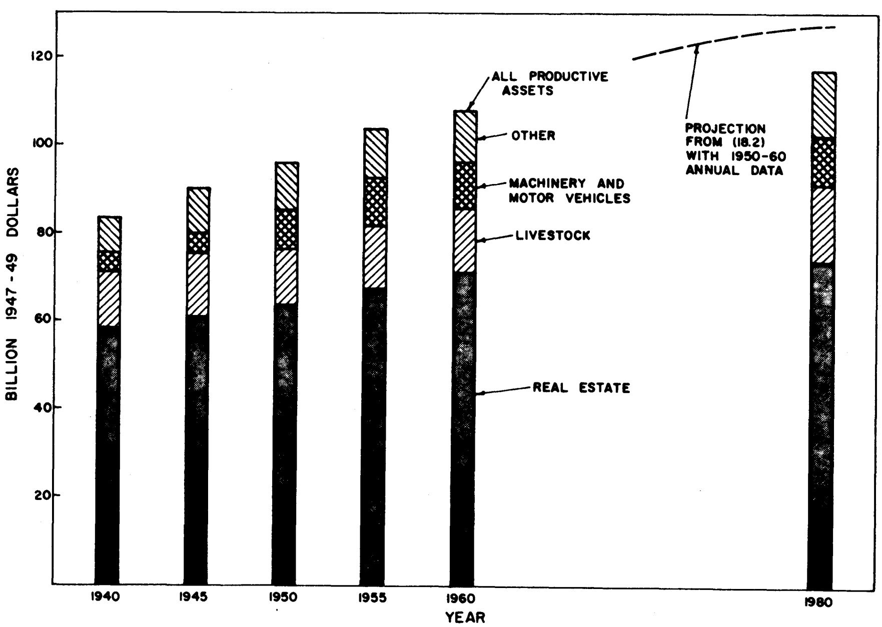

Figure 18.4. Projections of productive farm assets to 1980. (1940-60 data from: USDA Agr. Inf. Bul. 247. 1961.)

Chapters 8 and 9, whether these projections are realized or not depends not only on what happens inside agriculture (adoption of labor-saving machinery, farm consolidation, etc.) but also on what happens outside agriculture (level of national unemployment, aggregate demand, etc.). Judging from the low income and price elasticities in Chapters 8 and 9, modest efforts through farm programs to raise farm income will not materially impede labor mobility and upset the trends indicated.

Since the farm population measured by the old definition often is used and differs considerably in trend and numbers from the population based on the new definition, both estimates are included in Figure 18.3. The former and revised estimates of 1960 farm population (including Alaska and Hawaii) are 20.5 and 15.6 million, respectively, and hence differ by about five million. Projecting the revised 1950-60 series by equation (18.4), the farm population in 1980 is estimated to be nine million. The drop is 43 percent from 1960 and is comparable to the percentage decline projected for all farm labor. The estimate provides the basis for expecting a striking reduction in the proportion of the total national population on farms. The percentage dropped from 23 in 1940 to 9 in 1960, and if Figure 18.3 projections are realized, less than 4 percent of the U.S. population will live on farms in 1980. The smaller proportion of the farm population in farming has important political and policy implications. Since farm income as a percentage of the U.S. income can also be expected to decline, important economic implications are anticipated, particularly for the declining influence of a change in farm income on national income and economic outlook.

Farm Production Assets in 1980

Realization in 1980 of the lower levels of projected stocks, in Table 18.2 and Figure 18.4, would signify a considerable departure from the past trends. The three main categories (real estate, livestock and machinery) are expected to grow respectively only 4, 16 and 13 percent — considerably below their past rate and the projected future output rate.

The 1980 stock of real estate, 74 billion 1947-49 dollars, is based on the assumption that crop output requirements will be 34 percent greater. But the projected increase in yield per acre of cropland used for crops compensates for the larger requirements, and 4 percent fewer cropland acres and physical land resources are expected to be needed. An estimated 30 percent rise in irrigation, building and other land improvements, however, is predicted to offset the reduced land requirements and increase the total physical volume of real estate assets.

The projected 16 percent increase in livestock assets is based on an anticipated 52 percent increase in livestock output between 1960 and 1980. Assets need not grow as rapidly as output because livestock production per breeding unit is predicted to be slightly more than 30 percent greater in 1980 than in 1960 (see Figure 18.2).

The increase in machinery stock is predicted to be less in the two decades following 1960 than in the single decade preceding 1960. The 1980 estimate, 11.5 billion 1947-49 dollars, is 13 percent greater than in 1960 and implies an annual increase of less than 1 percent. The projection is based on trends in machinery stocks and is consistent with the short-run projections from the structural analysis in Chapter 11. The result also suggests a "mature" agricultural economy in terms of machinery. A large amount of new machinery will continue to be purchased not only to replace worn-out machines but also to substitute for machines which are inadequate for large holdings. This will offer sizeable opportunities for machinery to replace labor, despite the rather small increment in machinery assets.

The major components of "other" assets in Table 18.2 and Figure 18.4 are cash held for productive purposes and feed inventories. The categories are projected to increase appreciably because of the large increase in operating inputs for which cash resources are necessary. Feed inventories also are expected to rise appreciably because of larger livestock inventories and production. Feed efficiency (pounds of feed per pound of livestock production), as an average for the nation and in light of higher feeding levels which cause diminishing feed productivity for some classes of livestock, has not increased in the past at a rapid rate. It has been predicted to increase only one-half of 1 percent per year in the 20 years preceding 1980.[13] Cash for production, feed inventories and additional items classified as "other" assets are projected to increase 23 percent, or from a total of 11.9 to 14.4 billion 1947-49 dollars between 1960 and 1980.

Figure 18.4 illustrates the trends in Table 18.1. Real estate continues to be the major asset but its relative importance is declining. Machinery stocks grew rapidly from 1940 to 1955 but, as discussed above, that trend is not expected to continue. The physical land component only of the real estate resource, excluding building, irrigation, drainage and other improvements, would show a static or falling trend. The figure illustrates the declining rate of increase in growth of assets. The projection, to the extent realistic, signals an important shift to an even greater emphasis on operating inputs purchased from the nonfarm sector, and relatively less emphasis on durables as well as labor.

Using 1950-60 data and equation (18.2), nearly $128 billion of assets are projected for 1980. Because of the structural considerations underlying the lower projections, we believe it is more valid than the simple trend extension. Nevertheless, the upper estimate potentially can be reached, and should be regarded as the upper limit of productive assets under the most favorable growth conditions. The component parts of total productive assets would need to be adjusted upward accordingly.

[13] Jennings, Ralph D. Consumption of feed by livestock, 1909-56. USDA Prod. Res. Report No. 21. Washington, D.C. 1958. p. 46.

Operating Inputs

Extensions of past trends in Figure 18.5 indicate major increases in the use of fertilizer and other operating inputs by 1980. A large share of the rising productivity of agriculture undoubtedly will come

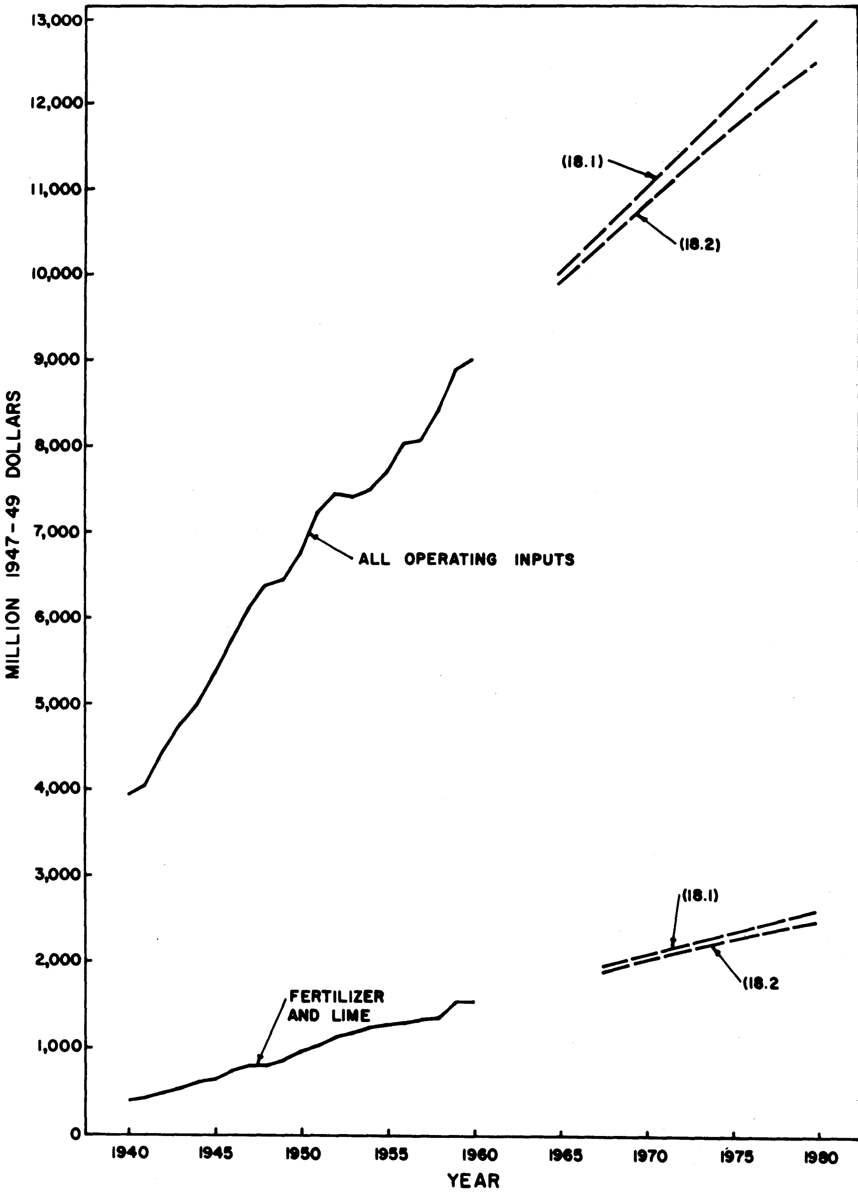

Figure 18.5. Projected purchases of fertilizer and lime, and of all operating inputs to 1980.

from these resources, because their per unit productivity is much higher than that of the resources they replace. Operating inputs include not only fertilizer and lime, but also feed, seed and chemicals furnished by the nonfarm sector. Especially important are high protein concentrates, weedicides, insecticides and hybrid seeds.

All operating inputs will total 12 to 13 billion 1947-49 dollars by 1980 if projections from (18.1) and (18.2) are realized. The rise is slightly more than 40 percent over the 1960 total of \$9 billion. A structural equation (18.6) (see Chapter 13) provides a somewhat similar estimate of 1980 inputs.

$$Q_{Ot} = -7551 - \underset{(1.5)}{11.8}(P_O/P_R)_{t-1} + \underset{(11.9)}{112.6}\, S_{pt} + \underset{(10.2)}{95.0}\, T \qquad (18.6)$$

$$R^2 = .99$$

The extrapolated 1980 quantity of operating inputs, Q_O, from the equation is 11.8 billion 1947-49 dollars. To make the prediction, the ratio of operating input prices to all commodity prices is set at the 1955-59 average, the stock of productive assets is set at \$117.1 billion (see Table 18.2) and T is 80. As stated earlier, however, the extrapolations from structural equations such as (18.6) have many limitations, and the higher estimates in Figure 18.5 are considered more realistic. It should be recognized that operating input prices have fallen, and future decrements would result in even larger projections from (18.6).

Fertilizer and lime purchases for 1980 are projected to be \$2.5 to \$2.7 billion. These estimates are 60 to 70 percent over 1960 purchases, or somewhat greater than the 40 percent increase estimated for all operating inputs (Figure 18.5).

Fertilizer requirements for 1980 may be computed approximately as follows: Crop production was 24 billion 1947-49 dollars in 1960, and projected 1980 requirements are \$32 billion, an \$8 billion increment. Assuming that 50 percent of the crop increment comes from added fertilizer,[14] the output imputed to fertilizer is 4 billion constant dollars. If we interpret an average ratio 2.5 of costs to returns as the "productivity,"[15] the additional output would require (4/2.5) = 1.6 billion constant dollars more fertilizer in 1980. An alternative estimate of fertilizer requirements, based on a study by Ibach and Lindberg,[16] suggests

[14] From 1919-21 to 1938-40, fertilizer was responsible for more than one-fourth of the increased crop production per acre and from 1951-52 to 1955 for more than two-thirds according to Durost, D. D., and Barton, Glen T. Changing sources of farm output. USDA Prod. Report No. 36. Washington, D.C. 1960. pp. 26, 27.

[15] The average U.S. marginal return from corn per dollar spent on fertilizer in 1954 was 3.06 according to Ibach, D. B. Substituting fertilizer for land in growing corn. USDA Agricultural Research Service. ARS 43-63. 1957. p. 5. Estimates ranged from 3.78 in the Corn Belt to 1.38 in the Northern Plains. In his concluding statement on page 15, he states that fewer acres would be required in 1975 than in 1943 and 1944 if fertilizer were applied on the 1954 acreage at a marginal return-cost ratio of 2.5.

[16] Ibach, D. B., and Lindberg, R. C. The economic position of fertilizer use in the United States. USDA Agr. Inf. Bul. No. 202. Washington, D.C. 1958. pp. 7-13.

40 percent of additional crop output attributable to fertilizer and a rate of return around 2.0. The requirements therefore would be (.4)(8) = 3.2 divided by 2.0 = 1.6, the same requirement as above. The 100 percent increase in fertilizer requirements indicated by these approximate computations is somewhat greater than the 60 to 70 percent increase projected from the 1950-60 trend. The findings show that fertilizer use reasonably could be over 3 billion 1947-49 dollars by 1980; and the $2.5 to $2.6 billion forecast by equations (18.1) and (18.2) may be a conservative estimate.

The additional tons of fertilizer in 1980 will be either for "widening" use to acres not previously fertilized or "deepening" use on acres already fertilized. Table 18.3 gives a brief summary of some past trends and future potentials in percentage of acres fertilized and in applications per acre. In the short period from 1947 to 1954, the percentage of acres fertilized rose markedly for all the crops listed. If the potentials for 1980 are realized, few opportunities will exist to widen fertilizer use to more corn and cotton acres. Despite large gains in the proportion fertilized of close growing crops (mainly small grains) and hay and pasture from 1947 to 1954, the potential for 1980 is indicated to be only 40 to 50 percent because of limiting price and productivity ratios.

Only 30 percent of all land in crops and pasture was fertilized in 1954, but an estimated 52 percent potentially will be fertilized in 1980. The proportion of acres suitable for use of commercial nutrients will be augmented by extension of irrigation and by depletion of virgin soil resources. More intensive crop rotations and introduction of new varieties and techniques encourage use of fertilizers until the marginal

Table 18.3. Percent of Acres Fertilized for 1947 and 1954, and Projected for 1980, and Average Rates of Fertilizer Applied per Acre in 1947 and 1954*

	Percent of Acres Fertilized			Average Rates (lbs.) per Acre Fertilized‡					
				N		P_2O_5		K_2O	
Crops	1947	1954	1980†	1947	1954	1947	1954	1947	1954
Intertilled crops	43	50	75	19	34	33	35	19	30
Corn	44	60	90	10	27	23	28	12	25
Cotton	45	58	85	25	49	28	31	17	25
Close-growing crops	18	29	40-50	11	19	24	27	11	19
Hay and pasture	7	12	40	4	14	55	40	10	28
All crops and pasture	23	30	52	15	27	33	34	16	27

*1947 and 1954 data from USDA Stat. Bul. No. 216. 1957. In some instances, 1947 and 1954 data are not strictly comparable.

†Potentials, based on past trends and on estimates, by Ibach, D. B. Potentials of agricultural production. In Iowa State Center for Agricultural and Economic Development. Dynamics of Land Use — Needed Adjustments. Iowa State University Press. Ames. 1961. p. 134.

‡Data not considered adequate for 1980 projections.

Table 18.4. Projected U.S. Annual Inputs in 1980: Productive Operating and Labor Inputs, Durable Services, Output-Input Ratios and Total Output (Million 1947-49 Dollars)*

	Actual			Projected			Source of Projections	
				1980		Percent change	Extension from 1950-60 data	
	1940	1950	1960	High	Low	1960-80	by equation:	Other basis:
Labor (based on man-hour requirements)	13,631	10,081	6,866	3,600		-48	(18.4)	
					3,000	-56	(18.3)	
Real estate (services)	3,485	3,651	3,750	3,900		4	(18.2)	
					3,750	0		30% increase in buildings and improvements, 4.2% decrease in soil, slight decrease in grazing
Fertilizer and lime	393	977	1,561	2,600		67	(18.1)	
					2,500	60	(18.2)	
Power and machinery	2,305	4,689	5,558	6,800		22	(18.2)	
					6,300	13		Extension by (18.1) of 1952-60 trend
Livestock and feed †	1,151	1,279	1,526	1,930		26	(18.2)	
					1,860	22		Output requirements: assuming 30% increase in livestock output per animal unit, 5% increase in livestock feed conversion rate
Aggregate nonfarm ‡	1,296	2,073	3,112	4,900		57	(18.1) & (18.2) average	
					4,400	41		Based on above estimate with 10% improvement in efficiency of purchased feed, seed and livestock
Taxes and interest on operating inputs	1,088	1,158	1,611	2,400		49	(18.2) for taxes, (18.1) for interest on operating inputs	
					2,190	36	(18.2) for operating inputs, 10% below "high" for taxes	
Miscellaneous inputs §	831	1,131	1,307	1,600		22	(18.1)	
					1,550	19	(18.2)	
Total inputs	24,181	25,040	25,292	27,730		10		Sum of high estimates
					25,550	1		Sum of low estimates
Output-input ratio	.94	1.12	1.40	1.9	1.9	35	(18.1) and removing the influence of weather	
Total output	22,825	27,958	35,454	52,000		47		
					48,000	35		

*Data based on Loomis, R. A., and Barton, G. T., Productivity of agriculture, United States, 1870-1958. USDA Tech. Bul. 1238. 1961. Also, U.S. Stat. Bul. 233. Revised 1961.

† Interest and other costs for holding livestock and feed inventories.

‡ Includes purchased feed, seed and livestock, but excluding interfarm sales.

§ Miscellaneous inputs include dairy supplies, blacksmith repairs, hardware items, etc. (see Chapter 14).

product is more nearly in line with real nutrient price (which also may decline). Various agencies will continue to inform farmers of the value of fertilizers.

Input Summary

The estimates in Table 18.4 and graphically presented in Figure 18.6 are based on the input breakdown used by the USDA to measure all annual inputs in farming. The inputs of durables are measured as the services required to maintain them at current levels in the years indicated. The projections in the table generally are consistent with those discussed for individual inputs, but in some instances a different concept is used. For example, the table contains man-hour labor requirements rather than the farm employment estimates of Figure 18.3. The projected labor requirements are 48 to 56 percent below 1960 requirements. Since labor is the only declining input and total inputs remain nearly constant or increase slightly, it is apparent that the major organizational change predicted is the continued gross substitution of capital for labor. Real estate inputs are expected to increase slightly, if at all. Improvements in real estate are predicted to increase up to 30 percent, but land input per se may be lower in 1980.

The two input categories projected to increase by the greatest percentage are fertilizer and lime and aggregate nonfarm inputs. Based on the above estimates of fertilizer requirements, the 60 to 67 percent increase depicted in Table 18.4 may be conservative. Aggregate nonfarm inputs include feed, seed and livestock inputs furnished by the nonfarm sector. Not only is the percentage rise appreciable, but also it is noteworthy that the quantity of these inputs is projected to be greater than quantities of labor and real estate inputs by 1980. This result again emphasizes the continued shift from resources originating in the farm sector to resources produced by the nonfarm sector. Based on the rising demand for operating inputs and increasing taxes apparent from the 1940 to 1960 data in Table 18.4, these inputs are projected to be from 36 to 49 percent greater in 1980 than in 1960.

Inputs in the miscellaneous category are expected to total 1550 to 1600 million 1947-49 dollars by 1980. The projected increase is less than for other inputs because some items, such as hardware and blacksmith repairs, are either obsolete or strong complements of other inputs which increase slowly. Other miscellaneous items, such as telephone expenses, are related to the number of farm dwellings which are expected to decline by 1980.

The respective high and low input projections total 27.7 and 25.5 billion 1947-49 dollars. The estimates suggest an increase in aggregate inputs of only 10 percent or less between 1960 and 1980. If this small increase in inputs is to meet output requirements (see Figure 18.1), it is essential that the substitution of fertilizer, protein feeds, etc. for labor and land continue at a rapid rate. That these input

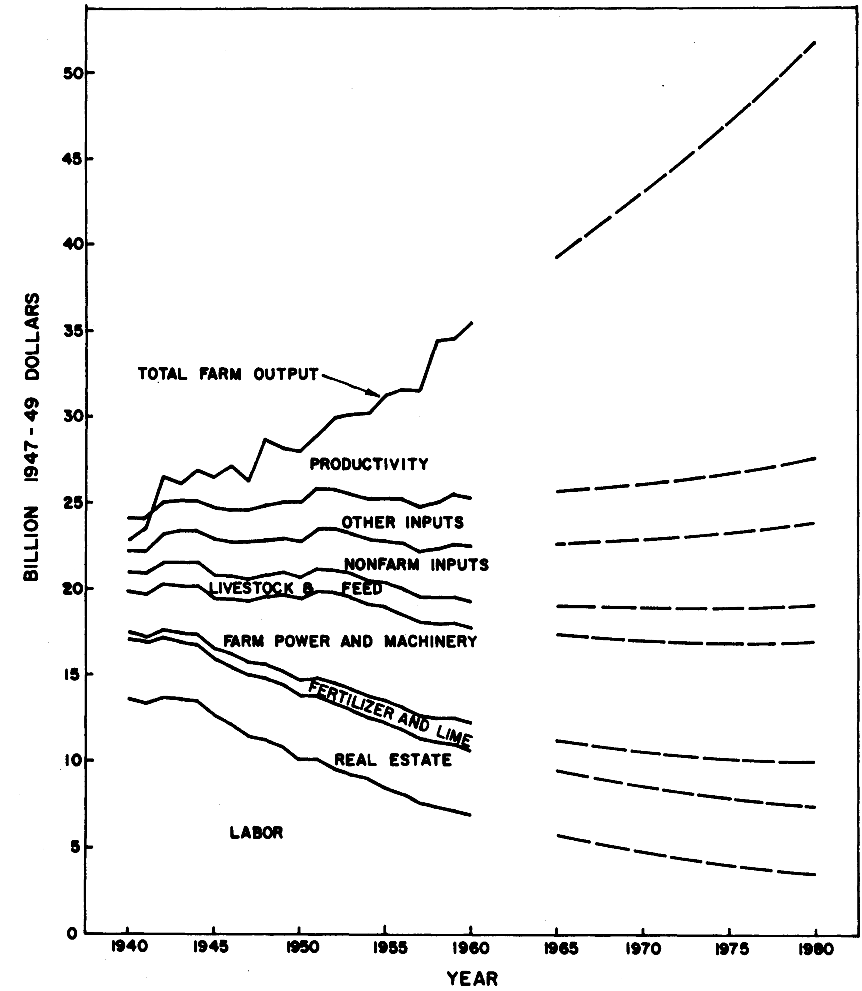

Figure 18.6. Cumulative trends in farm inputs, output and productivity from 1940 to 1960, and projected to 1980. (See "high" estimate, Table 18.4.)

projections are in line with future commodity requirements is apparent from output projections. Assuming a 35 percent increase in the productivity ratio (see Figure 18.2), the projected input levels meet the high and low output requirements given earlier in Figure 18.1. The input estimates generally are conservative, and there need be no doubt that farm resources will be adequate to fill needs in 1980. While the results are not sufficiently precise for exact inferences, the tendency for too many resources and overcapacity in agriculture may very possibly persist to 1980.

The results from Table 18.4 illustrated in Figure 18.6 are not intended to show that resources in agriculture will be adjusted optimally in 1980. For example, the 1980 output could be produced with even fewer labor resources. Too, even small deviations from the projection could disadvantage agriculture from an income standpoint. The estimate of 1980 fertilizer input may be conservative; a projection of 3200 million 1947-49 dollars may not be unrealistic. Assuming the added fertilizer input is $600 million over the high estimate and that one unit of fertilizer raises output by two units, 1980 output would be more than 53 billion 1947-49 dollars. Furthermore, Figure 18.6 shows that gains from efficiency are large, and an increase in productivity of 50 percent rather than 35 percent would result in an output of over $58 billion if inputs are $28 billion. Such outputs undoubtedly would greatly exceed requirements and would not clear markets at prices giving satisfactory returns on labor and other farm resources. The productivity increase would dictate the need for even larger decrements in resources, particularly labor, than anticipated, and our projections in Table 18.3 would not be realistic. These examples of deviations from resource projections are included to show that small errors could distort the measure of resource adjustments needed between 1960 and 1980.

FARM SIZE AND NUMBERS

Trends and projections of farm numbers and cropland used for crops per farm are presented in Figure 18.7.[17] The trend in farm numbers appears to have stabilized after 1950 and, therefore, 1950 to 1960 data are extended to 1980 by (18.3) and (18.4). The projected number of all farms is 2.3 million by equation (18.4), and slightly less than 2 million by the exponential equation (18.3). The decline from 1960 — 51 to 42 percent — is consistent with the farm labor and population decline in Figure 18.2, as would be expected.

Cropland acres per farm are projected on the basis of cropland requirements and the foregoing estimates of farm numbers. Crop production requirements are projected to be 32.4 billion 1947-49 dollars in 1980.[18] Given these requirements and a 40 percent increase in yield per acre, 341 million cropland acres used for crops are required in 1980, or 4 percent less than the 356 million crop acres in 1960.[19] If

[17] The new classification of farm numbers is used in Figure 18.7. The 1960 classification requires a place to have 10 or more acres in land and to sell at least $50 of products annually. A smaller place can qualify by selling $250 of products. In the 1950's, a qualified farm needed only three or more acres and at least $150 of products sold or produced. "Old" estimates indicate 4.54 million farms in 1960, "new" estimates 3.95 million (about .6 million less).

[18] Largely based on estimates from: USDA. Land and water resources, op. cit., p. 37.

[19] Using 1950-60 data in equation (18.1) and correcting for weather, the 1980 crop yield index is projected to be 172. The yield index (1947-49=100) was 123 in 1959, 129 in 1960; hence the 1980 projection is 40 and 33 percent greater. The report: Land and water resources, ibid., p. 38, predicts a 56 percent increase in crop production per harvested acre and a 35 percent increase in pasture production per acre from 1959 to 1980. Yield per

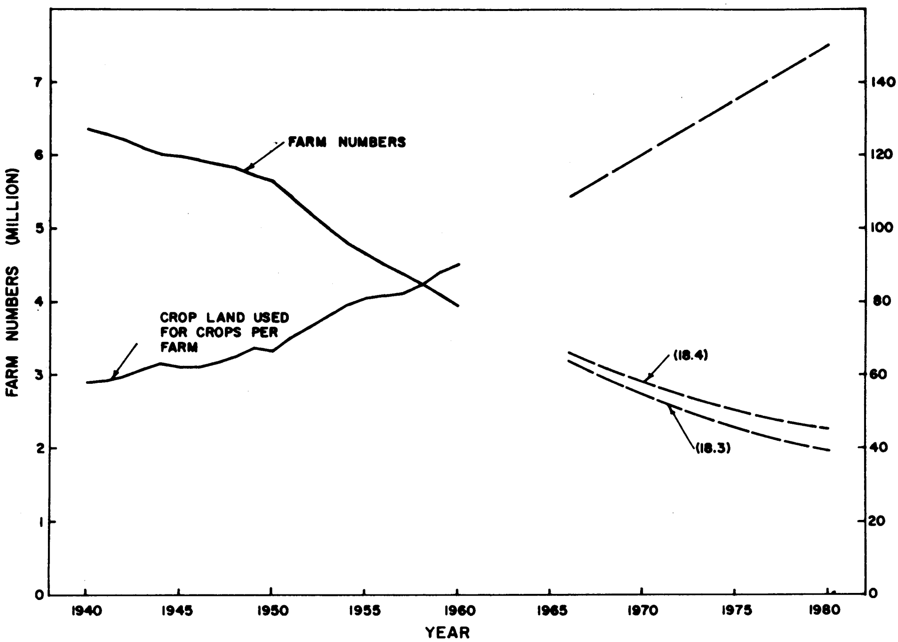

Figure 18.7. Projected farm size and numbers to 1980. (1940-60 data from: USDA. The farm income situation. July 1962; and USDA Stat. Bul. 233. Revised 1961.)

341 million acres are required in 1980 and if there are 2.3 million farms (the higher projection from (18.4) in Figure 18.7), then the average farm will have 150 acres used for crops.

The projected two-thirds increase in acres per farm over 1960 indicates considerable potential for improving input efficiency with larger units. Opportunities will exist to substitute machinery for labor by replacing depreciated stocks with new, larger machines adaptable to larger acreages. This substitution of larger machines for smaller ones need not appreciably increase stock if the new machines are

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harvested acre is expected to increase faster than yield per cropacre; nevertheless, our estimated 40 percent 1959-80 increase seems low. Our 1980 estimates were adjusted accordingly to a 47 percent increment over 1959, a 40 percent increment over 1960. This increase is predicted by equation (18.2) from 1950-60 observations without correcting for weather.

The report: Land and water resources, ibid., p. 38, projects land requirements (million acres) as follows:

	1959	1980
Total cropland used for crops	359	326
Soil improvement and idle cropland	33	11
Cropland used for pasture	66	70
Total cropland	458	407

The estimates suggest that 33 million fewer cropland acres used for crops and 51 million fewer acres of all cropland will be required in 1980 than in 1959.

Table 18.5. Percentage of All Farm Numbers in Specified Acreage and Sales Categories*

Item	Actual			Projected
	1939	1949	1959	1980
Sales†				
under $2500	69	61	48	24
$2500-$10,000	26	30	33	30
over $10,000	5	9	20	46
Acreage				
under 100	59	56	49	39
over 100	41	44	51	61
Total	100	10C	100	100

*1939 to 1959 original data from: Statistical Abstract of the United States. 1961. The definition of a farm changed some; corrections are made accordingly. However, no correction was made for the estimated 2.5 percent more farms that would have been included in 1939 had a later definition been used.

†Corrected for changes in dollar values in earlier years. No correction was made in 1959 because the index of prices received by farmers was nearly the same in 1954 and 1959.

introduced only at the rate necessary to replace worn-out and obsolete equipment. But larger machines do permit one family to farm a larger acreage and to produce more output per unit of labor; hence, machinery investment will continue to offer opportunities for movement of labor from agriculture.

In Table 18.5 and Figure 18.8, all farms are classified by sales volume and acreage. The total number of farms from 1939 to 1959 differs somewhat from estimates in Figure 18.7 because of slight differences in concepts. The data in Figure 18.8 for earlier years were revised slightly to correct for changes in the value of the dollar. This adjustment was not considered necessary between 1954 and 1959 because prices received by farmers were nearly equal in the two years. Inflation between 1959 and 1980 will place more farms in groups with higher sales volumes, but the projections in Figure 18.8 are intended to measure farm numbers from real or constant-dollar sales, not from inflated values.

Extension by equations (18.1) to (18.4) of the 1939 to 1959 trend using observations for the years included in Figure 18.8 resulted in considerable instability in 1980 projections. Those presented are based on extensions from equation (18.4) adjusted to the total farm numbers, 2.3 million, projected by (18.4) in Figure 18.7. The results also are similar to an average of the estimates from the four types of equations. Despite this "check," the projections by sales and acreage should be regarded as first attempts and considered cautiously, pending further verification.

If the estimates in Table 18.4 are correct, the relative proportion of farms over and under 100 acres will reverse between 1939 and 1980. In the former year nearly three-fifths of all farms were under 100

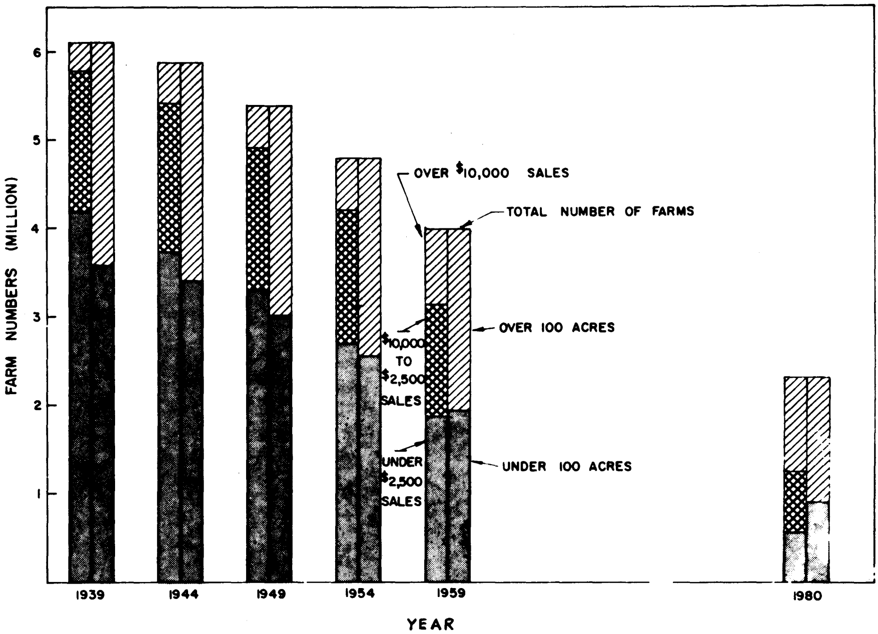

Figure 18.8. Projected farm numbers by acreage and sales volume to 1980. (1939-59 data from: Statistical Abstract of the United States. 1961.)

acres, and by 1980 three-fifths of all farms are predicted to be over 100 acres. The percentage change in the number of farms in each category is predicted to be nearly the same from 1959 to 1980 as from 1939 to 1959.

The most notable change in classification by sales is the shift in farms from the lowest to the highest category. The proportion in the middle $2500 to $10,000 category remains almost unchanged. In 1939 nearly 70 percent of all farms had sales under $2500. By 1959 the percentage in this group had dropped to 48 and by 1980 the projected percentage is 24. The proportion of farms with annual sales of over $10,000 increased from 5 percent in 1939 to 20 percent in 1959. Almost half of all farms will have sales over $10,000 by 1980 if our projections are correct. The results indicate that a major adjustment toward adequate units will have been made by 1980. The figures are somewhat misleading however, because increasing production expenses will reduce the proportion of cash income available to pay living costs by 1980 out of a given sales volume.

Having one-fourth of all farms in the lowest sales category by 1980 need not necessarily imply a great low-income problem. Many farmers in this group will be retired, work off farms or have various other sources of income. Hence, many of the 550 thousand farmers in this group may have adequate incomes despite the low receipts from farm sources.

Based on Figure 18.8, the trend is likely to persist for the majority of farm output to originate from fewer farms. The more than one million farms predicted to sell more than $10,000 undoubtedly will be responsible for a large portion indeed of all farm output in 1980. Sizeable investment and managerial skill will be demanded by these large farms. Whether these demands will be satisfied within the family farm structure remains to be seen. Much depends on the credit structure, managerial support provided by the Extension Service, and the institutional structure existing in 1980.

SOME CONCLUDING COMMENTS

The changes in the organization of farm resources depicted in the foregoing pages portend major shifts in the political and sociological as well as economic aspects of farm life. The projected $30,000 investment per farm worker, larger acreage and high proportion of purchased inputs all signal an increasingly commercialized agriculture. (The capital required per worker is stated in 1947-49 dollars and would be very much larger if expressed in 1960 dollars.) The diminution in labor inputs from 56 percent of total inputs to a projected 11 to 13 percent in 1980 is an integral part of the shifting emphasis to more purchased inputs. Some of the sociological characteristics of the "farm way of life" undoubtedly will disappear and the nostalgia of farm fundamentalism will become less intense. These changes also will be associated with increasing demand for management skills, a credit framework and other institutional arrangements (e.g. laws, corporate laws, leasing arrangements, purchase contracts) to service the changing farm organization. The direction taken in these institutional and other arrangements will be very important.

The impact of a given excess production and consequent low income may be even greater in 1980 than in 1960. The fact that family labor inputs have comprised a major portion of inputs in the past allowed this noncash item to absorb the variation in returns. While farmers sometimes grumbled, they at least were usually able to remain in farming by accepting lower labor returns if the income setbacks were not too severe. But if increasing cash costs are combined with inflexible procedures to adjust expenses between favorable and unfavorable years, the pressures for a more equitable market structure may be severe. Furthermore, the projected decline in farm population and numbers to 9 and 2.3 million respectively in 1980 will make efforts to improve bargaining power more feasible. Hence, the potential for reorganization of farming to obtain greater bargaining power will be much greater in 1980 than is true of the 1960's. Efforts in this direction may also be prompted by farmer reactions to a public indifferent to the economic disadvantage of agriculture.

Despite lags in redistricting of political units as population shifts, agriculture will undoubtedly lose a large amount of political influence between 1960 and 1980 as the farm population drops to as little as 4 percent of the total population. The declining political influence is expected to reduce the number of program alternatives available to farmers. Generally, the political shift is expected to remove alternatives requiring large government outlays and eventually to reduce alternatives to two: strict controls or free markets. Because of the large capital input relative to labor input, the appeal for farm programs also will tend to be based increasingly on a reasonable return to capital on well-organized farms, as well as an equitable labor income.

With national growth in capital and efficiency, total agricultural income also will continue to decline in proportion to national income. The consequence is that economic conditions in farming will have less and less influence on national business conditions and economic growth. Hence, economic planners and policymakers can more nearly design programs disregarding the contribution of agriculture to aggregate demand and national economic health. This condition, combined with declining political influence, will tend to shift the public focus from farm problems to other areas. The above considerations suggest, then, not only a change in farm organization but also a shift in political, sociological and institutional framework for agriculture. While indicating that conditions in agriculture may be determined to a larger extent by nonfarm political and economic forces, this does not mean that the destiny of agriculture must necessarily follow this positivistic trend. The reverse may be true — these forces may prompt agriculture to re-examine its enterprise creed and concepts of distributive and commutative justice. This re-examination, in an environment of the future farm organization (size, numbers) more conducive to marketing controls, followed by proper action could make the economic fortunes of agriculture increasingly <u>internal</u> rather than <u>external</u>. Furthermore, the small portion of the national food budget going to farmers might make the public somewhat indifferent to monopolistic tendencies of farm organizations raising farm commodity prices.

The projections in this chapter and the descriptive and structure analysis of previous chapters reflect both the cause and effect of economic growth. Given exogenous price and technology variables, the organization of agriculture, i.e. income, expenses, farm size and efficiency, is determined largely by resource supply and demand elasticities (coefficients). A principal goal of this study has been to estimate the magnitude of these parameters, both in the short run and long run. Estimates of these parameters allow prediction of variables such as resource prices and quantities. Although the estimates are largely based on single equations, the analysis in Chapter 16 shows how the individual equations expressing prices and quantities can be integrated to express total and per worker incomes and other concepts. The structural parameters are intended to be useful to such integrated studies, and also can be used in partial studies to determine the implications of a change in any one explanatory variable on resource employment, etc., in farming. The analyses are far from perfect, of course, and must be interpreted in terms of the reliability of methods and data discussed in the appropriate sections.

The structural parameters depend fundamentally on the technical know-how and values and goals of farmers. Through education, research and other means, the parameters continually are being altered. While this may be disconcerting to the statistician, it can bring large benefits to farmers and society.

As demonstrated throughout the book, our estimates can be used to gauge the future direction that economic forces are moving agriculture. Since the estimates are structural and not simply predictive, it is hoped that the parameter estimates can also be used to gauge the impact of policy variables or instruments on resource quantities, output, farm size, etc. If used properly within the framework of restrictions cited here, these estimates can be useful for determining which, if any, programs are needed to bring the agricultural input, output and returns in line with national needs.