Agricultural Adjustment Problems in a Growing Economy

- A compilation of essays on problems, research techniques, and results of investigations dealing with adjustments needed in American agriculture.
- Dedicated to the proposition that progress is made by discussing hypotheses, theories, techniques, and illustrations of their use even though some are still in their formative stages.
- Published for use by students, researchers, teachers, and administrators who are daily confronted by problems in this important area.

In This Same Series:

Resource Productivity, Returns to Scale, and Farm Size

Earl O. Heady, Lowell S. Hardin, and Glenn L. Johnson, editors (1956)

AGRICULTURAL ADJUSTMENT PROBLEMS IN A GROWING ECONOMY

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Preface

THIS book includes the papers presented at a conference on "Adjusting Commercial Agriculture to Economic Growth," sponsored by the North Central Farm Management Research Committee in cooperation with the Farm Foundation. This conference, held March 18-19, 1957, was designed to cover the major aspects of the current farm problem, and to bring together outstanding agricultural economists in the various fields discussed.

The reasons for holding the conference are well known. In a period of full employment and a rising national income, agriculture has been faced with a declining income. Apparently, adjustments in production and resources used by agriculture have not been sufficiently rapid to allow resource returns and incomes in agriculture which compare favorably with the rest of the economy. From the standpoint of the national economy, resources are being used to produce a surplus of farm products when consumers indicate that their welfare might be bettered if some resources were moved out of agriculture.

The cost-price squeeze, which developed in the 1920's and recurred in the 1950's, appears to be in prospect for the next decade or longer. If the wishes of consumers, as expressed in the market, are used as the criterion, some important adjustments apparently are required in agriculture: Fewer and larger farms which can produce at lower unit costs are necessary. A transfer of labor resources is required. Farming resources must be used more efficiently and the supply of products must be made to conform more nearly to consumer demand. Adjustments of this nature would allow a more favorable income per person in agriculture.

The conference was developed with the idea of giving a broad and deep view of the adjustment problem and its possible solution. The papers include:

1. A summary of the existing situation in respect to farm income, demand outlook, farm output, and trends in farm numbers, size and resource productivity.
2. An analysis of the basic forces giving rise to the current income and adjustment problems.
3. An inventory of current empirical knowledge which can be used for predicting future conditions and for recommending adjustments in resources used in agriculture.

4. An indication of the direction and extent to which adjustments in agriculture should be made in terms of: (a) scale economies and factor and product prices, (b) relative consumer demand for farm and non-farm products, and (c) the values held by society in respect to size of farms and the farm population.

5. An outline of the research, educational, and policy steps which could and perhaps should be used to improve resource use and income in farming and to adjust agriculture in line with prospective economic growth.

The basic purposes of the conference were to: (1) outline what already is known about adjustments needed in agriculture and solutions to the adjustment problem, (2) develop promising hypotheses, concepts, and empirical techniques, which can prove useful in further solution of the scale, resource use, and supply and income problems of commercial agriculture. It is a follow-up to the 1954 Conference of the committee reported in *Resource Productivity, Returns to Scale and Farm Size*, Iowa State College Press, 1956. The conference is expected to serve as a foundation for developing several regional or interregional research projects to fill gaps in knowledge where they exist.

The North Central Farm Management Committee wishes to express appreciation to the persons who prepared papers and discussions for analysis of this important problem, to the Farm Foundation for making possible the conference and the publication of the proceedings, and to Maudie Nakada, Elaine Martenson, and Marlene Bress of the Farm Foundation for their fine assistance and cooperation in preparing the manuscript for publication.

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Contents

PART I

Setting of the Problem

Chapter 1

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The Income and Resource Problem

AMERICANS have levels of living which are among the best in the world. Gross national income for the United States has more than doubled since 1929, and disposable personal income has increased by about half in the same period. Income and goods available to the consumer are still increasing. The results of these increases are seen everywhere: in the amount and variety of food, in the adequacy of housing, in the number of home appliances and automobiles, in health, educational, and recreational services, as well as in other goods and services. These improvements and conveniences are no longer considered luxuries, but are simply part of the "American way of life." Still the end is not in sight. It is predicted that, aside from temporary recessions, national and personal income will continue the sharp upward climb. In the past, these changes in incomes have been accompanied by changes in consumer spending patterns. These changes will continue into the future with the result that premiums or penalties will attach to incomes of different persons and industries.

In part, the accomplishments of agriculture have made possible this progress. At the same time, this economic progress, to which farming has made an important contribution, has caused and is causing income and transfer problems in agriculture. In becoming highly productive and efficient, agriculture has freed labor for use elsewhere in the economy, for production of the other goods and services which now characterize the American way of life.

A nation can be wealthy only if few of its resources are required to produce food for subsistence. The standard of living in many parts of the world is low because so much of the labor force must be used in producing food. Estimates indicate that 45 to 50 percent of Russia's labor force must be used in producing food. In some parts of the world the figure is as high as 80 percent. In contrast with these figures, United States farms require only about 10 percent of the total labor force. Table 1.1 shows the trend in population and the farm labor force, as a percent of the nation's total, since 1920. Agriculture has been shrinking, relative to the remainder of the economy, in labor and capital resources employed and in income produced. This is, of course, to be expected in a wealthy and growing economy. This trend will continue in the United States, and further economic growth can be anticipated as agriculture continues to use a smaller proportion of the nation's resources and to produce a smaller proportion of the nation's income.

Table 1.1. Trends in People Living on Farms and in Persons Employed in Agriculture, 1920-55*

Year	Percentage of nation's population living on farms	Percentage of available labor force employed mainly in agriculture
1920	30.1	27.0
1940	23.2	17.2
1950	16.6	11.9
1955	13.5	10.1

*Source: Farm Income Situation (AMS).

Currently, each United States farm worker can produce food for 20 persons. Only one person out of 20 need be engaged in producing food; the other 19 are freed to produce other goods and services and to help the national income grow in other directions. As technological progress continues, our farms will be able to produce food with still less labor. Output per man hour in farming is expected to increase by over 35 percent in the next 10 years.

This, then, is the healthy picture of agriculture; it is a development from which most consumers have benefited greatly. Food is available in quantity and quality at a relatively low price. In contrast with some areas of the world, where a major part of the consumer's budget goes for food, the U. S. family need spend only a relatively small portion of its income for food, leaving more for other goods and services.

THE INCOME SITUATION

But this complex of forces gives rise to one of our major farm problems today. The picture today is this: National income is at a record level and has grown at a rate of 6 percent per year since 1950. Aside from temporary setbacks, this general trend is expected to continue. In contrast, total farm income declined by about 25 percent from 1951 to 1955; net income per farm declined by 23 percent, since the number of farms also declined. Hence, we are in a period when national "prosperity" has been moving rapidly upward, but farm income has been going as rapidly downward, even though physical productivity in agriculture is still increasing.

The major cause of the surplus and income problem in agriculture is: Food output has been increasing faster than can be absorbed by growth in the population and national income. But other things have added temporarily to the problem. Export demand, particularly for wheat and cotton, has fallen rapidly in the last few years. Export demand had started to decline before the Korean outbreak, since farm production had recovered in most of the world by then. In some parts of the world, production was substantially above prewar levels by 1950. The Korean War interrupted the decline in export demand and caused some buildup of stocks in importing countries. U. S. farm exports rose sharply. With the end of the conflict, export demand again decreased. From 1952 to 1955, wheat exports dropped 50 percent; cotton exports dropped about 30 percent. By the end of the 1953 crop year, wheat stocks had grown to more than 900 million bushels — an amount 30 percent larger than one year's national usage. Cotton stocks jumped from 2.8 million bales in 1951-52 to 9.6 million bales in 1953-54. The large stocks of wheat and cotton have led to marketing quotas on these crops. But the large acreage reduction has not eliminated the surplus problem for these commodities.

While weather and postwar demand conditions partly account for fluctuations in farm income since 1946, the major force giving rise to differential income trends is economic growth or progress. Today's commercial farm problem is not the particular aftermath of war; it is not an "atomic fallout" from wartime economic bombs. It arises from complex forces, the roots of which were already well established in the 1920's. The so-called cost-price squeeze, with consumers saying that we had too many resources in agriculture, even then was being reflected in relative prices and incomes for agriculture; farm income was lagging behind nonfarm income. Then the depression of the 1930's and the wars of the 1940's and 1950's came along to obscure the longer-run picture. But the same set of forces which operated in the 1920's is with us again today as a mark of a progressing society. These facts are emphasized by the income data in Table 1.2 for peacetime and full employment years since 1910. These data show that growth in agricultural income has not begun to parallel growth in total national income, a condition expected in a developing economy. The figures also emphasize the extreme difference over the last five years.

WIDESPREAD PROBLEM

The pressure on farm incomes is neither a localized nor a homogeneous problem. It covers important sectors of commercial agriculture. While nonfarm income and wage rates have moved steadily upward since the end of the war, net income of major farm groups has fallen sharply, even from the pre-Korean level of 1947-49. Table 1.3 shows that the net farm income decline has varied by type of farm, with the greatest decline taking place on farms of the Corn Belt and Great Plains. Averaged for the years 1953 through 1955 to remove some of the effect of drouth, net farm incomes for this period were 38 percent below their 1947-49 level for hog-beef farms and 17 percent below for cash grain farms in the Corn Belt. Comparable figures include declines of 25 percent for Wisconsin dairy farms, 42 percent for Southern Plains wheat farms, and 47 percent for Northern Plains ranches. Income for Southern

Table 1.2. Trends in National Income and Farm Income, Selected Peacetime Years (1947-49 = 100)*

Year	National income Million dollars	National income Percent	Farm income[a] Million dollars	Farm income[a] Percent	Income per worker[b] Farm (percent)	Income per worker[b] Nonfarm (percent)
1910	33,252	16.7	4,703	27.3	20.6	31.3
1911	32,393	16.2	3,888	22.5	17.1	31.8
1912	35,022	17.5	4,975	28.8	21.8	31.8
1913	37,552	18.8	4,253	24.7	18.6	35.2
1914	36,454	18.3	4,677	27.1	20.5	34.6
1921	59,272	29.7	4,138	24.0	18.4	58.4
1922	60,970	30.5	5,081	29.5	22.6	54.4
1923	71,626	35.9	5,895	34.2	26.6	58.0
1924	71,251	35.7	5,681	32.9	25.9	58.7
1925	76,304	38.2	7,575	43.9	34.6	57.2
1926	80,937	40.5	6,810	39.5	31.2	61.0
1927	79,123	39.6	6,569	38.1	30.9	59.5
1928	81,467	40.8	6,844	39.7	32.1	59.9
1929	87,122	43.6	7,024	40.7	32.7	61.1
1946	169,730	85.0	16,721	97.0	96.6	86.8
1947	185,296	92.8	17,383	100.8	99.5	93.6
1948	208,980	104.7	19,704	114.3	103.0	102.4
1949	204,641	102.5	14,651	85.0	87.4	103.9
1950	220,151	110.3	15,459	89.6	98.4	108.2
1951	250,779	125.6	18,003	104.4	119.1	116.7
1952	266,406	133.4	17,004	98.8	116.9	122.8
1953	277,893	139.2	15,094	87.5	104.6	126.6
1954	276,780	138.6	14,239	82.6	100.2	128.9
1955	296,398	148.5	13,429	77.9	96.9	135.7

*Source: Farm Income Situation (AMS) and Federal Reserve Bulletin.
[a]Includes government payments, 1933-55.
[b]Total income divided by number of persons employed.

Piedmont cotton farms increased by 19 percent, and tobacco cotton farms, where incomes were not high at the outset, registered slight gains. However, part of these declines must be attributed to short-run fluctuations, such as drouth and hog cycles in the Corn Belt and drouth in the Great Plains.

Specialized fruit and vegetable farms, those producing commodities with highest income elasticities, have generally fared better than those producing staple commodities with low price and income elasticities. In this sense, the income and resource problems of the various segments of agriculture are not entirely homogeneous. Neither are the solutions homogeneous for those geographic regions which are depressed. For example, the adjustment problem is quite different between communities with little developing industry, such as western Kansas, and those with rapid local economic growth, such as parts of the eastern Corn Belt. It is different in spring wheat areas, with a declining per capita demand for its product, as compared with parts of Arizona and California,

Table 1.3. Farm Costs and Returns, Typical Commercial Family-Operated Farms, by Type of Farm*

	Corn Belt					
	Hog-beef fattening	Cash grain	E. Wisconsin dairy	S. Piedmont cotton	S. Plains wheat	N. Plains cattle ranches
Size of farm (acres)						
1937-41	178	209	115	158	586	3,322
1953-55	198	228	126	175	696	4,100
Total farm capital						
1937-41	$20,380	$29,950	$12,420	$ 4,700	$19,460	$20,730
1953-55	59,780	88,030	33,717	15,390	74,470	71,480
Net cash income						
1937-41	1,478	1,788	912	206	434	418
1947-49	9,814	8,140	3,061	921	8,962	5,629
1953-55	6,568	6,247	2,050	1,200	6,086	3,385
			Indexes: 1947-49 = 100			
Crop yield per acre						
1937-41	99	99	82	83	53	51
1953-55	105	111	121	111	82	98
Production per hour labor						
1937-41	77	78	79	78	52	64
1953-55	115	114	131	125	96	107
Power and machinery						
1937-41	71	69	62	54	57	65
1953-55	131	135	149	137	124	130
Net farm income						
1937-41	24	29	35	32	12	15
1947-49	100	100	100	100	100	100
1953-55	62	83	75	119	58	53

*Source: "Farm costs and returns, 1955, commercial family-operated farm by type and location," Agr. Inf. Bul. 158.

where some expansion in per capita demand for agricultural products is being realized.

ADJUSTMENTS REQUIRED

Agriculture in a wealthy, rapidly growing economy will generally be faced with a cost-price squeeze and a relative "dampening" of income. The reason is this: As incomes of consumers increase, food no longer becomes their major concern. They want more home appliances, better housing, television sets, recreation, travel, and education. Hence, as his income increases, the American consumer spends relatively little more on food. In fact, he does not buy more pounds of food, but simply changes the composition of the food purchased. The consumer shifts from fats, starchy foods, and similar staples to fresh vegetables, better cuts of meat, fruit, etc. The pounds of food consumed per person has not increased in the last 40 years. Increased expenditures for food, as consumer income rises, is due partly to the purchase of more expensive food, but more particularly to the purchase of extra services which go with food, such as packaging, freezing, etc.

The income elasticity for food expenditures is about .2 (or less), which means that for each 10 percent increase in incomes of consumers, expenditures for food increase by less than 2 percent (again with most of this going for processing and retailing services for food). The consumer does not want more food as much as he wants it in a more convenient package or form. Perhaps the United States has more persons who worry about overeating than those who worry about hunger, although improvement in the composition of diets is still possible. The consumer increases expenditures more rapidly on many nonfarm products as his income increases. While he increases expenditures on food by less than 2 percent with each 10 percent increase in income, his expenditures on home appliances, housing, travel, etc., increase several-fold. The income elasticity of demand for these goods and services is much higher. Table 1.4 shows that agriculture's share of the gross national

Table 1.4. Agriculture's Share of Gross National Product, 1910-1954

Year	Gross national product (billions)	Farm gross national product (billions)	Percentage farm of national gross product
1910	$ 36.7	$ 5.9	16.1
1920	85.0	12.3	14.5
1929	104.4	9.8	9.4
1930	91.1	7.7	8.4
1940	100.6	6.8	6.8
1950	285.1	21.1	7.4
1954	360.5	21.3	5.9

product has steadily declined since 1910. Again, this trend will continue as national income continues to grow and the consumer allocates an increasing proportion of his income to nonfarm products.

As incomes have increased consumers have been unwilling to place higher premiums on farm products. In fact, they have tended to hold prices of farm products down, saying that they do not need much more poundage of food, except as the population grows and more persons need to be fed.

Bidding higher prices or demanding relatively more nonfarm goods and services, the consumer also bids up or maintains the cost of steel, labor, petroleum, and other materials used particularly for those nonfarm goods with high income elasticities. Consequently, the cost of tractors, lumber, fuel, fertilizer, and other agricultural inputs is kept high. Table 1.5 indicates that while the proportion of total assets used in agricultural production has decreased since 1910, the productive assets per worker in agriculture are five and a half times as much as in 1910; in industry the increase is only a little more than three times as much. Agriculture is producing food for the population with an increasingly smaller proportion of the labor force but has been able to accomplish this only by using more productive assets per worker.

Table 1.5. Agriculture's Share in Total Privately Owned Tangible Assets Used in Production 1910-55

Year	Farm assets (billions)	Nonfarm assets (billions)	Percentage of total in agriculture	Productive assets per worker	
				Farm	Nonfarm
1910	$ 38.9	$ 53.0	42.3	$ 3,370	$2,060
1920	71.4	139.3	33.8	6,230	4,506
1930	47.2	160.0	23.9	4,650	4,160
1940	39.8	147.2	21.3	4,170	3,190
1950	102.3	292.0	26.0	13,630	5,567
1952	130.5	370.0	26.0	19,180	6,790
1955	121.6	420.0	22.4	18,470	7,140

This, then, is the cause of the cost-price squeeze and the income problem in agriculture. Consumers are saying that with higher incomes and a rapid increase in agricultural technology, they wish relatively more of the nation's resources to be used for nonfarm goods, and fewer for farm goods than at present. They are indicating, through the pricing mechanism, that we are producing relatively too much food and too few other things, and that accordingly they want some labor transferred from farming. But while consumers have been saying that they wish only slightly more food per person, output of agriculture has increased more rapidly than consumer demand; and we have had support prices and other governmental programs which have not recognized the basic nature of the adjustment program.

THE CHALLENGE

Two major sets of forces are at work which call for adjustments in agriculture: (1) those facets of growth which place a strain on agriculture from the outside — including changes in the relative importance of products from different sectors of the economy as the consumer allocates a growing income in line with his tastes and values, and (2) those elements of progress generated within agriculture — represented especially by technical improvement and the ability to expand output from a given collection of resources. Farming is being interlaced tighter and tighter, in terms of interdependence, with other sectors of the economy. This interdependence, which is basically the problem of agriculture in a nation growing progressively wealthier, would continue to call for adjustments in agriculture, even if adjustment-generating change within agriculture could be halted. The composition of the product mix will continue to change. A larger percentage of the gross national product will be represented by those commodities with high income elasticities of demand; a smaller percentage will be represented by those commodities with low income elasticities — notably farm products in their natural form. The pull on resources will be similar, and incomes of persons will be affected accordingly, unless adjustment in fact keeps pace with economic growth.

The challenge is to attain balance between agriculture and industry in a rapidly growing economy. Somehow, we need to spread the fruits of economic progress more evenly over the total population. We need a "moving adjustment," and one which is more rapid, to provide comparability of resource returns (incomes can also be comparable) for persons owning equal amounts of resources — including their own labor. Agriculture has contributed materially to economic progress by producing more products with less labor. Labor has been freed for use elsewhere in the economy. But much of it has been left stranded in agriculture, with these two consequences: (1) many farm families have had incomes depressed, resulting in a level of living lower than is consistent with an economy which is rapidly growing wealthy, and (2) the consuming society has not gained fully from the potential contribution of increased physical productivity to economic progress.

The basic solution is obvious: Some resources must be transferred out of agriculture if prices are to be used in guiding production and if income per farm is to be sufficiently high. The reference is mainly to labor, although adjustments in use of capital also are needed. If we had too many kerosene lamps, shaving mugs, and buggies and too few automobiles and television sets, the answer would be simple: Move people and production from buggies, which are in surplus, to automobiles which are in greater demand.

ADJUSTMENT UNDER WAY

The adjustments needed in agriculture are neither revolutionary nor dramatic. They are already under way. The great excess of births over deaths in agriculture has long required a net migration from the industry. The number of farms and the size of the farm population has, aside from temporary spurts during the depression and postwar periods, declined continuously for several decades. The number of farms in the United States declined by 600,000, or 11.1 percent, between 1950 and 1954. The number of workers in agriculture declined by 40 percent between 1910 and 1956; it declined by 23 percent even in the 10 years, 1947-56. But at the same time, farm output increased by 86 percent between 1910 and 1956 and by 15 percent between 1947 and 1956. Continued adjustments in the farm labor force, population, and farm size will be needed. Adjustments will need to keep pace as the temporarily high postwar demand decreases. They will be needed to an extent which will enable efficient farm managers, with units of efficient size, to have favorable incomes. But just as important, adjustments are needed so that persons who would otherwise be underemployed in agriculture, with resulting low incomes, can take advantage of better income opportunities elsewhere. Currently, many farms are simply too small either to use labor efficiently or to provide a good living, at prices the consumer is willing to pay, to the farm family.

It is easy to say that the basic solution to the problem of commercial agriculture is fewer farms, a smaller labor force, and a rate of growth in aggregate output which matches growth in demand. But the actual solution is not simple. Adjustments in farm numbers and the labor force have been quite rapid and they may continue to be so. But it is unlikely that the farm problem will vanish in a year or two. The adjustment will necessarily continue to be gradual, although the rate should be increased to an extent reasonably possible. Because of spatial considerations, acquired values, and differences in required and acquired skills, the adjustment process is more complex than the obviousness of the basic solution. The lathe operator can readily transfer his skills from tractors to automobiles but the transfer from milking cows to electronics is not as simple. Similarly, the bookkeeper who transfers from one firm to another in Detroit can remain in his home and community. But the western Kansas wheat farmer must break home and community ties if he transfers to a television firm in Minneapolis. Also, the costs of inter-industry transfer are greater for him than the intra-city transfer of the Detroit worker.

FLEXIBLE GROUPS

When we say that the long-run solution lies in fewer labor resources in agriculture and in a smaller number of farms, we do not mean that every farmer should quit farming. The majority of farm families are experienced in this occupation. Many prefer farm life and would make lower returns elsewhere. But many persons now on farms are still flexible in their final choice of occupation. Included here are beginning operators with small families who have invested but little capital, do not own their farms, have not developed strong community ties, and therefore can move fairly easily. (To replace retiring farmers we, of course, need beginners with capital and management resources who can expect to make as much or more in farming than in other occupations.) Also, many farmers situated near industrial opportunities can continue as part-time farmers. But perhaps most of all, we should look upon the problem as one of longer-term adjustment — of encouraging more of our farm youth to follow other pursuits.

Farming in general must be made more flexible. The composition of the product mix must become more adaptable to relative changes in demand for agricultural commodities as income per capita tends to grow. The size of the total output and resources used needs to conform more closely to demand. The adjustment problem in wheat areas stems as much or more from changing consumption patterns, as incomes have increased, as from a rate of technical progress which exceeds the rate of growth in demand — the major problem of the feed grain economy.

ALTERNATIVES IN DEMAND AND PRODUCTION ADJUSTMENT

The income and resource problems in agriculture will be solved through two basic sets of phenomena or relationships: demand and production (supply) adjustment. But as these two sides of Marshall's scissors are manipulated, they need to be consistent with the value systems of farm and urban people, as well as with economic progress. Evidently our society places a high value on progress. It makes large investments in agricultural research and education as one means of increasing labor productivity and progress. But what can be said about the rate of change or progress which is desired? Are the numerous farm policies, which often retard the full realization of potential progress, a reflection of society's belief that change is too rapid, that we must slow down the tempo and provide compensation for those whose incomes are affected adversely? Or, are they simply a reflection of lack of knowledge on the part of society generally? To provide a more rapid solution to the farm problem we need to examine these values as well as the alternatives in demand and production adjustment.

SOLUTIONS THROUGH DEMAND

Many of the solutions proposed for agriculture pertain to demand. Often it is said that if we will only wait out the drouth, a growing population and an increase in national income will restore equilibrium in returns to agriculture. But at the current rate of growth in population and farm output, the dry spell will be too long for comfort. We are now producing at a rate required for the population level four or five years hence; and in addition, we have an accumulated surplus. We need to look carefully at the demand potential and then see how supply can be adapted to it. Obviously, governmental policies of the past and present do not accomplish this.

Remedies through increasing demand, aside from population growth and increases in national income, are popular over the country. Proposals include quality improvement, advertising, improved nutrition, promotion, and industrial uses of farm products. Proper emphasis needs to be given to the potential of solving the farm problem through changes on the demand side. Currently, however, the major potential for solving the immediate problems of agriculture appears to fall on the production side.

Proposals for increasing demand usually give insufficient recognition to substitution effects. For example, an intensive advertising program which entices the consumer to eat more pork will most certainly reduce his intake of beef or poultry, although total meat consumption might be increased somewhat. Or, a quality improvement program which places hams in cans or frozen peas in cardboard containers will mainly replace consumption of ordinary hams or canned peas. The products and services which increase most in demand are cans and boxes, not hams and peas.

Solution of the income problem for one segment of agriculture through promotion, advertising, and quality improvement may simply shift the burden to another segment. Our concern here should be with solution of the over-all problem. But an objective examination should be made of improved nutrition, promotion, or any other market developments which actually do promise to solve the basic problem. Services which improve quality have a relatively high priority as the income of the consumer increases. The fact that income elasticities are highest for the nonagricultural component of food purchases is evidenced in the declining portion of the consumer's dollar which reaches the farmer. Possibilities of demand appreciation through quality improvement appear to have more promise for increasing consumer utility than for increasing farm income.

SOLUTIONS THROUGH PRODUCTION ADJUSTMENT AND SUPPLY

In large part, the basic solution must come from the production or supply side. How can we increase the flexibility of the producing plant? Can we improve our knowledge of the supply function sufficiently to devise educational and action programs which bring production more closely in line with demand?

What should be the production structure of agriculture? How many farms should we have, and how many people should be employed in the industry? Spatially, how should production be contracted to provide a total output, and a composition of output, consistent with consumer demand? Do we have sufficient information on returns to scale and resource productivities to specify the magnitude of adjustment required in farm numbers and agricultural workers to provide resource returns and family incomes comparable with other employment opportunities?

Restoration or attainment of equilibrium for agriculture, measured in the sense of comparable resource returns and family incomes — even if subjective values are included in these quantities — revolves particularly around these specific production relationships. But in the same category are other possibilities and problems which merit further attention. Examples are part-time farming, capital structure, and credit facilities. Given the adjustments outlined above, a problem which will become even more pressing is the capital requirements of a beginning farmer.

Farm management workers and production economists have a challenge before them. The adjustments required in agriculture call for data. Significantly, the purpose of this conference is to examine the entire structure of economic phenomena involved in solving the basic problem of agriculture, but in particular, to provide a basis for redirecting research relating to the production adjustments of agriculture.

COMPLEXITY OF PHENOMENA AND VARIOUS DISCIPLINES

Solution of the basic problem of agriculture can challenge most of the scientific disciplines found in land-grant colleges. Often, research efforts will need to be integrated. Just as important as the problem of production adjustment is social adjustment. Indeed, sociologists should be closely allied with an intensive effort to bring balance to agriculture. Shifts in the farm population necessarily give rise to migration and community problems. At the same level are institutional problems which challenge the land economists, such as equitable and efficient taxation and the possibilities of zoning and water regulations in rural-urban transition areas.

PROGRAM ANALYSIS

The farm problem is not subject to easy and quick solution, nor will it be solved by major farm programs of the type in existence over the past two decades. While these programs may not have retarded adjustment as much as sometimes supposed, they have not been directed to the basic cause of the farm problem. They have only helped to postpone the day of reckoning. An entirely different emphasis in governmental programs is needed if they are to provide real long-run solutions. Society may indeed feel obligated to compensate agriculture for the particular burden which falls on it as a result of progress. However, programs are possible which will provide this compensation as well as facilitate resource adjustment. This conference should help provide the basis for establishing such programs.

GENERAL CHALLENGE IN RESEARCH AND EDUCATION

In broad perspective, the agricultural adjustment problem poses a new challenge for the entire land-grant college system, the U. S. Department of Agriculture, and the farm organizations which serve the farming industry. These agencies have been administered efficiently. In a century of service to agriculture and society, they helped to: (1) increase agricultural output in early years when the status of economic and population growth allowed a greater farm product to be consistent with higher farm incomes, (2) provide food for wartime allies and postwar adjustments, and (3) safeguard the food supplies in decades when population growth was extremely rapid, both from the standpoint of births and immigration.

But now the challenge to institutions serving the industry is to help agriculture adjust its use of resources and output of product to national economic growth, as well as to aid this economic growth through further technical improvement. To be certain, investment in new techniques and their extension needs to be continued and perhaps even accentuated, but more in terms of national economic growth than in terms of increasing the incomes of farmers per se. If agriculture is not to bear the extreme burden of this economic progress, and if the technical innovations in agriculture are to make their full contributions to economic growth, then these efforts must be complemented with activities which help agriculture to adjust. Major efforts should be directed to research and education which facilitate the movement of surplus labor from agriculture. To free labor from agriculture, through technical progress, and then leave it stranded is as inconsistent with economic growth as not having freed it in the first place.

The challenge in education is extremely great. Education to inform farm persons of the relative income opportunities in different occupations will, over the long run, be decidedly more effective than current farm programs in solving the basic farm problem. Proper education, with the research to support it, cannot alone effect the transfer of all surplus farm labor, but it can be the important catalyst in bringing about adjustments required in a rapidly growing and full-employment economy.

It is obvious, of course, that the adjustment will require time. Labor in farming represents persons, not an inanimate resource. Labor is represented in older persons with values which tie them to the community and occupation. It involves persons who do not have the skills for ready transfer to other industries, who do not have funds for transportation to other work or for retraining in other employment. It represents persons who must market themselves as a resource and who have incomplete information about the market for their services.

INVESTMENT IN THE HUMAN RESOURCE AND MOBILITY AIDS

But herein lies the modern challenge. Insufficient investment has been made in research and education relative to the human resource in agriculture. Far larger quantities are invested in the capital resource through items such as improved farm machinery, fertilizer, livestock breeding, and animal rations; or in developing the land resource through improved soil management, irrigation, reclamation, and soil conservation. Certainly, we need to make a commensurate investment in that resource which is not only a means, but also is an end in itself, the human resource. Many opportunities and possibilities exist. Among these are: better economic information on income opportunities in farming and in other occupations for persons with different funds and skills; increased emphasis on vocational training which prepares farm youth for better opportunities in nonfarm employment, as well as for improved management in an increasingly competitive agriculture; vocational guidance and counseling which reaches farm youth at a flexible point in their lives and which guides them to their most promising and rewarding alternative; employment services which effectively inform farm persons of alternatives in other locations and industries; retraining programs for persons already in agriculture who wish to transfer to other employment; unemployment compensation, transportation subsidies, and "severance or mustering out" pay for those who prefer transfer over subsidies — through commodity loans, conservation grants, and soil bank payments — for remaining in agriculture.

We venture the proposition that even though more research is badly needed, the greatest need is education. As professional economists, we have considerable knowledge of the qualitative nature of required adjustments. But we have not been sufficiently effective in translating this knowledge to farm people. We have not sufficiently informed farm youth that while some are needed as efficient managers in a competitive agriculture, others can better prosper in nonfarm employment. We have failed to provide interregional and long-run outlook information regarding employment opportunities, but have emphasized almost entirely the short-run outlook on commodities such as hogs, cattle, and potatoes. The blame falls partly upon ourselves, as economists, for lack of proper emphasis in educational programs. But an important part of it also falls on agricultural education in general. Our emphasis in vocational agriculture and 4-H work, for example, has considered mainly the farm youth who will return to agriculture. The welfare and life's satisfactions of those who will not or should not remain in farming is no less important. To allow some to enter agriculture, only to find later that they have selected the wrong occupation, is no favor to them.

Investment in the human resource, with emphasis on education to keep people properly informed in occupational outlook and opportunities, should be the major element of policy in decades ahead.

ECONOMIC DEVELOPMENT

Increasingly, the agricultural economist needs to focus his attention on local economic development. His ranks have been somewhat thinned as his colleagues have accepted job opportunities in developmental programs for foreign lands. But often the challenge is just as great in a local or state area. Generally, we have been passive, leaving the encouragement of industrial growth to chambers of commerce. Yet the agricultural adjustment problem can be solved most simply by local economic development which is consistent with the spatial features of our society. It is far less painful and costly for a farm youth or established operator to transfer to a position in his home town than to move to the next state or across the nation; he need not move into a totally new community with an entirely different set of basic values. He may even remain as a part-time farmer.

We know too little about the phenomena of economic development. However, we certainly need to sharpen our tools in order to: (1) better predict where it should or will take place, (2) determine the spark which kindles growth, and (3) prevent misguided effort where it is economically ill-advised as the solution to the local adjustment problem.

THE COMMERCIAL FARMER IN AGRICULTURE

This conference necessarily has a pessimistic note: it deals with a problem. But it need only be a short-run problem. It arises because the potential of a more bountiful living exists and because agriculture has contributed greatly to this potential. Agricultural scientists have shown great ingenuity in helping to provide a foundation for this potential in economic growth. It is the expectation of the North Central Farm Management Research Committee that this conference will help generate ingenuity in raising the economic possibilities of agriculture to levels consistent with a progressive nation.

But in aiding agricultural adjustment through labor transfers, we should not swing the pendulum too far and devote too little attention to the commercial farmer who remains in agriculture. Family farms of efficient size, managed properly, are and can be prosperous. Just as we seek to drain surplus resources from agriculture, we need to focus attention on those who should remain and produce the basic food product of the nation. As a requirement for an efficient agriculture, we need to provide information and services which allow commercial farms to employ resources and produce commodities in proportions consistent with consumer demand and favorable family income.

GEORGE A. POND
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Discussion

THIS paper on "The Income and Resource Problem" provides the keynote for this symposium. After reviewing it quite searchingly I find myself in general agreement with the statement of the problem we are to discuss. My remarks, therefore, will merely supplement this paper.

The authors emphasize the high level of living in America today. The gloomy forebodings of the Rev. Thomas R. Malthus near the turn of the 18th century have seen no fulfilment in our present economy. Our population is not pressing on our food supply; rather, the reverse appears to be true, even in the face of our recent upsurge in rate of population growth.

The authors devote relatively little attention to the revolution in agricultural technology that has swept this country with devastating speed in our lifetime. To me this is one of the major causes of the problem under study. This may well be compared with the industrial revolution starting near the close of the 18th century. One radical difference is the breakneck speed with which this avalanche of new techniques has revolutionized this ages-old business of farming. Within the memory of our present generation of farmers almost every agricultural operation has been changed or displaced.

The wide disparity between the rewards in industry and agriculture, in different areas and in different types of farming, has been mentioned in this keynote paper. The authors might well have added that within each of these areas and within each type of farming group even greater disparity of income exists among individual farmers. Those areas and those individuals that have been able to utilize effectively the new techniques have, in general, kept pace with industrial prosperity in their areas.

The problem, therefore, as this paper points out, is primarily one of adjustment in resource utilization. For several reasons adjustments in agriculture have been slower than in industry. Agriculture is composed of a large number of small units in which management is an unspecialized function. Farmers are traditionally conservative. Too often they would rather bear their existing ills than take the risk of facing unknown hazards. Furthermore, agriculture is a biological business, and nature sets the pace.

Prior to the current agricultural revolution, rapid adjustments were less essential than in this highly dynamic age of ever changing techniques. I well remember this statement (characteristic of those epigrammatic generalizations for which he was famous) by Dr. G. F. Warren: "Adjustments in agriculture are made largely by the sheriff and the undertaker." In other words, extreme measures have been necessary to induce changes in agriculture. This slow response to change is doubtless a significant reason why agricultural prosperity has lagged behind that of the rest of our economy. What was good enough for our fathers is not good enough to keep the farmer in step with the progress of this modern atomic age.

Speeding up adjustments of resource use in agriculture is an individual and not an over-all or mass process. As the authors point out, to move a man from farming to urban employment is a more violent shift than is a move from one industry to another within the same area. The less radical the shift, the easier the adjustment. Since education is involved, changes cannot be made quickly in individual cases.

Another factor to consider in agricultural adjustments is determination of which areas to retain in agriculture and which to release for industrial, urban, or suburban development. Land differs widely in its adaptation for agricultural production. Good level prairie land should be retained in agriculture. Rolling land or timber lands on the lighter soil may be more satisfactory for urban or suburban residential development. This land use problem is only one of the types of problems that will arise in making the adjustments needed to bring agriculture back in line with the rest of our economy.

I would like your consideration of one more idea that occurred to me in studying this paper. A very large proportion of the public funds for agricultural research is for the field of production — agronomy, plant and animal breeding, livestock feeding, control of insects and diseases that prey on our crops and livestock, and the like. We need more of these expenditures, not less. But we must not be blind to the fact that the funds for this type of research contribute to the excess of agricultural production over present needs which the authors of this paper decry. Is it not time that we supplement these funds with additional expenditures for economic research to guide adjustments in the pattern of farm production to effective demand? Is it not time for us to spend more of our energies in trying to increase farm profits — and not merely production?

Sponsorship of this conference by a farm management research committee seems highly appropriate. The farm management researcher is perhaps more directly concerned with helping the farmer make money than any other research worker in agriculture. This concern should be an opportunity and a challenge to us in planning our research programs and in demanding financial support to conduct them.

Chapter 2

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The Agricultural Production Plant

THE commercial farm today is not merely land, machinery, livestock, and other inventory items, along with enough labor to operate it. The top one-third to one-half of our commercial farms require high-level managerial ability to coordinate the resources into a profitable operation. The value of these farms as a going concern is greater than the sum of the values of the individual resources.

Since 1940, technology has been applied to American agriculture at an unparalleled rate. All segments of agriculture have been affected. Examples are too numerous to cite here, but the results attest to the magnitude of the change. Between 1940 and 1955, crop production per acre increased one-fourth and total farm production increased more than one-third. This level of production was achieved, despite a 25 percent decline in the agricultural labor force, because output per man hour in agriculture nearly doubled. Between 1950 and 1956 alone, output per man hour in American agriculture increased approximately 20 percent.

From 1940 to 1956, physical production of commodities from the United States agricultural plant increased 36 percent. The increase from 1950 to 1956 alone was 13 percent. During the 1940-56 period, U. S. population grew only 27 percent and the increase from 1950 to 1956 was 10.5 percent. Effective demand probably increased more rapidly than population, but it still increased less rapidly than actual farm production and much less rapidly than potential farm production. Studies of the U. S. Department of Agriculture in cooperation with state experiment stations show that technology has reached the stage where farm production could easily be even higher if prices were not acting as a damper.

In general, foreign outlets for products of our agricultural plant are limited, except for those subsidized by the federal government. In 1956, our agricultural exports increased for the third consecutive year and approached the high levels of 1927 and 1952. Even so, depressed economies and exchange difficulties of foreign countries, along with our attempt to maintain domestic prices above the world level, definitely limit the extent to which normal commercial outlets abroad can help us dispose of the large surplus our agricultural plant is geared to produce.

The American agriculture production plant will be viewed from the following three standpoints: (1) the present situation, (2) trends in agricultural resources and production, and (3) prospects for further change.

CURRENT SITUATION

American agriculture is big business. Measured in terms of current dollars, the agricultural plant was valued in excess of 170 billion dollars on January 1, 1956. Approximately 60 percent of this total value consisted of real estate and the remaining 40 percent of other physical assets — machinery, livestock, crops on hand, household goods, and financial assets. Debts of agricultural proprietors totaled slightly less than 19 billion dollars, or approximately 11 percent of the total asset value. Financial assets of farmers exceed the total indebtedness; therefore, the debt structure remains very sound, and liquid assets continue high although not as well distributed as immediately following the war. Thus, the financial solvency of American agriculture is one of the real strengths of the current agricultural situation.

Number and Size of Farms

The 1954 Census of Agriculture indicated that there were 4.8 million farms in the United States under the Census definition of a farm. Like many manufacturing or processing industries, a relatively small percentage of the total firms (farms) market the major share of the agricultural commodities sold each year. The effective producing farms of the United States are considerably less than the 4.8 million total enumerated by the Census. The Census lists 3.3 million commercial farms and 1.5 million noncommercial farms in 1954. Therefore, one-third of the total farms were noncommercial and their market sales totaled only 2 percent of the total agricultural sales in 1954. The classification of farms in Table 2.1, according to the value of sales, shows that a small percentage of the commercial farms produce a relatively high percentage of the total marketable agricultural production each year. For example, less than 3 percent of our farms with sales of $25,000 and over sold nearly one-third of the agricultural market products in 1954. Less than 10 percent of the farms with sales totaling $10,000-$24,999 per farm produced 27 percent of the market sales in 1954; therefore, the 583,000 farms with gross sales of $10,000 or more, representing about 12 percent of all farms, produced over 58 percent of all farm products sold. All farms with gross sales of $5,000 or more, representing 27 percent of our farms, produced nearly 80 percent of all farm products sold in 1954. It is also noteworthy that the commercial farms averaged 336 acres in size in 1954 whereas all farms, commercial and noncommercial, averaged 242 acres.

In 1956, one farm worker produced enough for 20 people, on the average. Viewed in terms of class I, II, and III commercial farms, one farm worker on these farms supported approximately 45 people in 1956. This indicates the wide difference in output per farm and per farm worker within the total agricultural plant. Farms in economic classes II, III, and IV, by and large, represent the family-size farms long considered the backbone of American agriculture. Half of the commercial farms are included in these classes, and they produce approximately two-thirds of the total farm products sold. The 1.2 million farms in economic classes V and VI include most of the farm families with chronically low incomes, as the small size of the farm business ordinarily does not provide adequate employment for the family labor force.

Agricultural Labor Force

Much of the management of the agricultural plant is vested in the 4.8 million farm operators. The total labor force in American agriculture in 1956 was 8.2 million workers. More than three-fourths of them were family workers. Nonfarm employment has become more attractive as the pressure to supplement family income has increased in recent years. In 1954, nearly one-half of all farm operators reported some off-farm work and almost 28 percent reported 100 days or more of off-farm work. Income of the farmer and members of his family from off-farm sources exceeded the value of agricultural products on nearly one-third of the farms in 1954.

Although still minor, an increasing share of decision-making in farm organization and operation has been shifted to federal government

Table 2.1. Number and Percentage of Farms and Proportion of Market Sales, by Economic Class, United States, 1954*

Economic class	Value of sales	Number of farms	Percentage of all farms	Percentage of market sales	Ave. size of farm
	Dollars	Thousands	Percent	Percent	Acres
Commercial farms:					
Class I	25,000 and over	134	2.8	31.3	1,939
Class II	10,000-24,999	449	9.4	26.9	538
Class III	5,000-9,999	707	14.8	20.5	312
Class IV	2,500-4,999	812	17.0	12.1	201
Class V	1,200-2,499	763	16.0	5.7	133
Class VI	250-1,999	462	9.7	1.4	97
Total	---	3,327	69.6	98.0	336
Noncommercial farms [1]	---	1,455	30.4	2.0	71
All census farms	---	4,782	100.0	100.0	242

*Source: United States Bureau of the Census

[1] Includes part-time, residential and abnormal farms.

as a result of government programs of various kinds, to commercial agencies as a result of "packaged" technologies, and to professional farm managers on tenant-operated farms.

Farm Mechanization

By 1956, 4.5 million tractors and related power equipment had largely replaced the 26.7 million head of horses and mules on farms in 1918. More than 10 percent of cash receipts from farming are now annually being used to purchase new tractors, machinery and equipment, and new and used motor trucks and automobiles. The large amount of power machinery used is a major reason for the high agricultural production per farm worker in the United States. The importance of miscellaneous farm capital has been increasing tremendously in the farming operations. This resource includes principally livestock and necessary cash for various operating expenses such as purchase of fertilizer, feed, seed, and services of various kinds.

The investment per farm worker varies considerably with type of farm throughout the United States. For example, in 1956 investment per worker was about $59,000 on the typical family-commercial cash grain farms in the Corn Belt, $54,000 on winter wheat farms in the Southern Plains, $35,000 on cattle ranches in the Northern Plains, $14,000 for dairy farms in the central Northeast, and $8,000 on cotton farms in the Southern Piedmont. The average investment per worker for all United States agriculture was $18,470 in 1955.

TRENDS IN AGRICULTURAL RESOURCES AND PRODUCTION

Let us take a closer look at the scientific and technological changes we have experienced in our generation. If the full recorded history of man, starting with the story of creation in the Book of Genesis and continuing until 1854 — 100 years ago — were to be put on the face of a clock, the hands of the clock would have moved from noon around to 11:45 p.m. The last 15 minutes would represent the last century. Output per worker in the United States would have increased more in the last 15 minutes than in the entire previous 11 hours and 45 minutes. And most of the increase within that last 15 minutes would have occurred since the turn of the present century. Many of the people now living have played a substantial role in this amazing scientific and technological revolution.

Let us imagine for a moment that a good Egyptian farmer in the day of Moses could have been brought back to life in the day of the Caesars, some twelve centuries later, and placed on a good farm in Italy, then the most advanced nation of the world. He could have farmed with practically no additional instruction, for the art of agriculture had changed little, if any, in the intervening centuries.

Suppose that same farmer were brought back to life on a good

English farm in the day of Shakespeare, some four centuries ago. He still would have been a pretty good farmer with no additional instruction.

Now let us bring that same ancient Egyptian farmer to the eastern shores of America 150 years ago and put him on Thomas Jefferson's farm, one of the advanced farms of that day. He still would not have found the art of farming very different from that which he practiced in Egypt 3,000 years earlier. He would have used the same power, the same crude implements, and large amounts of hand labor. He would need to know very little about fertilization, improved varieties, high-producing breeds of livestock, and the numerous mechanical and electrical implements and tools found on our modern farms.

On a modern American farm, that same farmer would be completely bewildered. He would not even recognize the working end of the tractor parked in the farmyard. He would probably raise the cry of "witchcraft" at all the amazing things performed by mechanical and electrical power. He would require hard years of instruction and apprenticeship to operate the modern American farm.

Family farms will inevitably become larger, as the number of workers on farms decreases and as mechanization of our farms continues at a rapid pace. A closer look at the trends in number and sizes of farms, agricultural labor force, farm output, farm mechanization, and the financial and managerial aspects of commercial farming today are needed to determine its impact on the American economy and American agriculture.

Fewer but Larger Farms

More than 1.5 million farms, or about one-fourth of our farms, have disappeared from American agriculture since 1929. More than one-third of this change took place in the five years, 1949-54, and more than two-thirds of the change took place since 1945 (Table 2.2). All the decline in the number of farms took place among the commercial farms.

Table 2.2. Trends in Major Groups of Farms, United States, 1929-54*

Year	Number and average size of farms: All		Commercial		Part-time, residential, and subsistence
	(Acres)	(Thousands)	(Acres)	(Thousands)	(Thousands)
1929	157	6,289	[a]	4,723	1,480
1939	174	6,097	220	4,265	1,685
1944	195	5,859	255	3,941	1,738
1949	215	5,384	300	3,465	1,917
1954	242	4,782	336	3,100	1,682

*Source: McElveen, J. V., "Family farms in a changing economy," U.S.D.A. Agr. Inf. Bul. No. 171, Mar. 1957, pp. 19 and 26.

[a]Not available.

Part-time, residential, and subsistence farms increased approximately 200,000 in number between 1929 and 1954; therefore, only two-thirds of the commercial farms of 1929 are now in existence. Total land in farms is slightly higher than it was 25 years ago although cropland acreage is approximately the same. Thus, the 1.6 million commercial farms that have disappeared at the rate of over 60,000 per year have been absorbed into active, now-existing farms.

The average size of farms in the United States increased from 157 acres in 1929 to 242 acres in 1954, an over-all increase of nearly 40 percent since 1940 and over 50 percent since 1929. Commercial farms increased in size from 220 acres in 1940 to 336 acres by 1954 — an increase of more than 50 percent. In addition, commercial farms averaged nearly 50 percent larger than all census farms, indicating the extreme smallness of the part-time, residential, and subsistence farms.

Mechanization Continues

Even though mechanical power and equipment has replaced horse and mule power and related equipment, mechanization continues to substitute fairly rapidly for labor in agricultural production. The growth of mechanization in the past few years has been so great that the impact has not yet been fully felt. Tractor numbers in 1955 were double the total on farms in 1945, and the total number has tripled since 1940. The number of motor trucks on farms more than doubled between 1945 and 1955. The number of pick-up balers in 1955 was more than twice the total number on farms in 1950. Practically all farms now have electricity; the number of home freezers on farms in 1955 was one and one-third times the number in 1950. Approximately two-thirds of the farmers have television sets, and the remaining farmers are obtaining sets at the rate of about 1 percent per month.

Farm mechanization has had far-reaching effects and is one of the basic causes of the revolution in American agriculture. Crop production in the United States today is almost totally mechanized. The livestock industry is mechanizing rapidly. Prospects for changes in the livestock industry in the period ahead are fully as great as those in field crops during the past two decades. Much of the hard work and drudgery of farming has been removed as production practices have been modified and the timeliness of farming operations has been much improved.

Labor Force Is Much Reduced

The workers in agriculture totaled 13.4 million in 1920, 11 million in 1940, and about 8 million in 1956 — an 18 percent decline from 1920 to 1940 and a 40 percent decline from 1920 to 1956. In 1850, one farm worker supported approximately 5 people. By 1940 one farm worker supported 11 people and by 1956 nearly 20 people. From 1940 to 1956, the number of persons supported by one farm worker increased one and one-half times as much as in the preceding nine decades — a further indication of the revolutionary changes that have taken place in agriculture. With total agricultural production increasing and the agricultural labor force decreasing, production per farm worker obviously has been increasing at a phenomenal rate. Output per hour of farm work today is more than twice as much as 25 years ago.

One reason for this increase in farm labor productivity is the increase in the use of other resources with each unit of labor. From 1940 to 1955, for example, the quantity of various selected resources used with each unit of man labor in farm production increased as follows: cropland, 45 percent; fertilizer, 498 percent; tractors, 379 percent; and feed purchased, 243 percent. The amount of capital used per worker has become even greater in agriculture than in American industry.

The cost-price squeeze and the mechanization of the agricultural plant has induced farm people to seek more part-time nonfarm employment. In 1954 one-eighth of the farms in the United States were classified as part-time, and 28 percent of all farm operators worked off their farms at least 100 days during the year, as compared with 16 percent in 1939. In states with particular opportunities for people that work in industry to live on farms, the percentage of operators with at least 100 days of off-farm work was much higher — e.g., 48 percent in New Hampshire, 39 percent in Pennsylvania and Michigan, and 35 percent in California. Part-time farming has become an important transitional step in the transfer from agricultural into industrial occupations.

Technology Brings Specialization

The pounds of plant food used in commercial fertilizers for United States farm production more than doubled from 1940 to 1948 and increased another three-fourths from 1948 to 1956. This is only one illustration of changes that have been taking place in production techniques. Genetic improvements have been striking. In Indiana, for example, none of the four wheat varieties that accounted for three-fourths of the acreage in 1955 even appeared in the list of the important varieties of 1944, and 11 varieties that constituted two-thirds of the acreage in 1944 do not appear in 1955. One result of technological improvements of various kinds has been a sharp increase in the rates of crop and livestock production. Crop output per acre in the United States increased approximately 20 percent between 1940 and 1956 and livestock production per breeding unit increased 27 percent during the same period.

Measurements of specialization for the agricultural plant as a whole are not available, but we know that the specialized knowledge and equipment needs for efficiently operating any farm enterprise encourages specialization — large volume per enterprise. Farmers are handicapped if they try to keep up to date on methods for many enterprises. They are also handicapped if they either purchase equipment to use labor efficiently on many small enterprises or try to get along without the equipment. An additional encouragement to specialization is that better methods of meeting adverse production conditions have: (1) reduced risk in connection with having many "eggs in the basket," and (2) increased ability to produce off-season, thus permitting the specialized producer to distribute his labor more evenly over the year than formerly.

Financial Position Continues Strong

The market value of the agricultural plant more than tripled between 1940 and 1956, rising from 53.8 billion dollars to 170.1 billion dollars, while farm indebtedness increased less than 90 percent from 10 billion dollars to 18.8 billion dollars during the same period. Non-real-estate items and financial assets form an increasing part of the total value of the agricultural plant. This increase in non-real-estate items is taking place mainly in capital goods with a productive life much in excess of one year, the bulk of it being in farm machinery and breeding stock.

The agricultural plant of this country, in the aggregate, is still extremely solvent. In none of the years 1920 to 1940 was the industry's financial condition as good as during 1947 to 1956. Certainly, the strong financial condition has materially assisted agriculture in the face of the cost-price squeeze of the past several years. Nearly triple their 1940 level, land values in the United States have risen more than one-third since 1950 and have continued to rise at an average rate of 3 percent per year since the cost-price squeeze started in 1953.

A realistic examination of the farm picture must take into account the time farms were purchased and the actual dollar investment for owner-operated farms. Certain assumptions were made with regard to this in Table 2.3 which indicate clearly: (1) current earnings relative to actual investment, (2) the expanded credit base of the modern commercial farm, and (3) the continued ability of commercial farmers to adjust to profitable new technological developments.

The Family Farm Remains

Some public concern has been expressed about the family farm position being jeopardized by the increased farm size, expanded capital requirements, and fewer agricultural workers necessary to operate the agricultural plant during the past two decades. A close look at the ownership pattern of farm land in the United States does not bear out this public concern. As indicated in Table 2.4, nearly 98 percent of the land east of the Mississippi River is held by individuals, partnerships, or estates and more than 80 percent of the land west of the Mississippi is held in the same fashion. Corporate ownership of farm land totals less

Table 2.3. Typical Commercial Hog-Beef Fattening Farm, Corn Belt*

Approximately 5 percent of the farm real estate in the United States changes hands each year. In other words, farms are transferred about once every twenty years — on the average. Let us assume the typical Corn Belt farm has been owned for about 10 years and attempt to analyze its income and financial status in reviewing the current profit position of agriculture.

	1945	1955
1. Size of Farm:	189 acres	199 acres
2. Capital		
Land and buildings	$19,280	$37,610
Machinery	2,920	7,170
Livestock	6,170	9,820
Crops on hand	4,210	6,360
Total	$32,580	$60,960
Estimated Adjustments 1945-55:		
Added 10 acres	1,500	
Added machinery	1,700	
Added livestock	1,150	
	$36,930 - Adjusted total investment	

	1943-45 Ave.	1953-55 Ave.
3. Cash receipts	11,262	15,221
4. Net cash income	5,912	6,568
5. Net farm income	6,044	6,583
6. Return to operator and family labor	4,615	3,602
7. Probable credit available:		
Real estate	9,600	18,000
Non-real estate	6,400	12,000
Total	$16,000	$30,000

8. Based on capital charge (5 percent) against only the actual capital investment ($36,960), the 1953-55 average return to operator and family labor would have been $4,737 (No. 6 above).

9. Current credit base is within $7,000 of the actual capital invested in the farm business in 1945 and expansion since that date.

10. Though real income has fallen off materially from that of wartime and postwar years, capital gains and the credit base of commercial agriculture have expanded materially. As in many sectors of the industrial economy, consolidations have been rampant throughout the agricultural economy. As long as the U. S. economy maintains its business vigor and technological developments continue, consolidations will result in larger and stronger family farms. The commercial agricultural plant is financially solvent and sound and capable of adjustment to profitable technological developments — though at a slower rate than during the immediate postwar years.

*Source of basic figures (Items 1 through 6, except estimated adjustments): "Costs and returns, commercial family-operated farms by type and size," Stat. Bul. No. 197, Nov. 1956, and U.S.D.A. Agr. Inf. Bul. No. 158, June, 1956.

Table 2.4. Percentage Distribution of All Land in Farms by Type of Owner, 1950*

Type of owner	Geographic region		
	East[a]	West	United States
Individuals, partnerships, and estates	97.8%	81.1%	87.8%
Corporation	1.7	6.2	4.4
Indian	b	6.0	3.6
Federal government	.2	2.2	1.4
State and local governments	.3	4.5	2.8

*Source: Bureau of Census, U. S. Department of Commerce.
[a]All states east of Mississippi River.
[b]Less than 0.05 percent.

than 5 percent of all land in farms and is no greater than that held by public agencies. Therefore, the individual proprietorship is by all odds the principal type of farm ownership found in the United States.

Another matter closely associated with family farms is the type of tenure. There has long been considerable concern that too much agricultural land is owned by outside capital and farmed by tenants. It is interesting to note that farm tenancy in the United States changed very little from 1900 to 1940; however, from 1940 to 1955 farm tenancy decreased substantially (nearly one-third). Approximately the same percentage of the agricultural land is currently under tenant operatorship as in the 1920's and the 1930's, however. Likewise, the percentage of farms operated by hired managers has changed little during the past 50 years, although the total farm land operated by managers has approximately doubled since the 1920's (now comprising 8.6 percent of the total). During the period 1940-55, when U. S. land prices nearly tripled, the percentage of full-owner operators and part-owners in the United States economy increased materially (Table 2.5). These factors bear out the continuing strength of the family farm in United States agriculture.

Table 2.5. Percentage Distribution of U. S. Farms by Tenure of Operator, 1900-55*

Year	Full owners	Part owners	Managers	Tenants	Croppers (South only)
1900	55.8%	7.9%	1.0%	35.3%	a
1910	52.7	9.3	.9	37.0	a
1920	52.2	8.7	1.1	38.1	17.5%
1930	46.3	10.4	.9	42.4	24.1
1940	50.6	10.1	.6	38.7	18.0
1950	57.4	15.3	.5	26.8	13.1
1955	57.4	18.2	.4	24.0	11.6

*Source: 1954 Census of Agriculture, U. S. Department of Commerce.
[a]Not available.

Example of Changes Taking Place

National figures on the agricultural production plant naturally are composites of widely varying situations. Some changes that are hidden in these national figures show up more clearly in figures for a smaller area. Let us take a look at one township in Indiana, Forest Township in Clinton County, for which we have figures for various years.

Table 2.6 shows that during the period from 1910 to 1955, resources tended to shift away from labor and toward mechanical power, machinery, and miscellaneous capital items. While the total amount of land naturally did not increase, the ratio of land to labor increased greatly as the amount of labor decreased. Since the dollar values in the table are expressed in 1910-14 dollars, the shifts represent physical quantities rather than changes in the price level, except to the extent that

Table 2.6. Changes in Relative Inputs of Various Resources Used in Farm Production in Forest Township, Clinton County, Indiana

	1910 and 1913-15	1932	1945	1955
Value real estate				
Dollars per farm[a]	27,615	16,561	17,427	29,021
Percent of 1910, 1913-15	100	77	81	134
Labor				
Number of men per farm	1.62	1.62	1.65	1.17
Percent of 1910, 1913-15	100	100	102	72
Power				
Number of horses per farm	4.8	3.6	.6	.2
Percent of 1910, 1913-15	100	75	12	4
Number of tractors per farm	0	.5	1.3	1.8
Percent of 1932	0	100	260	360
Machinery				
Dollars per farm[a]	366	617	1,682	2,145
Percent of 1910, 1913-15	100	168	460	586
Livestock				
Dollars per farm[a]	1,556	1,374	1,604	1,835
Percent of 1910, 1913-15	100	88	103	118
Cash expenses				
Dollars per farm[a]	770	1,567	2,361	4,116
Percent of 1910, 1913-15	100	204	307	535

[a]At 1910-14 price level.

prices of various resources did not change exactly in line with general prices.

Table 2.7 shows a number of specific changes that have taken place in this sample township not only in combination of inputs but also in the outputs. The average acreage per farm increased more than one-half. Tenancy decreased but part renting increased. Capital requirements increased much more than the general price level. Farmers substituted machines for a large amount of labor. Fuel expenses and fertilizer expenses increased more than a hundredfold. The major shift in crops was an increase in soybeans. The major shifts in livestock, which do not show completely in the table, were an increase in beef cattle and hogs and increased specialization in livestock. Each man took care of more crops and livestock and produced more commodities.

The index of specialization shown in the table is an objective measure of the extent to which farm labor is concentrated on particular enterprises. The figure was obtained by computing for each farm the percentage of productive man work units on each enterprise, squaring these percentages, totaling them and extracting the square root of the sum. With specialization measured in this way, farms were only slightly more diversified in the earlier years. The difference from 1910 to 1955 probably is smaller than most people would expect. One possible explanation of this is that corn required so much more labor when horses were used instead of tractors, that farmers devoted a larger share of their time to corn production, whereas in 1955 they had more time for other enterprises. If the index of specialization had been computed on the basis of percentage of receipts from various sources, it might have shown a greater difference.

PROSPECTS FOR CONTINUED CHANGE

Let us speculate about the prospects for American agriculture as we look ahead to the future. Farms will likely continue to become larger. The continuing rise of land values in the face of the cost-price squeeze is ample indication of the tremendous pressure to enlarge size. In 1956, for example, 40 percent of the Corn Belt land sold was bought by other farmers for farm enlargement. In the Wisconsin dairy area, 20 percent of the farm land sold was added to existing farms. One-third of the Southern Piedmont cotton land, 50 percent of the Southern Plains wheat land, and 40 percent of the Northern Plains cattle ranch land sold was added to existing farms.

The trend toward higher cash costs relative to operating income continues as more purchased technology is added to replace labor. This trend has been apparent for many years and is increasing as more farm inputs are purchased. Greater specialization, meaning fewer commodities produced per farm, is apparent. Where a typical farm had three classes of livestock ten years ago, it more commonly has two today. The product and production is becoming more and more standardized. More and more, the capital, labor, and management functions are being separated in agriculture as they have been in industry. In the face of

Table 2.7. Some Comparisons of Farming in Various Years on 100 Farms in Forest Township, Clinton County, Indiana

	1910 and 1913-15	1932	1945	1955
Acres per farm	116	146	174	182
Percentage of farms				
Owner operated	34	24	32	39
Part rented	23	35	34	30
Rented	43	41	34	31
Total capital per farm				
Actual dollars	24,038	12,255	41,989	74,274
1910-14 dollars	24,038	18,854	21,422	34,071
Value of real estate per acre ($)	186	74	196	348
Number of machines per 100 farms				
Tractors	0	51	134	180
Combines	0	1	36	59
Corn pickers	0	4	51	66
Hay balers	0	0	8	11
Fuel and oil expense per farm ($)	6	37	328	658
Fertilizer expense per farm ($)	8	16	188	934
Percentage of land in:				
Corn	32.2	38.5	34.5	34.5
Soybeans	0	.4	9.2	14.9
Yield corn per acre (bu.)	49	32	66	64
Production corn per farm (bu.)	1,829	1,800	3,962	4,018
Number of animal units of livestock per farm				
Cattle	6.8	9.0	10.4	13.4
Hogs	10.7	17.2	19.1	12.0
Sheep	.3	1.5	.8	1.0
Poultry	1.3	3.0	3.7	.7
Colts	.8	.2	-	-
Value of products per worker				
Actual dollars	1,373	930	5,386	10,116
1910-14 dollars	1,373	1,431	2,748	4,640
Acres corn per man	24	32	36	60
Index of specialization[a]	49	51	[b]	53
Labor income ($)	205	-120	3,466	-974
Average deviation in labor income				
Actual dollars	470	392	2,837	3,569
1910-14 dollars	470	603	1,447	1,637

[a] The square root of the sums of the squares of the percentage of total man work units represented by the various enterprises.

[b] Not calculated for 1945.

depressed farm earnings and prices, the less efficient factors in agriculture — excess land, excess capital, and excess labor — must fall by the wayside. The "shaking out" takes time and is often retarded by other programs. For example, many government subsidies have been capitalized into higher land values, thus slowing down the needed adjustments by providing renewed incentive to stay on the farm with hope of increased earnings. With the billions of dollars poured into government agricultural programs since the war, agricultural income has been increased some, but practically none of the adjustments needed to solve the basic problems have been made.

Added technology and management skills increase the spread in earning capacity between the less efficient and the more efficient farms in commercial agriculture. If the government farm programs, which are basically the same today as originally set up in the 1930's, are superimposed over an agriculture that is totally different today, they cannot be expected to solve today's problems. Soon, the adjustment problems in agriculture must be faced squarely.

Prospective changes in the livestock industry in the period ahead are as fully dynamic as those in field crops of the past two decades. Livestock technology is reshaping, and will continue to reshape, much of the livestock farming operation.

The broiler industry gives us good insight with respect to the direction in which we are headed. For example, as the major livestock enterprise on a commercial Corn Belt farm today, the 20-cow dairy is as obsolete as the 10-cow dairy was in 1940; the 15-20 sow hog operation is as obsolete as 7-10 was in 1940; the carload beef feeding operation is as obsolete as one-half carload was in 1940. In addition, the whole farm building situation is in a state of flux, not only for livestock, but also for materials handling — grain and forage — as well. When genetics, nutrition, and disease control are combined, as they have been in broiler production, the result is an assembly line, mass production, and a standardized, integrated industry.

We know the direction in which agriculture is headed; we are not sure how far or how fast it will go. Barring severe economic depression in the general economy, it will take place faster than many of us anticipate. Certainly, the agricultural recession of the past few years has increased the rate of change taking place on the typical commercial farm.

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Discussion

AS I read over the brief description of the subject matter to be developed by Dr. Robertson and Dr. Diesslin, it seemed very broad. Indeed, the topic for the paper might be interpreted as treating the entire subject of the cost-price squeeze.

I feel that their development of the subject is too cursory in its treatment of demand. This may be partly a reflection of differences in our general areas of interest as well as the subjects to be discussed in papers to follow. Changes in demand are of strategic importance in determining the size of the production plant as a whole and in influencing the output of individual commodities. Although we quite rightly look on demand changes as largely a reflection of consumer behavior, they are not entirely independent of the supply response. Technological developments on the supply side influence consumption through price as well as in other ways. For example, the rapid expansion in the use of frozen food stems largely from technological developments affecting supply.

The nature of the demand for farm products and its relatively slow growth as the economy expands is an old story. Yet, it is pertinent to this subject. In measuring changes from the 1924-28 average to the 1951-55 average, a period of a little more than a quarter century, we find population up 36 percent and income per capita (real) up more than 58 percent. Per capita consumption of livestock products for food increased about 16.5 percent from 1924-28 to 1951-55. Livestock product prices relative to all farm products rose by about 5.5 percent offsetting a small part of the income effect on consumption. Based on the changes between the two periods and our general knowledge of elasticities for livestock products, an income elasticity around 0.3 looks reasonable. Nonfood use includes primarily wool and the tallow and greases which are a by-product of meat production. Feed use of milk products on a per capita basis has decreased during the period. Thus, total domestic use of livestock products per person for both food and nonfood uses increased less than 8 percent. With a 36 percent increase in population, domestic utilization in 1951-55 was about 47 percent above the 1924-28 average. Since both exports and imports of livestock products are relatively small, production increased about the same as domestic use.

Demand changes are primary forces influencing the kinds of products desired. With relatively favorable demand conditions for meat animals, production was up 45 percent. Since technological developments in meat animal production apparently have been relatively slow, prices, compared to those of all livestock products, increased by nearly a fourth. Output of poultry products nearly doubled; technological developments in production contributed to expanded output as well as to a decline of about 30 percent in relative prices for poultry products. Milk production rose about a fourth. And dairy product prices, although supported in recent years, were off about 10 percent relative to all livestock products.

Per capita consumption of food crops as a whole has held relatively steady over the past quarter century except for a rise during World War II. If anything, the trend may be slightly downward. Food consumption of crops combines food grains and potatoes, where per capita use is declining, and fruits and vegetables where consumption is rising. These divergent trends apparently have been largely offsetting in the past quarter century. Nonfood use of crops per capita has increased even more rapidly than consumption of livestock products. This group includes cotton, tobacco, and industrial uses of oils and grains. The decline in feed use, on a per capita basis, reflects the reduction in use of feed for horses and mules as well as some apparent efficiencies in feeding. In the case of food use of crops as a whole, changes over the last 25 years suggest virtually no price and income effect on consumption. Increases for nonfood crops may result in an income elasticity as high as 0.3. With a substantial decline in feed use relative to population, domestic requirements for crops, on a per capita basis, declined nearly 5 percent from 1924-28 to 1951-55. Crop prices also declined about 5 to 6 percent

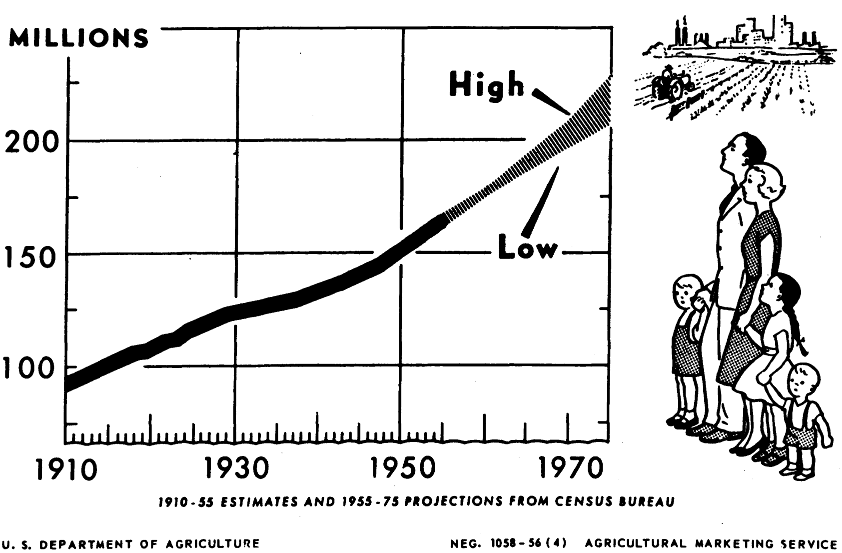

Fig. 2.1 - Growth of United States population with projections to 1975.

relative to all farm product prices. Since population increased 36 percent, total domestic utilization of crops was up about 29 percent even with the smaller use per person. Exports increased 6 percent, imports 27 percent and output 30 percent over the period. But this production rate resulted in substantial stock accumulation during 1951-55: about 4.5 percent of output in 1952, 7 percent in 1953, 6 percent in 1954, and 6.5 percent in 1955. It should be noted also that surplus disposal programs during these years prevented even larger stock accumulations.

Production changes for major commodity groups since the last half of the 1920's indicate that fruits, vegetables, oil crops, and tobacco were relatively more responsive to changes in income than were food grains, potatoes, and cotton, for example. A sizable reduction in relative prices for potatoes probably reflects efficiencies in output as well as the decline in total requirements. Lower relative prices for fruits were accompanied by a big increase in production and cost-reducing technological developments affecting supply, particularly for citrus fruits. Demand for oil crops has expanded very rapidly and prices in 1951-55 averaged about a fourth higher than in 1924-28 despite big gains in output per man hour.

The above changes for crops and livestock products, net of feed and seed use, sum to an increase in total domestic utilization of farm products of about 50 percent from 1924-28 to 1951-55. Since exports increased less than a tenth, total utilization was up about 45 percent. With farm output averaging in 1951-55 some 50 percent above 1924-28, net stock accumulation during the period averaged about 3 percent of total

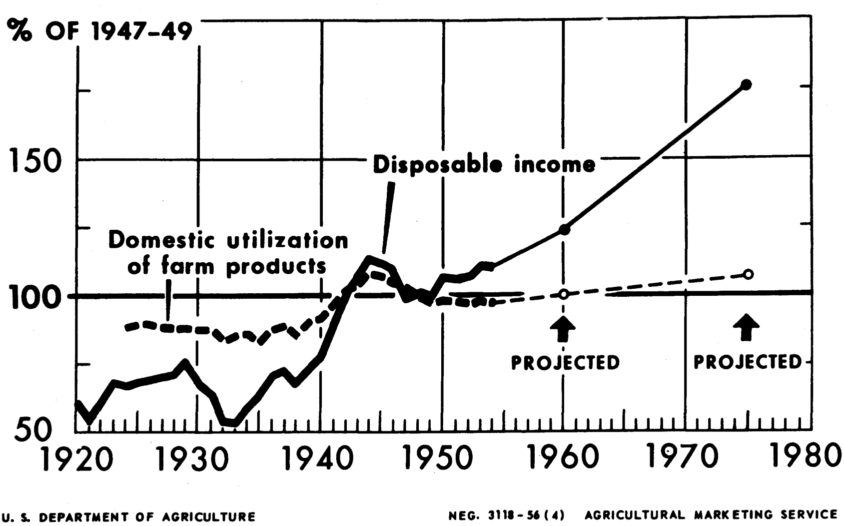

Fig. 2.2 - Disposable income and domestic use of farm products per person, with projections to 1975.

farm output. This stock build up is now represented largely by more than a billion bushels of both wheat and corn and some 14.5 million bales of cotton.

Production in excess of requirements and the consequent build up of stocks in recent years were largely responsible for a decline in farm product prices of more than 20 percent from 1951 to 1956. With rising incomes and expanding economic activity in general, prices paid by farmers for goods and services have been maintained at a high level. The index of prices paid, interest, taxes and wage rates in 1956 was about 1.5 percent above 1951. The cost squeeze, as measured by the parity ratio, thus tightened considerably; the ratio declined from 100 in 1951 to 83 in 1956. In March, 1957, the index of prices paid was running 3 percent above the average for 1956. Prices received were up from a year earlier, but held near the average for 1956 and the parity ratio in March stood at 80. Farmers' realized net incomes declined by about a fifth from 1951 to 1956, reflecting the drop in prices and continued high production costs. Net incomes in 1956 were up 4 percent from 1955, the first increase since the gain from 1950 to 1951.

The relatively slow growth in demand for farm products, in the past two to three decades, has been accompanied by rapid increases in productivity and the trend toward mechanization of agriculture. As the authors pointed out, these developments have resulted in a substantial decline in the number of agricultural workers needed to supply food and fiber. In 1930 less than 10 persons were supported by production of one farm worker; by 1956 this ratio had risen to nearly 20. Attractive alternatives for labor in nonfarm industries also have drawn farm workers, as well as rural population, to urban centers.

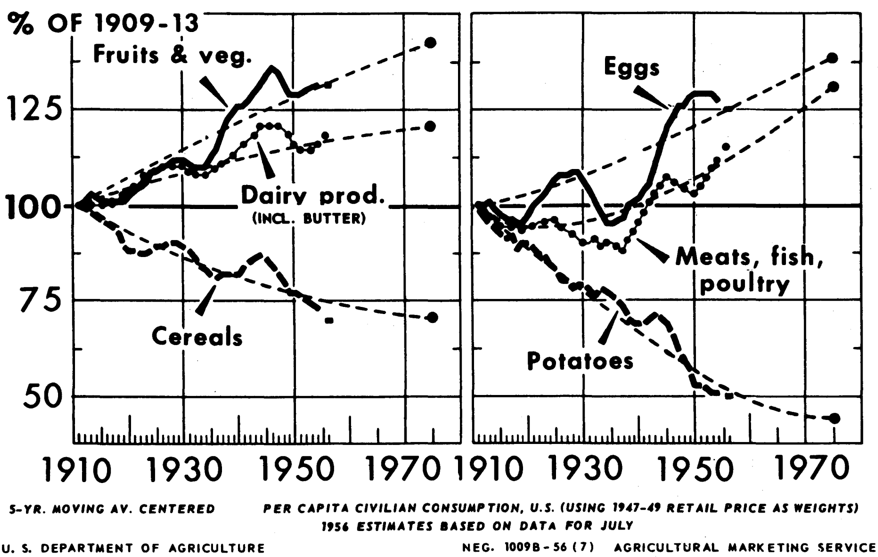

Fig. 2.3 - Trends in our eating habits with projections to 1975.

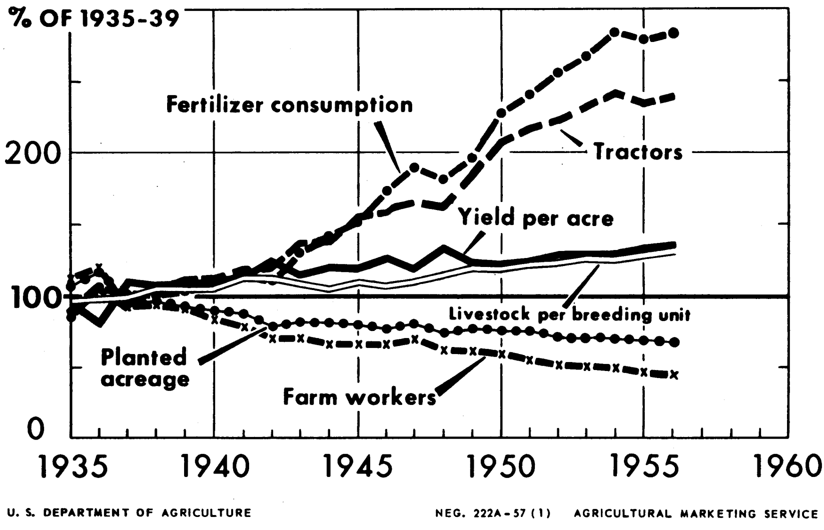

Fig. 2.4 - Factors in farm production per unit of farm output.

The authors have covered changes in resources and organization of the farm production plant. These trends might be generally characterized as: a rise in capital inputs, a decline in the use of labor and land, and a trend toward fewer and larger farms. It is interesting to note, however, that acreage needed for domestic use (less exports and feed for horses and mules) has increased about 50 percent since 1910 as land used for horse feed declined. Since this shift is largely completed, it has some significance for the future.

The authors report that we are on the threshold of significant new technological developments which may be opening up tremendous possibilities for production. This and the general supply situation facing agriculture today suggest that our major concern for the next several years will involve production adjustment and possibly programs to tailor farm output to probable expansion in demand. Many of the trends in our eating habits will continue though they may be moderated somewhat. Demand for farm products, reflecting a growing population, expanding incomes, and trends in consumer preference, will expand — possibly as much as 40 to 50 percent in the next quarter century. Few new land resources are in prospect. But capital inputs will likely increase further with rising yields per acre and per animal unit. Output per worker will increase, and more farm operators and workers will leave agriculture for higher paying nonfarm jobs.

Chapter 3

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Effects of Technological Research and Education

THIS topic is under the general heading of "The Basis of the Cost-Price Squeeze in Commercial Agriculture." The program, therefore, appears to take for granted that research and education are at least partly responsible for some of the present farm income difficulties.

This is not the first time that the finger of suspicion has pointed to research and education. The charge has been made rather frequently in the last two or three years. When it arises in discussion by laymen, the reasoning is about as follows: Most production research and education is output-increasing. We do not need any more farm output to add to our surplus problems. Why not, therefore, slow down, or even place a moratorium on, production research and education for the time being?

Usually, discussions by laymen do not cast suspicion on utilization and marketing research. Studies along these lines are designed to develop larger markets for our surplus products, or at least to give the producer a larger share of the consumer's dollar. The suspicious characters are production research and education which stimulates adoption of the results.

In this program also, the question is limited to technological research and education, and presumably confined to the farm-production aspects of the problem.

Economists recognize that improvements in farm technology are frequently (though not always) associated with direct increases in output of farm products; also that unless demand expands enough to absorb the larger output, the resulting lower prices may actually reduce farm incomes. This is the basis for the charge against technological research and education. We shall examine a little later the special circumstances under which the charge is justified, but before doing this it may be well to mention some other public programs that also increase output. New reclamation projects, conservation and watershed programs, and even credit and price-support programs also have production-increasing effects. All of these programs, including research and education, involve public investments that are intended to benefit agriculture. All need to be examined realistically in order to determine to what extent they temporarily aggravate the surplus problem, and how they might be modified to serve farmers more effectively in the years ahead.

Our assignment is limited to the effects of technological research and education. Frequently, their effects cannot be separated from other production-increasing activities, but insofar as they can be separated, the following questions would seem to be pertinent: Do they increase or decrease net farm income? How are the gains from technological improvement distributed? If the gains tend to be shifted away from farmers to the benefit of other groups, is there a conflict between progress and income improvement and stability in commercial agriculture? If so, can the conflict be reconciled?

To deal with these questions, it seems necessary to review briefly the objectives of technological research and education, and to trace the impacts of adoption of improvements with respect to:

1. Effects on output.
2. Short-run effects on costs, and on gross and net incomes of individual farmers.
   a. On initial adoption.
   b. When adoption becomes general.
3. Short-run effects on farmers as a group.
4. Short-run effects on other groups.
5. Long-run effects on farmers and other groups.

OBJECTIVES OF TECHNOLOGICAL RESEARCH AND EDUCATION

The objectives of technological research and education frequently are stated in the general terms of increasing the efficiency of agriculture. If more specific objectives are outlined, they usually illustrate how farmers would benefit if, for example, the yield of a crop is increased, or if the costs of producing it are reduced. Little attention has been given to how the benefits from increased efficiency are likely to be distributed, although the benefits to the general economy have been recognized. An individual worker in research or extension may put his objective simply as "helping farmers to make more money." The assumption here is that if individual farmers make more money, farmers as a group will profit also, and society as a whole will benefit. Unfortunately, the process is more complex than this, but as most of our research and education has proceeded on these assumptions, we need to examine the effects on this basis.

Technological research is conducted by public agencies, endowed institutions, and private firms. Public agencies and endowed institutions are primarily interested in advancement of knowledge and enhancement of farm and general welfare. Private firms are justifiably interested in developments that will be profitable to the firm, but they recognize that the improvements offered must also be profitable to the farmers who use them. The research under consideration may be applicable only to farm production as, for example, fertilizer, or it may be applicable to the economy generally, as are automobiles and motor trucks.

Whenever new production techniques are developed that decrease the total inputs of resources per unit of farm output, adoption of the new techniques is advantageous to individual farmers.[1] Educational activities are organized to disseminate to farmers the advantages of adopting new techniques of this kind. Sometimes the process of adoption involves development of the necessary technical and managerial skills that are needed for successful use of the new techniques. In fact, farmer "know how" is frequently the key element in profitable adoption. We should recognize also that the foundation for requisite knowledge is the increasingly higher level of basic education of farm people.

The primary appeal that education makes for adoption of improvements is the possibility of increased income to the individuals who adopt them. Or, in some instances, the appeal may be in terms of reducing the workload of the farm family. Advantages of improvements are made known to farmers through the various educational activities, and in that way adoption is accelerated.

Some of the farm programs supplement educational activities by providing direct financial and other inducements for adoption of improvements.

EFFECTS ON OUTPUT

Historically, substitution of mechanical power for animal power has been the most important output-increasing improvement in agriculture. Release for other uses of cropland that formerly produced feed for horses and mules on farms was responsible for about half the increase in output in the interwar years, and it has accounted for about one-fourth of the increase since the beginning of World War II. Since 1920, this land-saving improvement has released some 70 million acres, or about one-fifth of our harvested cropland, for production of marketable products.[2] Its future influence will be relatively small because less than 10 million acres are now used to produce feed for horses and mules.

Improvements in crops usually increase the yield per acre, and livestock improvements result in larger output per animal. In one sense, however, the large segment of research devoted to protection against pests and diseases of both crops and livestock is an exception. A large part of the current research program is needed merely to maintain the current level of production without contributing to an increase in output. Output likely would be greatly reduced if research in these fields were to be discontinued.

Similarly, protection research is needed to maintain our soil and water resources, although frequently maintenance is inseparably combined with improvement that results in larger output.

Machines that save either labor or capital usually have no direct

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[1]Assuming no change in factor prices, and that the necessary capital can be obtained.

[2]Substitution of mechanical for animal power also has been a major labor-saving innovation, and this has added to the problem of resource adjustment.

effect on output. An example of exceptions to the general rule would be a machine for more effective placement of fertilizer. In this instance crop yields might be increased even with some reduction in fertilizer use per acre. Also, if a new machine is labor-saving, it may release sufficient labor to permit increased output of the product on which it is used, or to expand the output of some other product. Similarly, if the purchase price of a machine is reduced because of technological improvements, the capital saved might be invested to increase output — for example, in the purchase of more fertilizer.

Although there are some exceptions, the conclusion appears to be well founded that most technological improvements do increase output. As previously noted, adoption of new technology increases output per unit of resources. The net effect on total output depends, among other things, on whether aggregate resource inputs are reduced. Figure 3.1 shows the trend of farm output in relation to the trend in population. The relatively faster rate of growth in farm output during the postwar years largely explains the unbalance between total farm output and available markets. It does not explain the unbalance in specific products, such as wheat and cotton. But if total farm output had not increased by 11 percent since 1951, or if it had increased by only half as much, price-cost relationships would now be much more favorable.

Undoubtedly, technological research and education have prepared the way for the increases in output that have occurred in recent years, as well as for the earlier increases that made it possible to provide

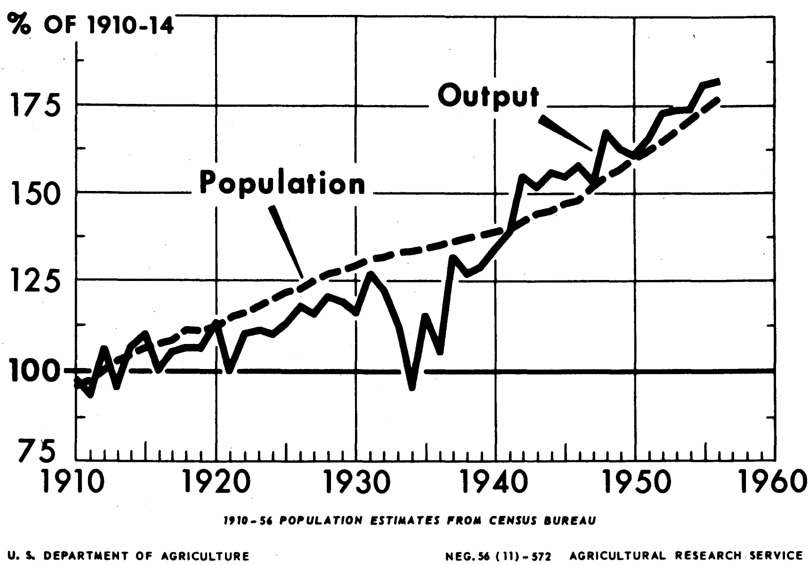

Fig. 3.1 - United States population and farm output.

"food enough" for ourselves and our friends abroad during the late war and its aftermath of rehabilitation. Neither technical advances nor the development of technical and managerial skills that made possible their adoption occurs spontaneously. They are largely the product of research and education. But the credit for the increased production during the war and its aftermath, as well as the responsibility for more rapid expansion of output than of markets in recent years, must be shared with the other production-increasing activities previously mentioned.

We shall not attempt in this paper to assess the relative importance of the different output-increasing activities. Much of the following discussion, therefore, relates to the effects of output-increasing forces from whatever source, recognizing that the initial impetus for much of the expansion is found in research and education. We shall discuss first the short-run effects, which may cover a period of several years, and then take up the longer run consequences to farmers and the general economy.

SHORT-RUN EFFECTS ON COSTS, AND ON GROSS AND NET INCOMES OF INDIVIDUAL FARMERS

It is generally recognized that the market demand for most farm products is so inelastic that a smaller total output of, say, wheat or potatoes, sells at prices enough higher to bring a higher gross value than would a larger output. Therefore, a cost-reducing improvement that increases production eventually may mean much lower prices for the product and a lower gross income to individual farmers, unless demand increases fast enough to absorb the additional output.

But individual farmers balance the advantage of adoption in relation to product prices without considering the potential price effects of larger supplies. And farmers who first adopt a cost-reducing and production-increasing improvement benefit from the resulting direct gain until or unless the price of the product is affected. Therefore, those farmers who first adopt a well tested improvement gain in the early period of its adoption. This is a powerful incentive for adoption by those in a financial position to make the change. In the case of price supported products, farmers continue to gain unless allotments and price supports are reduced as more surpluses accumulate.

We should also recognize that farmers who cannot, or who for some other reason do not, adopt the new techniques are not injured because other farmers adopt them until or unless the price of the product is reduced. However, the difference in net incomes will increase between those who adopt the improvement and those who lag in adoption.

What happens then, when a production-increasing improvement is widely adopted? If market demand is expanding rapidly, as it did during the war and rehabilitation years, the larger output is absorbed without a decline in prices. If the market expands at least as rapidly as the increase in output, individual farmers will retain the direct benefits, but other groups will benefit also because the larger output will become available at lower prices than would otherwise prevail.

Under less favorable conditions, demand may expand less rapidly than output, as in recent years, or it may fail to expand and perhaps may actually diminish. Prices are then likely to go down. How individual farmers fare under these conditions will depend on: (1) the extent of the decline in prices, (2) the cost structure which farmers have developed, and (3) their ability to adjust to the new situation.

Frequently, adoption of a production-increasing improvement involves a large fixed investment for equipment — supplemental irrigation, for example. Once such an investment has been made, it becomes for a number of years a fixed, or at least semifixed, input that has increased the total cost of operation despite significant reductions in cost per unit. Even variable costs such as fertilizer add to the total cost at the same time that cost per unit is decreased.

The added costs of producing the larger output may, therefore, result in a lower net return to the farmer when price declines result from a larger volume of marketable products. If the price goes down so much that the larger output brings no more gross income than before the improvement was adopted, individual farmers can continue to gain only if their total costs have been reduced in the adoption process. Although it is difficult to achieve a lower total cost for a larger output than was previously incurred for a smaller total output, it can be done under certain conditions. Usually it involves a reorganization of the entire farming system and a considerable saving of hired labor.

If a farmer's costs are higher than they were before he adopted the improvement, and his gross income has been reduced by declining prices, his annual loss may be greater than his annual gain during the first few years of adoption. But the road back to the previous position has been closed for a number of years. His investments for adopting the new practices have become a part of his fixed costs. Even if the new practice involves only variable costs such as fertilizer, he is likely to find that his net return would be lower if he lessened its use. As an individual operator, he cannot gain by reducing production.

SHORT-RUN EFFECTS ON FARMERS AS A GROUP

As indicated previously, all farmers who adopt an improvement retain the direct gains from adoption if the market demand is expanding fast enough to absorb the increase in output without a decline in prices. And as prices do not fall, the nonadopters are not injured. It can be argued that, with inelastic demand, prices would rise in response to a smaller supply under such conditions. Therefore, farmers would gain even more if production did not increase. But this condition would be purely temporary because other ways would be found to increase output, but at higher costs. Farmers would be even more vulnerable in the event of slackening demands. Therefore, the crucial question is how farmers as a group fare under a price decline resulting from a production-increasing improvement.

We have already traced the impact of a price decline on individual farmers and noted that they may lose part or all of the original gain from adoption of an improvement. In fact, their net incomes may be lower than before adoption. Under these conditions, the nonadopters would experience relatively greater income losses because they would have no increase in output to help offset the decline in price.

We conclude that, in the short run, price declines because of increases in output may result in annual losses to farmers as a group of part, all, or more than the original annual gain from adoption of an improvement. How long the annual losses will continue will depend upon how rapidly farmers can adjust to the new situation, as well as on whether market demand is expanding for the products affected.

Under the assumptions of perfect competition and free mobility of factors, enough resources should be shifted out of unprofitable enterprises to make production profitable again for those who have sufficient competitive advantage to remain in production. But whether such shifts actually will be made in the short run will depend upon the availability of better income alternatives to farm people who are caught in the squeeze; also upon whether they are in position to take advantage of other opportunities. A wheat producer with an $80,000 investment in land and equipment may not be able to liquidate without the loss of most of his capital. Consequently, he decides to weather the storm. Some producers who are heavily in debt may be forced to liquidate, but the land will move into financially stronger hands and remain in production. Such a shift, however, may result in higher incomes to the fewer workers who remain on farms. In farming areas where several enterprises are closely competitive, it may be possible to shift, say, from beef to dairy, or to cash crops. But when prices are relatively low in all lines, the only alternative is nonfarm employment, and even that may not be available at all times.

Adjustment to a surplus situation, whatever its origin, is likely to be both painful and slow. Moreover, the impediments to adjustment may be sufficiently strong to offset the forces that pull in the direction of adjustment. Consequently, a chronic condition will develop unless the impediments are removed. Our recent experience appears to verify these conclusions. Price, cost, and income relationships have been relatively unfavorable in most farming areas since 1951. Still, total farm output has moved upward by about 11 percent in five years. We had the same experience from 1922 to 1929, although output increased more slowly at that time — about 9 percent in seven years.

Why do farmers as a group increase output in the face of low net incomes? At present, our explanation consists of hypotheses that need quantitative verification. Perhaps the momentum gained in responding to earlier favorable price-cost relationships is a partial explanation. It is difficult for farmers to realize that market conditions have changed, and easier for them to assume that the price decline is temporary. In the more recent period, some of the investment for increased capacity made up to 1951 became available for increasing output after the price had dropped, and the pressure on farmers to utilize fixed resources needs no further elaboration. Also, some farmers find it profitable to adopt new production-increasing techniques even under relatively unfavorable conditions. Actually, however, farmers have been decreasing their rate of net investment in machinery since the peak year 1948. (See Fig. 3.2.) Purchases of new machinery in 1956 were at the lowest level since 1947. But machinery inventories are still quite adequate, and even further increases in output are not likely to be retarded by shortages of machinery.

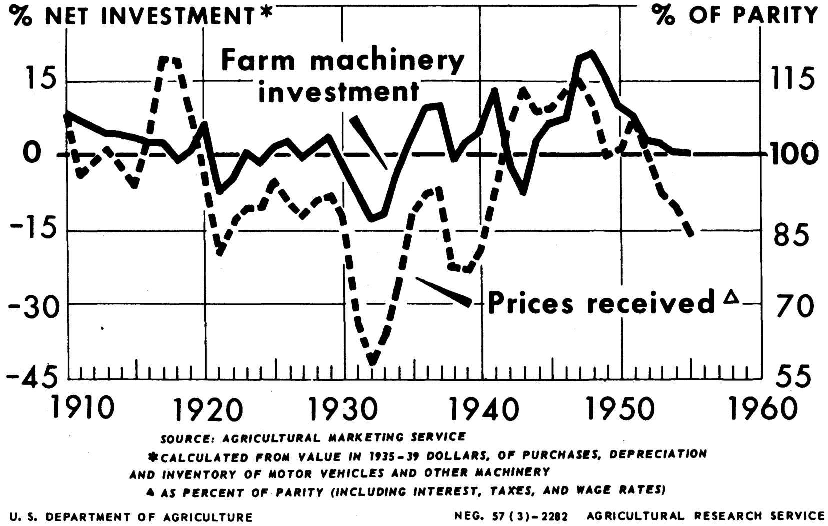

Fig. 3.2 - Farm machinery investment and farmers' prices in the United States.

From 1951 to 1955, farmers continued to increase their outlay for some of the variable cost items such as fertilizer, pesticides, and some of the processed feeds. Apparently, even at the lower prices for farm products, the return above these variable costs was sufficient to increase their use in combination with fixed inputs. Figure 3.3 reveals, however, that the rate of increase in the use of fertilizer has declined since 1950, and preliminary data indicate that the total quantity used in 1956 actually dropped slightly below the level of the previous year.

Acreage allotments and marketing quotas have been in effect for some crops during at least a part of this period. Although they have reduced production of cotton, wheat, rice, tobacco, and peanuts, other crops

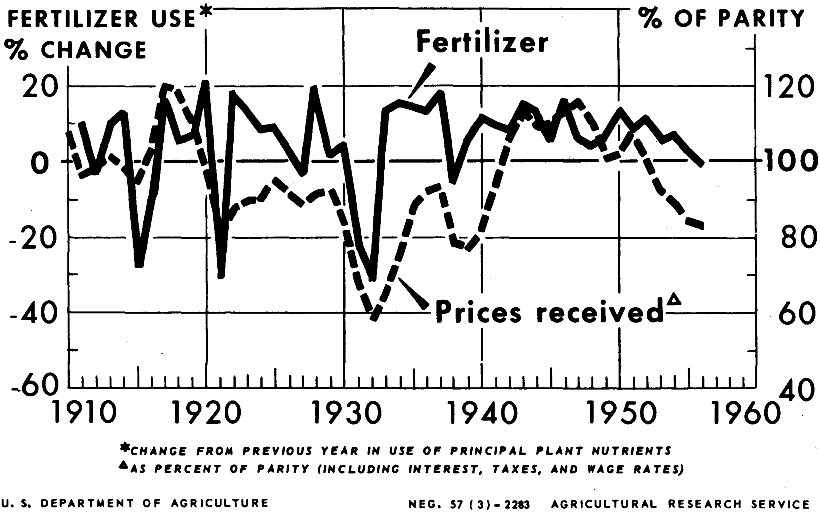

Fig. 3.3 - Fertilizer use and farmers' prices in the United States.

have been grown on most of the diverted acreage.[3] Also acreage restriction of price-supported crops induces greater use of fertilizer and other inputs on the limited acreage. Consequently, with higher production on the allotted acreage and substitute crops on the diverted acres, the net result in some instances may be an actual increase in total output.

Irrigation development resulting from both public and private investment has contributed to increased output. Conservation activities also have tended to increase output.

These developments have all resulted in higher production per acre. The rise in livestock production per breeding unit since 1950 has been even greater than the increase in production per acre. (See Fig. 3.4.) This is partly the result of a larger feed supply and, hence, is directly related to crop production. But it also stems from direct improvement in the livestock enterprises, especially in production of broilers, eggs, and milk. For example, a large number of the higher-producing cows resulting from artificial insemination have come into production in recent years. Antibiotics, and other feed additives, and disease control also have had significant effects.

If these tentative explanations are accepted for some of the output increases of recent years, what about the 1920's? There were no farm programs to give an upward push at that time. But the tractor, truck, and combine harvester had been developed to such a point that adoption

[3]"Effects of acreage-allotment programs 1954 and 1955: A summary report," Prod. Res. Rept. No. 3, ARS, USDA, June, 1956.

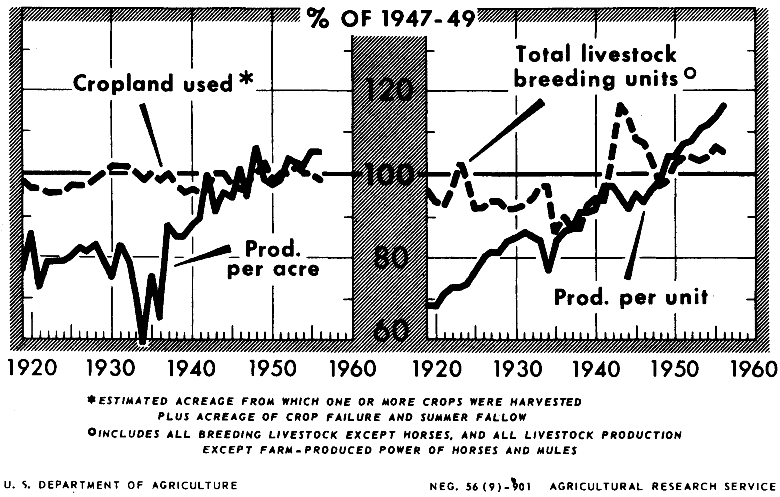

Fig. 3.4 - Farm production per acre and per animal in the United States.

constituted significant economies. Credit was available for purchase of these new machines. The equipment had a special advantage in the wheat areas, with the result that millions of acres of sod were broken in the Great Plains and the Pacific Northwest. Livestock production also increased during these years, as farmers were struggling to find more intensive enterprises to meet the fixed charges on high indebtedness incurred during the war boom. In one respect, the 1920's were more favorable to output expansion than the 1950's. Prices paid by farmers were much below 1920 levels, although they did not decline as much as prices received. Net farm incomes made some recovery in the 1920's.

Does the recent decrease in the rate of purchase of new machinery, and even in use of fertilizer, foreshadow a slowing down in output? Is this slowing down in farm expenditures and capital investment the result of financial exhaustion of many farmers and, therefore, a withdrawal of capital resources from production? Availability of nonfarm employment in recent years has continuously reduced the labor force on farms. About 9 percent fewer man-hours were used in 1956 than in 1951. But enough capital and current inputs have been substituted for labor to maintain total inputs and to achieve the increases in output. (See Fig. 3.5.) Assuming average weather, output will not be decreased unless there is an actual withdrawal of land, labor, or capital resources. The acreage reserve part of the Soil Bank will result in a temporary withdrawal of land resources, but a part of this effect could be offset rather soon by soil improvement and summer fallow on reserve acres, and by applying relatively more labor and capital to the land remaining in use.

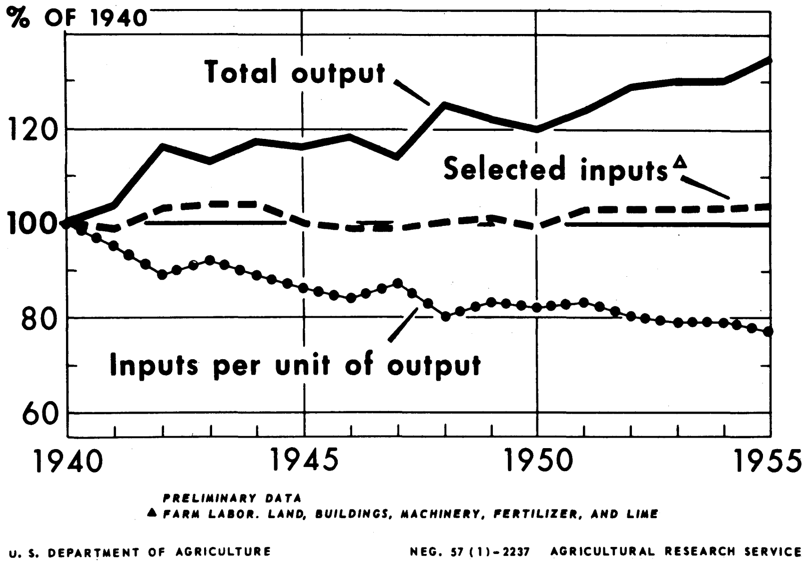

Fig. 3.5 - Farm inputs per unit of output.

SHORT-RUN EFFECTS ON OTHER GROUPS

When market demand increases, the general economy benefits from production-increasing improvements because the larger output tends to prevent a rise in prices. Under these conditions the benefits of improvement are shared by farmers and other groups. Farmers retain the direct gains, but other groups benefit from a larger output available at relatively lower prices. This was the case during the war and the early postwar years. But we have already seen that when production increases faster than demand for the product, the decline in prices will shift part or all of the original gain, or even more, away from farmers to other groups.

How much of the gain is passed on to consumers and how much is retained in processing and marketing channels depends on the organization of the processing and marketing channels and on the relative bargaining power of the groups engaged in these activities. In recent years, a considerable part of the gain has been absorbed by additional processing and marketing services, higher wages to workers in these fields, and increased profits in some lines.

It seems evident that other groups in the economy benefit from production-increasing improvements in agriculture under most circumstances. In periods of relatively low business activity, however, a labor-saving improvement that releases workers from agriculture may aggravate unemployment. Consequently, for the nation as a whole, the gains could be offset temporarily by the cost of unemployment relief.

LONG-RUN EFFECTS ON FARMERS AND OTHER GROUPS

In the longer run, technological research and education have contributed immensely to public welfare. The new technology has made possible increased production of food and fiber with much less labor and other resources. For example, with the farming practices in use as late as 1910, one farm worker could provide food and fiber enough for only 7 persons. In 1956 one farm worker provided enough for 20 persons. Over the years the farm labor released as a result of technological improvement has become available for development of other industries and services in our economy.[4] In this way, technological advances in farm production have contributed immeasurably to the technical and economic progress that has meant a high and still rising level of living in this country. Furthermore, in a growing economy greater farm output will be needed in the years ahead. For example, an increase in output of about one-fourth from 1956 to 1975 may be needed to meet projected market demands. However, most of the increase in demand will come in later years.

How do farm people share in the long-run benefits of improved technology? As consumers they share in the general economic progress. Perhaps the best test of their gains as producers is the trend of real incomes for farm workers. (See Fig. 3.6.) But other contributions to

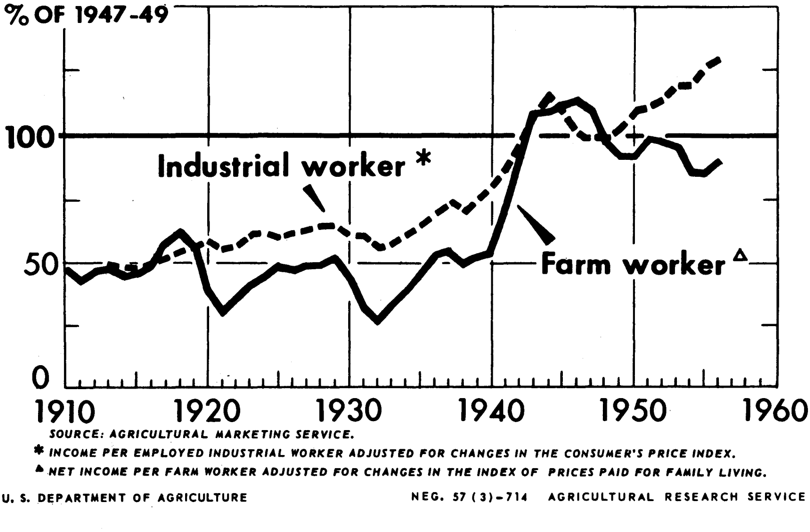

Fig. 3.6 - Real income of farm and industrial workers.

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[4]Some of the released labor is now engaged in producing goods and services formerly produced on the farm.

farm living also need to be considered. Electricity and other improvements have greatly relieved the burden of physical labor both on the farm and in the farm home. Community facilities now provide better education and health services. Improved roads and automobiles have brought local towns or even larger trading centers within a few minutes' ride. Rapid transportation, radio, and television also have increased urban contacts, and most farm people are now a part of the same cultural group as their urban cousins.

Better education and closer contacts with urban groups have greatly increased the mobility of human resources in agriculture. Farm people are now much better informed about income opportunities in nonfarm occupations. Good roads and automobiles have made it possible to combine rural living and nonfarm work and to explore work opportunities in other areas. Historically, adjustments in agriculture have been made more easily in the areas adjacent to urban development where other employment was available.

What would be the income and living conditions of farm people today if little or no technological improvement had taken place on farms since the beginning of World War I? The conditions that would have developed in this country with a combination of industrial progress and a static agriculture are almost impossible to visualize. Farm people isolated from urban developments probably would have become a peasant society. In other countries where those conditions have prevailed, we find either small peasant farms, or large farms operated with low-paid labor, or both types of situations. Undoubtedly, farm prices would have risen with the increase in market demands.[5] Increases in output then would have been obtained by devoting more of our land resources to crops and by applying more labor and capital to our productive lands. Land values probably would have absorbed most of the gains. In other words, the secular law of diminishing returns would have operated about as postulated by the classical economists. At any rate, it would be difficult to contend that farm people would have had a higher and more satisfactory level of living in the years since 1910.

Figure 3.6 indicates the broad sweep of changes in real income per worker of farm and factory workers since 1910. Perhaps a more effective and somewhat more valid comparison can be made by considering percentage changes in real income between periods of relatively low industrial unemployment. These comparisons are made in Table 3.1.

Real income per farm worker nearly doubled from the years 1910-14 to 1953-55. However, the real income per employed factory worker increased about one and a half times over the same period. In other words, although farm people have benefited greatly in an absolute sense, their rate of gain in real income has lagged considerably behind the gain achieved by factory workers. From the years 1947-49 to 1953-55, real

[5]More people would have remained in farming, and they would have increased production under existing technology. The cost structure, including land costs, probably would have been even higher; and commercial farmers with high fixed charges for debt service would have been in a vulnerable position in a period of slackening demands and declining prices.

Table 3.1. Comparisons of Real Income Change Between Farm and Factory Workers

	Percent change in real income per worker	
Period	Farm	Factory
1910-14 to 1925-29	8	29[a]
1918-20 to 1942-44	98	92
1910-14 to 1953-55	96	149[a]
1925-29 to 1953-55	81	92
1947-49 to 1953-55	-11[b]	21

[a]Based on a 1913-14 average for the beginning years.
[b]No adjustment is made for the higher equity investment per worker in 1953-55.

income per employed factory worker increased by 21 percent. The unfavorable income situation of recent years tends to obscure the long-term benefits. We must bear in mind, however, that technological developments are not responsible for all of the income changes — either favorable or unfavorable. And we must also recognize that short-run unfavorable developments, from whatever source, greatly retard the benefits of progress over the longer term, and may wipe them out entirely for many farm people.

CAN CONFLICTS BETWEEN PROGRESS AND INCOME IMPROVEMENT AND STABILITY BE RECONCILED?

It is evident that although farmers have benefited greatly from production-increasing improvements, the impacts of these improvements can also contribute to instability of income for farm people over the short run. But the solution to this problem does not lie in retardation of progress by restricting research on technological improvement. It must be found in removing the obstacles to adjustment that are the root causes of instability and in working out ameliorative measures to help those who encounter substantial hardship from major changes. Agriculture must go forward with the rest of the economy. We can no longer consider farm people as a group apart. Both technical and economic progress is necessary if agriculture is to provide income opportunities that will attract and retain persons of ability. Industrial progress and a static agriculture are incongruous under present conditions.

The real conflict between progress and income improvement and stability arises from assuming that adjustments to important technological developments, or to any other production-increasing forces, can be made automatically. For example, about half of the increase in output during the interwar years arose from substitution of mechanical power for animal power. One solution to this problem would have been to slow down or actually prevent this shift. Although it seems strange now, there were strong advocates of this solution at that time. The opposite solution would have been to adopt measures to facilitate adjustment to the new situation.

When surpluses and low prices became really serious because they were accentuated by deep depression, programs intended to relieve the surplus problem were developed. They were developed as emergency programs, however, and they did not have an adequate research foundation. The adjustment programs in effect today are based largely on those developed during the 1930's, and the research basis is still inadequate.

The question then arises as to what research can contribute toward facilitating adjustments to production-increasing improvements, or to other significant changes, and providing a better foundation for ameliorative programs. We believe that research can be organized in a way that will greatly facilitate adjustments to changing conditions. It can contribute along the following lines:

1. There are some opportunities for expanding markets beyond their normal rate of growth. For example, the development of the broiler industry probably expanded the total market for meat. In this way, it has caused a shifting of consumption from lower value to higher value products, and provided an opportunity for employment of more resources in agriculture.

2. It may be possible to develop new crops that will increase total market outlets. Earlier development of soybeans undoubtedly expanded the total market for farm products. There is some discussion now that entirely new uses can be found for castor beans. If these new uses can be found, the market for farm-produced oils will be expanded even more. But exploitation of this potential market depends on the development of economical methods of production, including an effective mechanical harvester.

3. Although many difficulties must be resolved in expanding export markets, research may reveal new foreign outlets that will result in increasing the market for farm products.

4. Research in the economics of production can greatly facilitate shifts toward the products with the greatest potential market expansion, including those indicated under points 1, 2, and 3. Such research will be needed especially if new crops or new uses are developed. But perhaps the most important contribution of research in the economics of production lies in facilitating shifts toward production of livestock products, fruits, and vegetables. The normal market expansion resulting from increases in population and in purchasing power seems likely to favor these products.

5. Research in economics of production needs to give special attention to the obstacles that prevent rapid adjustment to new conditions and ways of overcoming them. Research of this kind will include emphasis on improvement of the situation for those who suffer substantial hardship as a result of changing conditions. The goal should be to find ways of improving incomes for all farm people — hired workers as well as farm operators.

6. At present, farm workers probably would receive higher returns

if fewer production resources were used in agriculture. Economic analysis would suggest a shifting of the least productive resources into other uses. The conservation reserve features of the Soil Bank and the Great Plains conservation programs are directed toward this objective on the land front. Research is needed to make them more effective. For example, to the extent that entire farm units of low productivity can be shifted, both land and labor of relatively low productivity are devoted to more productive uses.

Shifting land of low productivity into grass or trees will build up a reserve of productive capacity that may be needed in an emergency or in the distant future. Other means of lessening present exploitation of land and water resources and conserving them for future needs should be fully explored. It may be possible also to slow down the rate of addition of capital inputs in agriculture, especially those that involve public investments for new development.

One of the goals of farm people that is frequently stated is an opportunity to earn real incomes equal to those available in other occupations with the same effort, skill, and managerial ability. Research is needed to determine the alternative ways of achieving this goal. Will it require better health, education, and other community facilities in rural areas? Will such facilities in turn improve the opportunity for some rural people to go into other occupations that afford a better outlet for their talents?

Here again, encouragement should be given to shifting resources that are now bringing the lowest return; for example, migratory labor and stoop labor of all kinds, provided that better income alternatives are available for these workers. Research to mechanize the operations performed by stoop labor will need to be stepped up to provide economical substitutes for low-paid hired labor.

7. Economists must be alert in detecting emerging changes and in analyzing their potential impacts. They should appraise the structure of agriculture that is likely to result from the pending changes and be in a position to suggest ways of modifying the effects of undesirable changes. For example, the potential effects of the increased tendency toward vertical integration of farm production with furnishing of farm supplies and with processing should be carefully analyzed. More and more projections of longer term prospects are needed, and great emphasis should be given to analyses of their implications concerning the future welfare of agriculture.

We conclude that physical and biological research should continue in all major areas. But greater emphasis should be given to basic research, to protection research as previously noted, and to other types of applied research that give promise of aid in solving adjustment problems; for example, more productive grasses for the Great Plains. However, the greatest need is for a combination of natural science research with greatly expanded research in economics of production. Research to facilitate adjustments to changing conditions is essential if farmers are to share fully in the benefits of technological progress. Finding a solution to the conflict between progress and income improvement and stability is the real challenge to researchers in economics.

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Discussion

SINCE there is little basis for disagreement with the analysis presented by Drs. Johnson and Barton, I shall devote most of my discussion to extending certain of the ideas developed by them. Most of my attention is directed to the long-run considerations.

The long-run distribution of the benefits of technical development (defined as shifting to a higher production function) in agriculture between farmers and non-farmers can assume three different forms:

1. The welfare of both farmers and non-farmers is improved.
2. The welfare of one group, farmers or non-farmers, is improved while the welfare of the other group is not changed.
3. The welfare of nonfarm groups is improved while the welfare of farmers is diminished.

If we ignore intra-group changes in welfare, we can conclude that either of the first two effects would improve the total welfare of society. However, since we are unable to make inter-personal comparisons, we must defer judgment on the third possibility.

In an earlier paper Dr. Johnson[1] states that agricultural economists tend to be pessimistic about the long-run benefits of technical development to farmers. He attributes this pessimism to a failure to appreciate possibilities of lower costs for a larger output through new production combinations. I believe this notion has merit although Dr. Johnson places less emphasis on this possibility in the present paper. Possibilities of lowering costs are perhaps greater in the case of labor-saving, land-using types of innovations.

Current research at Oklahoma A. and M. University indicates that the labor and machinery supply on the modal 320-acre and 640-acre north central Oklahoma wheat farms are the same. Similarly, there appears to be no real difference in the level of practices or the input-output relationships. Furthermore, the present organization and the programmed "optimum" plan is such that the crop acreages and livestock numbers simply double in moving from the one-half section to the one section unit. Thus, in this case, doubling the land input apparently

[1]Johnson, Sherman E., "Technological changes and the future of rural life," Jour. Farm Econ., Vol. 32, No. 2, May, 1950.

doubles the output with no increase in non-real-estate capital and little increase in hired labor.

There are, however, reasons to believe that the results mentioned (i.e., no change in output per acre after resources were recombined) are not applicable to any large number of resource situations. The area studied is one of homogenous soil resources where alternative enterprises and production practices are quite limited. In an area such as the Southeast, output per acre may well increase when units are consolidated due to the employment of more intensive production practices. Thus, perhaps we must tentatively conclude that innovations which lower total costs are the exception rather than the rule even after resources are recombined. In any event, it is significant that although the equipment making possible the savings indicated in the Oklahoma area have been available for many years, few operators have adjusted their resource combinations along the indicated lines. This is evidenced by the fact that the 320-acre unit is the modal farm size in the area.

If, as is generally agreed, technical innovations usually increase total costs, then in the absence of an increase in demand sufficiently great to increase the gross incomes of farmers as much or more than costs, successful technical research and education has a depressing effect on net incomes in agriculture. This follows from the inelastic nature of the demand function for farm products in the aggregate and for most individual products. Therefore, we would conclude that in the long run the major benefits of technical development in agriculture accrue to nonfarm segments of society. These benefits are in the form of resources made available to increase the production of non-subsistence goods and services. As Dr. Johnson indicates, these benefits to society have been tremendous. Yet as significant as technical progress in agriculture has been, we should recognize that certain measures tend to overestimate the resources released by agriculture. For example, some of the jobs formerly performed by farmers have been shifted to organizations serving farmers. Thus, some movement of labor from farms has not resulted in net reduction in labor employed in agricultural production.

The farmer as a member of society shares in long-run benefits of technical development in agriculture. In fact, most of the farmer benefits enumerated by Johnson accrue to farmers as consuming members of society rather than as producers of agricultural commodities. An additional important benefit is that the expanding nonfarm economy, made possible in no small part by technical development in agriculture, offers one means of facilitating the constant resource adjustments, within agriculture and between agriculture and other industries, which are a necessary part of a productive and growing economy. However, since, as the data presented by Johnson shows, farm incomes have not increased as much as those of other groups, farmers as consumers have not been able to share in the increased productivity of the economy to the extent that many nonfarm groups have. Furthermore, farm income data, such as those presented, reflect varying degrees of compensation paid farmers by society. Thus, such data would appear to underestimate the farm to nonfarm income transfers generated by market forces.

Technical research and education which reduce the risks and uncertainties of farming may increase the welfare of farmers even though they tend to reduce net incomes. Many of the technical developments which reduce risk and uncertainty are output increasing and, therefore, given a fixed demand, income reducing. However, if farmers prefer the lower but more certain income, farmer and society welfare may be increased by such innovations.

The innovating farmer in an area of rapid technological development, producing a commodity with a relatively high price and income elasticity of demand which has enjoyed rapid technological development, is in the most favorable position to make short- and long-run adjustments to technological developments. On the other hand, the farmer who is slow to adopt innovations, who is in an area of slow technological development, and who is producing a commodity for which development has been slow and which has a relatively low price and income elasticity of demand, is most adversely affected by technological development.

The various technological developments in agriculture have probably caused important long-term intra-industry income transfers. Technology has not been developed or adopted at the same rate in the different areas or with respect to different commodities. Such a differential rate of technological development benefits areas or commodities where development is more rapid at the expense of areas or commodities where development has been slower. In like manner, the early adopter benefits at the expense of the late adopter. Thus, even in the absence of inter-industry income transfers, technological development would not, in the long-run, appear to improve the position of one group without injuring other groups.

Intra-agricultural income transfers are most pronounced where there is a differential rate of technological development between competing products or competing areas. For example, the development of corn hybrids probably improved the position of producers in areas where corn yields were substantially increased relative to corn producers in other areas and producers of competing feed grains. In similar fashion newly developed hybrid grain sorghum may allow certain grain sorghum producers to gain at the expense of other feed grain producers.

An output increasing innovation can, of course, in the long-run decrease the incomes of the innovating group as well as competing groups. Whether this occurs depends on the extent to which prices are reduced relative to the per unit cost reduction resulting from the innovation. However, the important point is that even though an innovation increases the net income of farmers as a group, the welfare of farmers may be decreased due to changes in income distribution within agriculture.

Public research and education funds could be allocated so as to minimize income transfers within agriculture. Scientific discoveries or advances are probably not predictable. However, some degree of correlation would be expected between the funds and effort expended in a given area and the progress made in that area. Thus, major public research and education funds could be directed to depressed areas or commodities in an effort to equate, to some extent, the rate of technical development in agriculture. Such an allocation would not, however, maximize overall social progress from a given research input.[2]

The fact that research and education are not the sole factors responsible for shifting the agricultural supply function and that not all technological research and education are publicly sponsored are important points. The first point suggests that a given reduction in the rate of supply increase may be achieved, with less sacrifice of economic progress, by policies influencing non-research and education factors than by rationing, in some fashion, resources devoted to research and education. The fact that private firms are important elements in agricultural research and education implies that the rate of technical advance is not a variable that can be fully controlled by public policy. In fact, in a full employment economy, expansion of private agricultural research and education activities would be expected if publicly supported research were curtailed. In addition, only publicly supported research and education can be planned to guide progress in an optimum direction.

Dr. Johnson has outlined a challenging and extensive program of research designed to shed light on problems of resource and market adjustments in a growing economy. Over the past 50 years farm management workers in this country have made tremendous contributions to the efficiency of a growing commercial agriculture. During the next 50 years we must not only continue analyses of farm firms, but we must expand our efforts and direct more attention to analyses of factor markets and of the structural nature of dynamic supply functions. Farmers and society expect workers in farm management-production economics to provide a research basis for a rigorous and forward-looking evaluation of alternative resource-market adjustments. The interest evidenced in this conference certainly suggests that our profession will not betray this trust.

[2]Heady, Earl O., "Basic economic and welfare aspects of farm technological advance," Jour. Farm Econ., Vol. 31, No. 2, May, 1944.

PART II

Demand and Supply

Chapter 4

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Demand Functions and Prospects

THE QUESTIONS

THE primary question at issue for this conference can be posited simply: What will be the on-farm demand for major classes of farm products in each production period over the next 20 years? This simple question cannot really be answered — simply or otherwise. Ideally, net price-quantity functions together with output, factor price, and relevant general-economy relations could indicate magnitudes of alternative net returns streams and thus help to guide output adjustments. Commodity classes and markets should be defined to yield fairly low cross-demand and high cross-input relations to facilitate implementation of policy recommendations. All interrelated functions should be projected from a simultaneous system in which dynamic changes in variables and functional forms are explicitly introduced. Variables should include no processing or service components irrelevant to farm revenue. The system should reflect the impact of changes in market structure upon farm returns. Finally, possibilities for, and effects of, demand manipulation should be indicated.

METHODOLOGY

In general, available demand projections do not meet these specifications. Estimates of "needs" or requirements cannot easily be translated into unequivocal on-farm net price-quantity functions suitable for guiding input allocation.[1] Possible mutuality, temporal interrelations, and market-structure constraints are not always considered. Systems do not generally indicate means for controlling demand. However, these limitations are common to all projections and in those concerning food demand their adverse effects have usually been minimized.

[1]The following quotation illustrates the form projections commonly take: "The use of the term 'demand' in this paper is not synonymous with 'demand' in the usual economic sense, that is, the functional relationship between prices paid and quantities purchased. It is a broader term — widely used in outlook appraisals — that refers to total utilization of a commodity resulting from the combined influence of changes in price, changes in income, and changes in population." Cavin, James P., "Long-term outlook — trends in consumer demand," talk before 34th Agricultural Outlook Conference, Washington, D. C., Nov. 27, 1956, p. 3.

Nearly all economic projections involve essentially the same methods.[2] It is implicitly assumed that demand determinants and their interrelations are known from past experience; that reasonable limits can be assigned to their future dimensions and to both social variables and physical contexts as well; and that temporal changes in exogenous variables have been taken into account. Thus, projections indicate "acceptable" ranges of results consequent upon a disjunctive set of "reasonable" assumptions with respect to determining variables, their magnitudes, and interrelations. They are statements of this sort: If demand be generated within a specified system and if specified changes be introduced into the variables, their magnitudes, their functional interrelations, or the system itself, then future attributes of the demand may reasonably be expected to fall within indicated limits.

With a complete economic theory of change, relevant variables and relationships would be identified and others could be excluded. Without such theory, likely future patterns may be generated in many alternative ways, even if general agreement exists with respect to past observations over a period encompassing many significant changes in variables, their magnitudes, and relationships. Some demand projections, but not all, rest implicitly upon the orthodox static and disjunctive mechanism of individual demand theory which generates a simple system of determining variables and relations, imposes the constraint of maximization, and takes into account an undefined but complex battery of social and physical variables in the preference system. Most studies, however, depend explicitly on only one of the variables — income — specified by orthodox theory.

The preference system, income, and relative prices can define the static demand function of the individual. With fixed stocks of goods, a complete market system of exchange can be derived. If production and income-generating functions are introduced, a self-contained and consistent system for mutual determination of market inputs, outputs, costs, prices, incomes, and rates of purchase can be derived. Difficulties of aggregation are severe. A system based on classical theory is not statistically operational. Such demand constructs identify the relevant variables and impose broad limits upon likely functional forms and systems of determination. However, since neither the determinants of temporal changes nor their interrelationships are specified, there is no general agreement with respect to methods of projection. The effects attributed to preferences, population, and income changes appear in fact to be temporally interrelated in most demand projections. But, again, demand theory imposes no stringent limits on likely forms of such relationships. It seems impossible to derive operational hypotheses for projection from the limited propositions of orthodox demand theory.

Most published projections of farm demand seem to involve similar

[2] There is an excellent discussion of methodology in Kuznets, Simon, "Concepts and assumptions in long-term projections of national product," Long-Range Economic Projections, Studies in Income and Wealth, Princeton University Press, 1954, Vol. 16, pp. 9-42.

assumptions and operations.[3] Per-capita consumption rates are usually projected from income and price assumptions with shifts in preferences reflected in the income elasticities employed. A level of total population is then assumed and aggregate requirements defined. Thus, projections are usually net rates of purchase from which net price-quantity functions could presumably be adduced through adjustment for quantity-price elasticities. The explicit variables, then, are size of income and of population. Other attributes of both series which affect preferences may be implicitly introduced.

Generally, a global, all-commodity index is projected first. Base-period, per-capita takings at base-period prices are adjusted for projected incomes and then aggregated on the basis of population assumptions. Net export and nonfood demands are usually projected separately and often quite arbitrarily. Commodity projections are adduced separately and revised as necessary to achieve consistency with each other, with past relationships, and with the separately developed global projection. Thus, base-period consumption rates are assumed to change as fairly simple functions of population and income with constant base-period price ratios. Population projections are taken from demographers. Disposable income is projected from assumptions of number of workers employed, productivity per man-hour, and hours worked. Domestic utilization so estimated is then adjusted for net outside and nonfood uses.

A complete logical system cannot be derived from assumptions that: (1) net total consumption-total population elasticity is unity and (2) global projections so derived may then be adjusted through (a) assumed net consumption-income elasticities and (b) "judgment." No economy-wide or temporal interrelationships appear in the system. Assumption of constant price ratios or unexplained "adjustments" therein are disturbing. However, prices of many farm products and inputs are in fact tied together by close physical or economic interrelationships.[4] Base-period, net consumption-price coordinates are shifted rightward for population and for income, and then perhaps other "judgment" adjustments are made, particularly for relative price shifts. Such projections are not the ideal, but they may well indicate the general drift of future demands as well as more complex methods and as validly as production, cost, or supply projections.

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[3] For a comprehensive treatment of methodological aspects of farm-demand projections, see Daly, Rex F., "Some considerations in appraising the long-run prospects for agriculture," Long-Range Economic Projections, Studies in Income and Wealth, Vol. 16, pp. 131-89. Also, one of Cavin's studies, "Projections in agriculture," Long-Range Economic..., Vol. 16, pp. 107-30. Equilibrium supply-demand solutions for aggregate output and average price levels are developed under three sets of assumptions with respect to the general economic context in Cochrane, Willard W., and Lampe, Harlan C., "The nature of the race between food supplies and demand in the United States, 1951-75," Jour. Farm Econ., Vol. 35, No. 2, May, 1953, pp. 203-22.

[4] Schultz has argued that the relative price structure of major groups of farm foods tends to remain fairly stable in the long run. See Schultz, T. W., Economic Organization of Agriculture, McGraw-Hill Book Co., New York, 1953, p. 58.

THE DATA

The underlying logic calls for assumptions with respect to magnitudes of population, income, and those variables whose effect is determined by "judgment"; their preference-related attributes; and their net consumption elasticities at given price ratios. Data are also required to reduce retail-price-weighted-consumption projections of demand to farm levels. If market-structure and demand-manipulation changes are introduced, additional data are needed.

Population

Early projections of population were not realized because of higher-than-projected immigration, lower death rates, and sharply higher birth rates which may or may not represent a short-run bulge.[5] Structural changes in proportions of women married, age at marriage and first child, and perhaps in family size, appear to be basic factors in continuing the high birth rates of the 1940's. The Census Bureau published four projections of total population based respectively upon assumptions that (AA) 1954-55 rates would continue; and 1948-53 rates from 1955 bases would (A) continue through 1975; (B) continue to 1965 and decline thereafter to 1940 levels by 1975; and (C) decline continually, reaching 1940 rates in 1975 (Table 4.1).[6]

Table 4.1. Census Bureau Projections of Total United States Population (Including Armed Forces Overseas)*

Year	Series			
	AA	A	B	C
1960	179,358,000	177,840,000	177,840,000	176,452,000
1965	193,346,000	190,296,000	190,296,000	186,291,000
1970	209,380,000	204,620,000	202,984,000	196,370,000
1975	228,463,000	221,522,000	214,580,000	206,907,000

*Source: U. S. Bureau of the Census, Current Population Reports, Series P-25, No. 123, Oct. 20, 1955.

Assuming unit elasticity of food consumption and population, projections of "needs" or "requirements" can be generated as functions of population. There is, however, no "most reasonable" population series since no new pattern has yet definitely emerged. Population is the crucial series. The range in projected needs based upon divergent population assumptions is dangerously wide. This range is extended by

[5] Davis, Joseph S., "The population upsurge and the American economy, 1945-80," Jour. Polit. Econ., Vol. 61, No. 5, Oct., 1953, p. 371.

[6] For projections and discussion of various fertility assumptions, see U. S. Bureau of the Census, Current Population Reports. Series P-25, No. 123, Oct. 20, 1955; No. 78, Aug. 21, 1953. For earlier projections see No. 58, Apr. 17, 1952; No. 43, Aug. 10, 1950.

divergent assumptions of age, numbers of separate family units, and other population attributes related either to preference systems or to disposable income and usually introduced as a "judgment" adjustment.

However, with no change in real income or price relatives, domestic food needs could increase over 1955 levels by 12.7 to 17.0 percent in 1965 and by 25.2 to 38.3 percent in 1975 from population growth alone, assuming unit net elasticity of consumption with respect to population. The diversity of possible population assumptions leads to consequent diversity in projections of size of market, preference patterns, and income.

Disposable Income

Again, in the absence of any accepted theory of growth, many income projections are equally tenable. Income is usually related to population, number of employed workers, productivity, and hours worked, in a system which is operational and which is no weaker logically than more complex alternatives.

According to series AA, A, and B, United States population in 1975 may range from 215 to 228 million. Most entrants into the 1975 — or earlier — labor force are now living. Labor-force projections are, therefore, not greatly affected by changing birth rates. All three series project about 137 million people 14 years and older by 1965. Series A and B project about 159 million by 1975, and series AA about 161 million. Since 1945, from 57.2 to 58.8 percent of people 14 years and over have entered the labor force.[7] Percentage participation by particular age and sex groupings has been less stable. Expectations of wider schooling, early marriage, and high fertility lead to projected participation rates in 1965 and 1975 of slightly more than 57 percent.[8] This would mean about 78.3 million people in the labor force in 1965 and about 91.5 million in 1975 — an increase of about one-third over 1955. Most projections assume a decline in male participation to about two-thirds of the labor force, increased participation of women aged 35 to 64 years, and a lower percentage but a larger number of persons under 20 years in the labor force. Preference systems as well as incomes will vary with alternative labor-force assumptions. Despite the variety of assumptions, this is the most stable series in the system.

Productivity is defined in most analyses as real gross national product per man-hour of labor. More satisfying definitions usually cannot be quantified effectively.[9] Labor represents total factor input. Identity,

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[7]U.S. Bureau of the Census, Current Population Reports. Series P-50, No. 61, Dec., 1955, Table 1.

[8]U.S. Bureau of the Census, Current Population Reports. Series P-50, No. 69, Oct., 1956, Table 3. Separate age-sex group participation rates were obtained from this table and applied to population series AA, A, and B to obtain estimates of labor force.

[9]For a discussion of this point, see Kendrick, John W., "National Productivity and Its Long-Term Projection," Long-Range Economic Projections, Studies in Income and Wealth, Princeton University Press, 1954, Vol. 16, pp. 67-104.

magnitude, and combinations of all factor inputs are subsumed in the ratio. Estimates of average annual rate of increase in productivity have generally ranged from 2.1 to 2.5 percent. An average annual increase of 2.5 percent is generally projected.[10] With low-income elasticities, varying assumptions here yield relatively minor differences in projected demand.

Projected declines in average hours of work per week vary from 5 to 15 percent below 1955 levels, centering about a decline of some 5 percent by 1965 and 12 percent by 1975. Decrease in hours worked may be partly offset by increases in labor force participation.

With additional assumptions of an unemployment rate of 4.5 percent, and with no war, depression, or other major disaster, gross national product is usually projected by the relationship:

$$P_1 = P_0 \left[E \times \frac{H}{E} \times \frac{P}{H} \right],$$

where P_1 and P_0 are the projected and base period indices, respectively, of GNP, E_1 is the projected index of number of workers employed, $\frac{H}{E}$ is the projected index of average man-hours per worker, and $\frac{P}{H}$ is the projected index of average productivity per man-hour. In each case the base period index equals 100. From a 1955 base, the 1965 GNP would be up about 34 percent and for 1975 about 75 percent. It is generally assumed that total disposable income will be about 71 percent of GNP in 1965 and about 73 percent in 1975. The new postwar income distribution patterns have been remarkably stable, and these patterns are, therefore, extended to 1975.[11]

Other Variables

Base-period price relatives are required even for point projections of "needs" or "requirements." Price projections are also necessary to adjust individual commodity projections or to develop net consumption-price functions. "Judgment" adjustments usually imply assumed changes in preference structures, with specific variables sometimes used as surrogates. If changing market structure and demand promotion are related to on-farm demand, carrier variables must also be identified.

THE BASIC RELATIONSHIPS

Projection of base-period consumption-price coordinates requires assumption of net elasticities of consumption with respect to population

[10] This is the assumption employed by the U. S. President's Materials Policy Commission. See U. S. President's Materials Policy Commission, Resources for Freedom, 1952, Vol. 1, p. 7.

[11] U. S. Office of Business Economics, Survey of Current Business, Mar., 1955, p. 18.

and to income. A zero net consumption-price elasticity for total food is assumed in most studies. Other magnitudes are assigned in some cases when projecting consumption rates or deriving net consumption-price functions for particular commodity classes.

Observed consumption-population elasticity has approximated the assumed magnitude of unity. The effects of changing population characteristics upon individual commodity classes appear to have been offsetting. By 1965 the total population will increase about 15 percent and the 10 to 19 age group about 48 percent. This should increase average per-capita demand for milk, citrus juices, and cotton. Infants and children consume only one-half the calories required by an adult, but caloric intake of teen-agers is about 25 percent above adult levels. Thus, changes in age distribution may raise per-capita caloric consumption 3 to 5 percent by 1975 despite the increase in older age groups.

Regional differences in population patterns and, therefore, in demands are closely related to the income variable.[12] Moreover, diets appear to be increasingly homogeneous. Changing occupational — and perhaps other — population attributes may affect regional, commodity, or even total demand.

The net retail expenditures-income elasticity is about +0.4 and about +0.7 for the service components. Net on-farm value-income elasticity averages about +0.15 with a wide variation among commodities. Net on-farm tonnage-income elasticity is near zero. The major effects of rising per-capita real income consist mainly of a minor shift to higher cost foods and a great increase in service components. Income elasticities appear to be higher than the average of all farm products for beef, chicken, most leafy, green, and yellow vegetables, and citrus fruits; about average for pork, eggs, and most dairy products; and less than zero for wheat, flour, dry beans, peas, and sugar.[13]

Net consumption-price elasticity is usually either not explicitly considered in total consumption projections or, if introduced, is generally set near zero. In projecting individual commodity requirements, net price elasticities must be considered only if projections are "adjusted" or if net consumption-price functions are derived. The existence of a stable relative price structure together with low and declining on-farm price elasticities probably mitigate the effects of omitting this relationship. The assumption of constant price relatives is usually relaxed for livestock products on the grounds that "requirements" could not be produced at such ratios. At least implicitly, output for these products is taken to be determined simultaneously with "demand" but in an unspecified system.

American tastes have changed dramatically in association with

[12] U. S. Department of Agriculture, "Food consumption of urban families in the United States." Agr. Inf. Bul. No. 132, Oct., 1954, p. 9.

[13] For a discussion of empirical findings, see Daly, "The long-run demand for farm products," Agr. Econ. Res., Vol. 8, No. 3, July, 1956, pp. 73-91; Kuznets, George, "Measurement of market demand with particular reference to consumer demand for food," Jour. Farm Econ., Vol. 35, No. 5, Dec., 1953, pp. 878-95; and Schultz, *op. cit.*, pp. 44-82.

changes in population, income, labor-force constituency, dietary recommendations, processing and marketing technologies, market structure, perhaps promotion, and — almost surely — other factors. Thus far there has been no effective quantitative expression of the preference structure. Demands have shifted from carbohydrates and may be shifting now from certain animal fats.[14] Technological changes may affect both the form of products at retail and on-farm demands. Changing market structure may already have related requirements for type, uniformity, minimum quantity, terms of sale, and methods of distribution to farm returns. Promotion might conceivably have some net effect on consumption but its effects are, thus far, not measurable even for specific products. The relationships among these possible determinants of preference are largely nonquantified and perhaps largely nonquantifiable.

OTHER DEMANDS

The two-variable plus "other factors" projection mechanism is not usually replicated for nonfood items, which comprise more than one-third of the value of farm production.[15] Three-fourths of nonfood output is used as farm inputs — mainly feed. Consequently, demand projections for meats and feed-livestock conversion ratios must be major variables in the nonfood projection system, but few explicit references are made to them. Changes in particular demands are usually projected with fibers dependent on income and technology; tobacco dependent in part on medical research findings; and fats and oils dependent mainly on synthetic detergents, paints, and varnishes.

Foreign takings of major exported commodities such as wheat and flour, cotton, tobacco, and oils must be projected on quite arbitrary assumptions. Higher world population and per-capita incomes may reasonably be projected, but assumptions with respect to development and trade policies, exchange balances, and foreign aid are of a different order. Most studies project 1975 exports at levels somewhat below the 1955-56 volume without full explanation of the generating system.

PROJECTED DEMAND PATTERNS

The U. S. Department of Agriculture projections prepared by Dr. Daly generate increases between 1955 and 1975 of about 90 percent in GNP and 50 percent in average per-capita real income. As supplements, projections are also based on: population levels AA, A, and B; an

[14] U. S. Agricultural Marketing Service, The national food situation, Nov. 7, 1955 (outlook issue, NFS-74, 1956), p. 25. Also, Sebrell, W. H., Jr., "Nutrition — past and future," Proc. Nat. Food and Nutr. Inst., Agriculture Handbook No. 56, July, 1953, pp. 3-12.

[15] The U. S. Department of Agriculture concept of a "total flow of goods produced by agriculture" is used to define farm production. See U. S. Department of Agriculture, "Measuring the supply and utilization of farm commodities," Agriculture Handbook No. 91, Nov., 1955, pp. 16 and 83.

unemployment rate of 4.5 percent; an annual increase of 2.5 percent in output per man-hour; and a decrease of 5 percent in average hours per week by 1965 and of 12 percent by 1975. For all projections an average on-farm consumption-income elasticity of +0.2 is assumed.

Projections of demand determinants suggested by Dr. Daly imply a 1975 per-capita food consumption of 110 percent and aggregate consumption of 140 percent of 1955 levels. The three other projections also indicate that total demand may be expected to rise about 20 percent by 1965 and between 40 and 50 percent by 1975. Population change is the main determinant with income change a less important determinant. Within the limits noted, these shifts in "needs" may be taken as measures of change in aggregate on-farm demand. These projections are presented in Table 4.2. The total nonfood demand, projected to 1975 by aggregating commodity class projections, is expected to increase between 40 and 45 percent above 1955 levels. Export demand is expected to fall slightly below 1955-56 levels.

Dr. Daly's 1975 projections of per-capita and total utilization indices for commodity classes are presented in the two columns marked "I" in Table 4.3. Per-capita and aggregate use are also projected on the basis of a 1975 population of 221.5 million and a GNP of 680 billion dollars, using Dr. Daly's basic methods insofar as possible. These are shown in the columns marked "II." Only a few items are threatened with shrinkage in aggregate requirements. Relative changes in "requirements" do not necessarily indicate relative profitability in production with either set of assumptions. The smallest increases are projected for nonfood fats and oils, fruits other than citrus, sugar, potatoes, and wheat. Percentage increases in "requirements" for dairy products, eggs, and vegetables other than tomatoes and the leafy, green, or yellow items, are about the same as for the total food market. "Requirements" for meats and meat products, and thus for feeds and forage crops, will apparently increase at a faster than average rate.

These are all well-established trends. However, changes in market structure may shift on-farm demands sharply in terms of type of product and in terms and methods of sale. Expansion of prefabrication and convenience processing could also introduce new variables into the farm-demand function. And if the commodity projections are used as guides to production, price elasticities must also be projected.

IMPLICATIONS OF FINDINGS

There is no clearly articulated theory of economic change from which workable hypotheses can be derived to guide selection of data and functional forms. Thus, there are many equally tenable methods of projection. Most demand projections measure net price-quantity relationships in a base period and project them within a simple system. Measurement techniques are rudimentary largely because the concepts themselves are crudely defined and are not couched in a complete theoretical structure.

Table 4.2. Projected 1965 and 1975 Aggregate Domestic Food Consumption Under Several Alternative Assumptions

		1965		1975			
	1955	AA	A and B	AA	A	B	Daly[a]
Gross national product (billion dollars)[b]	390.9	524.2	524.2	684.5	679.8	679.8	725-750
Population (millions)	165.3	193.3	190.3	228.5	221.5	214.6	210.0
Disposable income (billion dollars)	270.6	372.2	372.2	499.7	496.3	496.3	519.8
Disposable income per capita (dollars)	1,637.0	1,926.0	1,956.0	2,187.0	2,241.0	2,313.0	2,475.0
Labor force (millions)	68.9	78.3	78.3	92.0	91.4	91.4	90-95
Labor force employed (millions)	66.2	74.8	74.8	87.9	87.3	87.3	88.3
Computation of GNP							
Index of number employed	100.0	112.9	112.9	132.7	131.8	131.8	133.4
Index of productivity	100.0	125.0	125.0	150.0	150.0	150.0	140.0
Index of hours expended per worker	100.0	95.0	95.0	88.0	88.0	88.0	
Product of indices	100.0	134.1	134.1	175.1	173.9	173.9	186.8
Computation of index of aggregate consumption							
Index of population	100.0	116.9	115.1	138.2	134.0	129.8	127.0
Index of per-capita food consumption	100.0	103.5	103.9	106.7	107.4	108.3	110.2
Index of aggregate consumption	100.0	121.0	119.6	147.5	143.9	140.6	140.0

[a] The assumptions used by Dr. Rex F. Daly are developed in: "Appraising longer run demand prospects for farm products," Increasing Understanding of Public Problems and Policies, 1956, Farm Foundation, pp. 49-66. Also, "The long-run demand for farm products," Agr. Econ. Res., Vol. 8, No. 3, July, 1956, pp. 73-91.

[b] Projections for population assumptions AA, A, and B are made on the basis of the 1955 price level by multiplying 1955 GNP by the product of the three indices: index of number employed, index of productivity, and index of hours expended per worker.

Table 4.3. Indices of Per-Capita and Total Utilization (Including Exports) of Major Agricultural Commodities — Two Projections for 1975*

Commodity group	1975 per-capita utilization I	1975 per-capita utilization II	1975 total utilization I	1975 total utilization II
	1953 = 100			
Food use				
Meat				
Beef and veal	109	107	138	143
Pork (excluding lard)	119	114	152	154
Lamb and mutton	87	90	113	124
Total	113	109	143	146
Poultry products				
Chickens and turkeys	119	114	153	155
Eggs	108	106	140	145
Dairy products				
Total milk equivalent	106	104	134	140
Fats and oils: food	105	103	148	154
Fruit				
Citrus	136	127	176	173
Other	107	105	131	136
Vegetables				
Tomatoes	122	117	154	155
Leafy green and yellow	115	111	145	148
Other	112	109	138	142
Potatoes and sweet potatoes	85	89	106	117
Wheat	89	92	104	114
Sugar	97	97	126	134
Nonfood use				
Fats and oils: nonfood	97	98	131	139
Feed concentrates	--	--	142	145
Cotton	115	111	143	146
Tobacco	119	115	155	157

*Sources:

I—Projections by Dr. Rex Daly in: "Appraising longer run demand prospects for farm products," Increasing Understanding of Public Problems and Policies, 1956, Farm Foundation, pp. 49-66. Also, "The long-run demand for farm products," Agr. Econ. Res., Vol. 8, No. 3, July, 1956, pp. 73-91.

II—Dr. Daly's projections adjusted by authors for a population of 221.5 million and GNP of 680 billion dollars.

Demand Prospects

The assumptions upon which a 40 to 45 percent increase in total consumption is projected over the two decades ending in 1975 are not unreasonable. This is the relevant estimate for determining resources which need to be used in agriculture as a whole. With respect to optimum input allocations among particular products, all projections indicate essentially a continuation of trends well established in the last decade or more. Despite inherent and inescapable limitations of current predicting methods, the broad outlines of future demands may be sketched in more effectively through use of these than through blind guessing, to provide part of the necessary data in planning adjustments by commodities, seasons, or regions. Technical implications of the projected demand shifts involve appraisal of increasing crop yields versus addition of land; conversion of feeds into livestock products at levels implicit in the demand projections; and fertilization, supplemental irrigation, and other cost-increasing technological changes or shifts in input allocation dictated by relative net income prospects. Projections are dangerous. Food-demand projections involve two special dangers — the difficulty of deflating for services at retail and adjusting for changing market structure. Long-term planning must, therefore, be kept fluid.

Possibilities of Increasing Demand

One possible line of adjustment in trying to solve the agricultural problem is to manipulate demand. Conceptually, demand can be shifted by controlling preference structures through advertising, promotion, or education; by lowering cross-demand elasticities through product differentiation; and by manipulation of income distributions. Most proposals for manipulating demand for agricultural commodities involve promotion and differentiation, either to increase real expenditures for farm products as a whole or to shift relative expenditures among commodity lines or items.[16]

Thus far, net effects of various means to decrease substitution elasticities or to increase demand for agricultural commodities have not been measurable — not even for single products, and certainly not for multiple-product enterprises or for broad sectors of the industry. Long-run changes in tastes have had drastic effects on the demand for commodities and on enterprises. Some of them seem to be related to population and income patterns. But preference systems are not really defined quantitatively and, thus far, efforts to specify net effects on demands of variables thought to reflect changes in preferences have not been successful.

[16] For a discussion of possibilities of sales promotion and advertising, see Cochrane, W. W., "Advertising ... fact or fancy?" Farm Policy Forum, Vol. 9, No. 1, Summer, 1956, pp. 28-32. Also, "Some additional views on demand and supply," pp. 94-106, in this book.

Experience indicates that demands shift toward livestock products as incomes rise. Thus, there is no logical reason to believe that total consumption could be affected any more favorably by advertising than by increased income; nor in all likelihood could advertising have any sustained effect upon any class of product to which demand does not normally drift as incomes rise. Efforts to manipulate food demand through advertising and other promotional methods cannot be expected to serve as a fully effective method of solving the farm problem and achieving future economic adjustments. If this is true, then the mechanism associated with achieving adjustment of farm production should be analyzed.

Chapter 5

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Supply Function—Some Facts and Notions*

HISTORICAL perspective is ordinarily desirable; for this conference it is essential if we are to avoid repetition of past work and concentrate on areas requiring further development. Space limitations do not permit an historical recounting of works on supply responses in this paper. As, unfortunately, I am unaware of a suitable reference to cite, the long footnote below sketches, hastily, some of the main contributions in recent decades.[1]

*Michigan Agricultural Experiment Station Paper 2049. This paper is based on work done at the Michigan Agricultural Experiment Station and at the Giannini Foundation, University of California, Berkeley, California.

[1]In 1938, Galbraith and Black published an article which reviewed the then-current explanations of the maintenance of agricultural production during depression years. (See Galbraith, J. K., and Black, John D., "Maintenance of agricultural production during depression: the explanations reviewed," Jour. Polit. Econ., Vol. 46, 1938, pp. 305-23.) After reviewing and, for the most part, rejecting the explanations, they advanced their own explanation of continued high-level production during depression. As they saw it, and in accordance with classical and neo-classical theory, fixed assets but not fixed charges contribute to the maintenance of output during depressions. The role played by fixed assets in their explanation was the poorly understood role which fixed assets play in neo-classical theory. In other words the "whys" of asset fixity or variability were not fully explained by either the Galbraith-Black article or the neo-classical theory used therein.

In 1945, T. W. Schultz published his Agriculture in an Unstable Economy, McGraw-Hill, New York, an excellent secular analysis of differential rates of growth in supply and demand for farm products, the intellectual roots of which are to be found in the works of Mill, J. S., Principles of Political Economy, Longmans, Green and Co., London, Book IV, ed. W. J. Ashley, 1923. Mill, in turn, built on the works of Malthus. Schultz modified the Malthus-Mill analysis by introducing labor saving, technological growth, and capital accumulation as upward shifters of supply curves for farm products, both individually and in the aggregate. He concluded that, secularly, (1) the growth of supply for farm products tends to exceed the growth in demand, particularly for the high-calorie, low-income-demand elasticity products with adverse effects on the terms of exchange between farmers and others, and (2) the need to transfer capital into and labor out of agriculture depresses labor earnings and maintains capital earnings in farming.

Also in 1945, Johnson, D. Gale, Forward Pricing for Agriculture, The University of Chicago Press, Chicago, concentrated on price instabilities. His work too, had respectable, though younger, ancestors; it was based on Knight's and Hart's earlier works on risk, uncertainty, and profits. (See Knight, Frank H., Risk, Uncertainty and Profits, Houghton Mifflin Co., Boston and New York, 1921; and Hart, A. G., "Risk, uncertainty and the unprofitability of compounding probabilities," Readings in the Theory of Income Distribution, The Blakiston Co., Philadelphia, 1946, and "Anticipations, uncertainty, and dynamic planning," Studies in Business Administration, Vol. 11, No. 1, The University of Chicago Press, Chicago, 1940.) Both short-run and business cycle price instabilities were considered. Capital rationing, as a consequence of price risks, was envisioned as a major restriction on supply responses which deters agriculture from reaching optimum economic adjustment as defined in static equilibrium economics. The forward price proposal is essentially a method

When studying the works of Galbraith and Black, Schultz, D. Gale Johnson, Cochrane, Brewster and Parsons, the reader finds himself in general empirical agreement with the input-output facts presented by authors trying to explain supply responses. As far as short-run changes in the supply of individual products are concerned, economists appear to be in substantial agreement both conceptually and empirically as to the factors affecting supply and their quantitative influences. Even

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for removing price risks to enable the economy to attain more fully the benefits of reaching static optima. Harold Halcrow also studied weather risk and crop insurance. (See "Actuarial structures for crop insurance," Jour. Farm Econ., Vol. 31, Aug., 1949).

Two papers, one by Brewster and Parsons in 1946 and another by Ellickson and Parsons in 1947, stressed the roles of technology and "workman like" as contrasted with "business like," determinants of agricultural productivity. (See Brewster, John M., and Parsons, Howard L., "Can prices allocate resources in American agriculture?" Jour. Farm Econ., Vol. 28, Nov., 1946, pp. 938f., and Ellickson, John C., and Brewster, John M., "Technological advance and the structure of American agriculture," Jour. Farm Econ., Vol. 29, Nov., 1947, pp. 827f.)

Cochrane began to write on the subject of supply responses in 1947. (See Cochrane, Willard W., "Farm price gyrations — an aggregative hypothesis," Jour. Farm Econ., Vol. 29, May, 1947, pp. 383f., and Wilcox, Walter W., and Cochrane, Willard W., Economics of American Agriculture, Prentice-Hall, Inc., New York, 1951, Chap. 24, Cochrane, Willard W., and Butz, William T., "Output resources of farm firms," Jour. Farm Econ., Vol. 33, Nov., 1951, pp. 445f.) With respect to supply responses for individual commodities within agriculture, he placed heavy reliance on the classical, marginal principle of opportunity cost. He uses this principle to explain the allocation of assets fixed for firms among the different products. He does not explain why such assets are fixed for the firm but not for individual enterprises; but then, neither did Marshall. Supply responses to completely variable inputs were not carefully considered either. The burden of explaining change or lack of change in aggregate farm output is placed almost entirely on technology. While technological advance explains *part* of the *expansions* in aggregate output, it (technology, not Cochrane's analysis) does not appear to explain failures of aggregate output to contract or some of the resource flows both into and out of agriculture which, fortunately for Cochrane's analysis, have tended to cancel each other. We need a better set of hypotheses to explain when assets are fixed, when they become variable upward, and when they become variable downward for firms and for industries as well as between the enterprises of multiple enterprise firms.

In 1950, D. Gale Johnson specifically examined the supply function for agriculture. (See Johnson, D. Gale, "The nature of the supply function for agriculture products," Amer. Econ. Rev., Vol. 40, pp. 539f.) He related his analysis to the earlier Galbraith-Black article and emphasized the difference between supply responses under depression and prosperity conditions. While he rejected as invalid the belief that high fixed costs are responsible for the failure of farmers to reduce output during a depression, he did consider how the availability of different classes of productive resources to the agricultural industry vary under depression and prosperity conditions and, hence, have differential impacts on the amounts of farm products produced. While Johnson's analysis represented a distinct improvement over earlier analyses, the treatment of fixed assets was not complete enough to explain why they do or do not flow between the farm and nonfarm sectors under different conditions.

T. W. Schultz has made three more recent contributions to the literature on supply responses. (See Schultz, T. W., The Economic Organization of Agriculture, McGraw-Hill, New York, 1953; "Reflections on agricultural production, output and supply," Jour. Farm Econ., Vol. 38, Aug., 1956, pp. 748f; and a paper read at the 1956 annual meetings of the American Farm Economic Association at Asilomar, Pacific Grove, California). As his thinking is changing rapidly, his current position is difficult to determine. By and large, however, it seems safe to say that it is moving in the direction of the Cochranian analysis, i.e., the major burden for explaining changes in the aggregate output of American agriculture is placed on technology and education (improvement in the quality of the human agent) rather than on changes in resources used.

In 1955, Earl Heady presented a paper on the supply of farm products at full employment. (See Heady, Earl O., "The supply of farm products under conditions of full employment," Amer. Econ. Rev., Vol. 45, May, 1955, pp. 228f.) Heady, like Galbraith and Black earlier, and D. Gale Johnson later, stuck close to neo-classical marginal analysis. His

T. W. Schultz in his more critical moods has not really questioned the adequacy of our quantitative knowledge of supply responses for individual products; instead, he has stressed the inadequacy of our knowledge concerning changes in the aggregate supply of farm products. Galbraith-Black's depression presentation, D. Gale Johnson's depression-prosperity contrast, and Heady's more detailed examination of the full-employment situation seem lacking, conceptually, in explaining asset fixities and their influences on the aggregate supply function. The Cochrane and Schultz technological analyses do little to remedy the situation, though the earlier secular analysis of growth in the supply and demand for farm products, made by Schultz, appears to remain very satisfactory. Thus, what follows is based on the conviction that the deficiency in our past attempts to understand agriculture's aggregate supply function is not in omitted variables; instead, the difficulty appears to be primarily in the analytical apparatus.[2]

A slightly modified form of neo-classical marginal analysis is available and promises to handle fixed assets, quasi-rents, capital gains, marginal costs and supply responses more adequately than the unmodified neo-classical analysis used by Galbraith-Black, D. Gale Johnson and Heady. This analysis, in turn, can be combined with analyses which include technology, education, capital growth, risk, etc.

THE MODIFIED ANALYSIS

The most neglected aspect of current aggregative supply analysis

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analysis of the supply of individual farm products closely resembles Cochrane's. Both analyses explain short-run supply changes for individual products largely in terms of opportunity costs in the allocation of fixed inputs in multiple enterprise firms. The two analyses, however, part ways when the aggregate supply of farm products is considered. Heady, in disagreement with Cochrane and in some disagreement with Schultz (at least as to emphasis) finds in his full employment analysis much greater possibilities for aggregate output to respond positively and negatively to changes in "factor/product price ratios."

While Heady's paper is not empirical, he does marshal enough evidence of aggregate resource flows (both in and out of the agricultural sector) in response to price changes under full employment to suggest strongly that a properly identified aggregate supply function would have a positive slope. He agrees that the elasticity of the supply function is low, though not as low as it appears. Heady explains the low elasticity of the aggregate supply curve in terms of: (1) low reservation prices for family labor in farming, (2) capital limitations, including capital rationing, resulting from risk discounting, (3) asset fixities and miscellaneous forces such as "the close bonds between the firm and household," low reservation prices on particular resources, and a greater degree of short-run fixed costs. Forces contributing to an "apparent" inelasticity of the aggregate supply function include, in addition to Working's and Frisch's "identification problem,": (1) flexibility in factor prices, (2) technical change, and (3) capital accumulation and redistribution of assets. While Heady identifies more of the relevant variables than D. Gale Johnson and appears to have judged the situation better than Cochrane and Schultz, his analysis still seems somewhat short insofar as the theory of asset fixity is concerned.

[2]Schultz feels that we have neglected technology and education, yet Heady considered technology in terms which do not preclude education to "improve the quality of the human agent" — so did Galbraith and D. Gale Johnson. As a matter of fact, so did Schultz himself in his book, Agriculture in an Unstable Economy; if he had not, he would have produced another of book 4 in J. S. Mill's Principles of Political Economy.

for agriculture is the theory of fixed assets. This neglect can be traced back into the classical and neo-classical marginal apparatus on which many of the existing supply analyses are based. Analytically, the law of diminishing returns (or of variable proportions) operates when different amounts of variable inputs are used in conjunction with a set of fixed assets. The law of diminishing returns, in turn, determines the nature of the marginal cost curve for individual enterprises and, ultimately, of the aggregate supply curve for an industry. The rate at which the marginal productivity of variable inputs declines depends on the proportion of fixed inputs, the levels at which they are fixed, and the degree of substitutability or complementarity between fixed and variable resources. Thus, it is extremely important that the framework employed in analyzing supply problems be capable of determining: (1) which assets are fixed and (2) the levels at which they are fixed. Furthermore, it is important that the analytical framework define fixity with respect to: (1) assets used in multiple-product firms, (2) single-product firms, (3) single-product industries, and (4) multiple-product industries.

The neo-classical, marginal apparatus includes the opportunity cost principle for purposes of pricing multiple-use, fixed assets within multiple enterprise firms.[3]

Similarly, neo-classical analysis has a well developed body of theory for treating land as an asset which is fixed for the agricultural industry as a whole. The neo-classical framework, however, is almost devoid of explanations as to why assets are fixed for a firm, making it necessary to apply the opportunity cost principle. Similarly, it does not explain why assets become fixed for industries but not for firms within industry. When it became apparent in the development of economic thought that land and fixed capital goods have many things in common, this difficulty was met, in part, with the concept of quasi-rents. After that, came the question of whether quasi-rents could be negative as well as positive. Stigler has argued this question without producing a worthwhile conceptual solution.[4]

Micro-production economists conducting empirical work in the field of farm management also encountered related problems involving fixed assets. First, it is clear that a different sub-production function exists out of, say, $y = f(x_1, \ldots\ldots, x_i \ldots\ldots, x_n)$ for each of the infinite number of combinations of x_i and levels at which the x_i can be fixed. Instead of (1) an ultimate short run in which all are fixed, (2) a short run in which some are fixed, and (3) an ultimate long run in which no assets are fixed,[5] there is a multiplicity of lengths of run. Secondly, it is also clear that there is more than just a short and a long run in the pricing of fixed assets. In the short run, farmers do not stay in production

[3]This principle has been used effectively by Galbraith-Black, D. Gale Johnson, Cochrane, and Heady in analyzing supply responses for individual products produced by multiple enterprise firms.

[4]Marshall, Alfred, Principles of Economics, 8th ed., Macmillan, London, 1920, p. 426n., and Stigler, G. J., The Theory of Competitive Price, The MacMillan Co., New York, p. 180n.

[5]See Marshall, Alfred, Principles of Economics, Macmillan and Co. Ltd., London, 1946, pp. 376-7.

until marginal revenue equals marginal cost at the minimum point on the average variable cost curve.[6] In milk production, the number of cows in a herd is sometimes fixed and sometimes variable. Furthermore, the quasi-rents on cows sometimes appear to be both positive and negative simultaneously; in 1953 quasi-rents appeared negative with respect to what had been paid for cows in 1952 but positive with respect to what the nonfarm economy would pay for them in 1953. Cows become variable when they are worth less in the herd than they are to someone else, either another farmer or the packing house. Hence, farmers shift from the "length of run" in which cows are fixed to the one in which they are variable, long before marginal costs equal average variable costs on the particular sub-set of cost curves which treats cows as fixed assets.[7] If cows flow from farm to farm, both the supply of milk and the aggregate supply curve for agriculture are unaffected. However, if they flow from farm to packing house, both the milk supply function and the aggregate supply function shift downward because of less milk and upward because of more meat unless changes in the dairy cow inventory are taken into account.

These questions involving fixed assets, lengths of run, negative and positive quasi-rents[8] tend to be avoided in the neo-classical analysis by assuming either perfect factor markets[9] (i.e. markets in which firms can buy and sell or industry acquire and dispose of inputs at the same price) or completely imperfect markets (i.e. markets in which the costs of acquisition are infinitely high and salvage values are zero for economies.)

At the individual firm level, most factor markets are perfect in the sense that firms can buy and sell factors, including land, at the same price. If for some reason a factor market is imperfect and market prices are inappropriate, the principle of opportunity cost is used to price the factor within firms. The neo-classical analysis does not explain clearly how or why resources move into or out of industries as variable inputs, and then become fixed. For purposes of explaining aggregate supply responses in agriculture under condition of widely fluctuating absolute prices and price relatives it seems essential that our analytical apparatus be capable of dealing with such problems.

In what follows, an asset will be defined, very simply and crudely, as fixed "if it ain't worth varying." More elegantly stated, an asset will be defined as fixed so long as its marginal value productivity in its present use neither justifies acquisition of more of it or its disposition.[10]

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[6]Contrary to Marshall, *ibid.*, p. 376.

[7]Schuh, George E., The supply of milk in the Detroit milk shed as affected by cost of production, Mich. Agr. Exp. Sta. Tech. Bul. 259, Mar., 1957.

[8]Also of capital gains and losses.

[9]Stigler, *op. cit.*, pp. 104f, 180n.

[10]Johnson, Glenn L., and Hardin, Lowell S., "Economics of forage evaluation," Purdue Agr. Exp. Sta. Bul. 623, Apr., 1955. This definition of a fixed asset is sufficiently flexible to define: (1) an asset fixed in one enterprise such as a corn picker, (2) an asset fixed for a farm but variable between enterprises according to the principle of opportunity costs, such as family labor or a tractor on a general crop and livestock farm, (3) an asset fixed for an industry in the production of one product or type of product but variable between firms, such

If the acquisition cost and salvage value[11] of an asset are substantially different, the asset can remain fixed while the price of the product it produces varies both absolutely and relatively over wide ranges. If on the other hand, as is commonly assumed in using the marginal apparatus, the acquisition cost of an asset is equal to its salvage value, any variation in product price relative to the price of the asset will cause either acquisition or disposal of the asset.

THE PROBLEM AT HAND

Our examination of previous work on supply responses has indicated that the work on individual commodities is more adequate than that on the aggregative response of the farm sector.[12] Furthermore, it indicated that the main difficulty is of a conceptual nature, involving the treatment of asset fixities as they depend on shifts in the acquisition costs, salvage values, and expected marginal value productivities of assets. Thus, the problem at hand appears to be improving the conceptual treatment of fixed assets, analyzing existing data, and explaining changes in the aggregate inputs and output <u>for the farm economy</u> as a whole.

A CLASSIFICATION OF PRODUCTIVE RESOURCES

For purposes of this conference, it appears desirable to classify the inputs used in the agricultural economy into categories which are reasonably homogeneous with respect to the behavior of acquisition costs, salvage values, and marginal value productivity. Since the object is to explain aggregate output, the primary interest is in the movement of

as a self-propelled combine in the Great Plains, or (4) an asset such as land which may be fixed for an economic sector producing a variety of vastly different products, such as peppermint oil, milk, beans, celery, and pulp wood. Using this definition, quasi-rents are negative if figured with respect to acquisition value, positive if figured with respect to salvage value, and zero if figured with respect to their marginal value productivity.

[11]Appropriately adjusted for the life expectation of the assets, for operating costs, to a net, at-the-firm basis, and for risk and uncertainty (economic, institutional, and technological). A fixed asset is fully employed (or it is not fixed); its expected MVP is, of course, dependent on the amount of variable inputs associated with it in most instances.

[12]In his doctoral dissertation, "Economic structure in American agriculture," Dept. Agr. Econ., Michigan State University, 1957, W. A. Cromarty concluded that his estimates of supply elasticities for product categories within agriculture were more reliable than his expected estimates of demand elasticities for the same product categories. While this is contrary to some recently dramatized conclusions, many demand studies appear to be subject to shortcomings and to lack independence, a factor which decreases the importance of agreement among them. Total (not per capita demand estimates) have, of course, been no better than population, war, and prosperity estimates. An example of the consequences of poor demand estimates in the case of wheat is found in T. W. Schultz's Agriculture in an Unstable Economy, p. 246. Writing in 1945, he stated that, "The level of wheat storages in central markets of the world has in recent years been excessively large." In 1946 international wheat allocations were made to divide limited supplies among countries. In evaluating the reliability of demand estimates it is desirable to read George Mehren's paper, pp. 61 to 73, in this book.

resources between the farm and nonfarm sectors as contrasted with movements within the farm sector. Acquisition costs and salvage values for the farm sector, rather than within the farm sector, are relevant considerations in setting up the input classifications. Each category in the following classification includes resources which are reasonably homogeneous in the above respect:

1. Nonfarm produced durables — tractors, combines, tiling, etc.
2. Unspecialized farm durables — fence posts, pasture seedings, soil improvements, etc.
3. Specialized farm durables — dairy cows, orchards, sows, ewes, beef breeding stock, etc.
4. Unspecialized farm expendables — corn, hay, etc.
5. Specialized farm expendables — seed corn, grass seeds, etc.
6. Nonfarm expendables — fuel, oil, and commercial fertilizers, etc.
7. Hired labor
8. Family and operator's labor
9. Land

THREE FACTS CONCERNING PRICES AND THE GENERAL LEVEL OF EMPLOYMENT AND BUSINESS ACTIVITY

First, the terms of exchange between the farm and nonfarm sectors are related positively to the general level of employment and business activity with wars and increased foreign or domestic demands tending to strengthen the terms of exchange and vice versa. (See Table 5.2.) Second, farm product prices (measured in current dollars) are related positively to the same factors. Third, prices of farm products relative to each other, though far from stable, tend to be independent of the general level of employment and business activity.[13]

SOME HYPOTHESES ABOUT RESOURCE EMPLOYMENT AND THE GENERAL LEVEL OF EMPLOYMENT AND BUSINESS ACTIVITY

Table 5.1, below, has been set up to present some hypotheses about relationships among acquisition costs, salvage values, and expected marginal value productivities as they influence resource employment in agriculture. Influences of technological growth on employment are indicated with pluses or minuses as the case may be. Economic growth (excluding technology) can generally be expected to cause resource employment to be higher, i.e., expanding instead of stable, more expanding than indicated, less contracting than indicated and, possibly, expanding instead of contracting.

[13] Johnson, Glenn L., "Allocative efficiency of agricultural prices — as affected by changes in the general level of employment," Ph.D. Dissertation, Dept. Econ., University of Chicago, 1949, pp. 62-70.

For instance, a 20 percent expansion of population in a 10 or 15 year period keeps the marginal value productivities over all levels of employment and business activity of farm inputs high relative to what they would be in the absence of such growth. This, in turn, stimulates resource flows into and retards resource flows out of the agricultural economy. This influence is particularly noticeable in the resource employment data, 1946 to date.

The Employment Hypotheses Tested

Table 5.2 contains data on the employment of 12 different resources, at least one for each of the nine resource categories. Each chart shows the ratio of prices paid to prices received by farmers.

The resource employment hypotheses advanced in Table 5.1 were tested against the data. Table 5.2 of the thirty-six hypotheses concerning resource employment all are verified in the sense of being generally consistent with the resource employment data in this table.

CONCLUSIONS ABOUT RESOURCE USE, AGGREGATE OUTPUT, AND CHANGES IN THE GENERAL LEVEL OF EMPLOYMENT AND BUSINESS ACTIVITY

Under conditions of increasing prosperity with the terms of exchange moving in favor of agriculture, the hypotheses call for no expansion in the employment of five resource categories and stability or slight expansion in the employment of a sixth. One case calls for expanded employment and two for contraction. The expansion occurs for nonfarm expendables while the contractions occur for (1) hired labor and (2) family and operator's labor. In general, the verified hypotheses indicate little change in aggregate input under conditions of increased prosperity, ceteris paribus; if considerable growth is occurring, as in the period 1946 to date, input use may change considerably.

Under full prosperity conditions, the situation is not much different. Three hypotheses call for stable employment, three for stable or expanding employment, one for expansion, one for stability or contraction, and one for contraction. With three categories which are stable, four which are stable or expanding, and two which are stable or contracting, little increase in output is likely, ceteris paribus.

With declining prosperity, five hypotheses call for stable employment and two for stable or decreasing employment, with two uncertain. The indications are that aggregate output is stable or slightly contracting, ceteris paribus.

Under depression conditions, four hypotheses call for stable resource employment, two for stable or decreasing employment, and one for decreases, and two are uncertain. No hypothesis calls for expansion. Clearly, curtailed production is indicated under depression conditions,

Table 5.1. Some Hypotheses About Acquisition Costs, Salvage Values, and Expected Marginal Value Productivities in Relation to the General Level of Employment and Business Activity, by Resource Categories

Resource category	Recovery	Prosperity	Recession	Depression
Nonfarm Durables				
Acq., MVP, Salv.[a]	MVP $\leqq$ Acq.	MVP $>$ Acq.	Acq. $\geqq$ MVP $>$ Salv.	MVP $\leqq$ Salv.
Employment[b]	Stable +	Expanding +	Stable +	Stab. or Contr. +
Unspec. Farm Durables				
Acq., MVP, Salv.[a]	Salv. $\leqq$ MVP $\leqq$ Acq.	Salv. $\leqq$ MVP $\leqq$ Acq.	Salv. $\leqq$ MVP $\leqq$ Acq.	Salv. $\leqq$ MVP $\leqq$ Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Spec. Farm Durables				
Acq., MVP, Salv.[a]	Salv. $<$ MVP $\geqq$ Acq.	Salv. $<$ MVP $>$ Acq.	Salv. $<$ MVP $\leqq$ Acq.	Salv. $<$ MVP $\leqq$ Acq.
Employment[b]	Stab. or Exp. -	Stab. or Exp. -	Stable -	Stable -
Unspec. Farm Expend.				
Acq., MVP, Salv.[a]	MVP $\geqq$ Acq.	MVP $\geqq$ Acq.	MVP $\leqq$ Acq.	MVP $\leqq$ Acq.
Employment[b]	Stab. or Exp. -	Stab. or Exp. -	Stab. or Contr. -	Stab. or Contr. -
Spec. Farm Expend.				
Acq., MVP, Salv.[a]	Salv. $<$ MVP $=$ Acq.	Salv. $<$ MVP $=$ Acq.	Salv. $<$ MVP $=$ Acq.	Salv. $<$ MVP $=$ Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Nonfarm Expend.				
Acq., MVP, Salv.[a]	MVP $>$ Acq.	MVP $\geqq$ Acq.	MVP $\leqq$ Acq.	MVP $<$ Acq.
Employment[b]	Increasing +	Stab. or Exp. +	Stab. or Exp. +	Contracting +
Hired Labor				
Acq., MVP, Salv.[a]	Salv. $\leqq$ MVP $<$ Acq.	Salv. $<$ MVP $<$ Acq.	Salv. $\lessgtr$ MVP $\leqq$ Acq.	Salv. $\lessgtr$ MVP $\leqq$ Acq.
Employment[b]	Stab. or Contr. -	Stab. or Contr. -	Uncertain -	Uncertain -
Fam. and Opr.'s Labor				
Acq., MVP, Salv.[a]	Salv. $>$ MVP	Salv. $>$ MVP	Salv. $\gtrless$ MVP	Salv $\gtrless$ MVP
Employment[b]	Contracting -	Contracting -	Uncertain -	Uncertain -
Land				
Acq., MVP, Salv.[a]	Salv. $<$ MVP $<$ Acq.	Salv. $<$ MVP $<$ Acq.	Salv. $<$ MVP $<$ Acq.	Salv. $<$ MVP $<$ Acq.
Employment[b]	Stable	Stable	Stable	Stable

[a] All acquisition costs, salvage values, and expected marginal value productivities apply to agriculture as an industry. The MVP's are the present value of the expected future stream of annual MVP's in the case of durable resources.

The three price generalizations,page 80, support the following generalizations about the behavior of acquisition costs, salvage values, and marginal value productivities for the nine resource categories:

The *expected* marginal value productivities of all nine of the input categories will move up and down with the changes in product prices (measured in current dollars) over the business cycle as modified by the presence or absence of war and abnormal domestic and foreign demands.

Acquisition prices for both nonfarm durables and expendables rise less rapidly with prosperity than their expected marginal value productivities. Salvage values for nonfarm, specialized durables are, essentially, zero or if not, are determined by their value in non-specialized uses, i.e. scrap iron for tractors.

Salvage values for nonfarm expendables are largely irrelevant as farmers do not carry significant stocks; the same is true for farm-produced, specialized expendables. However, salvage values for unspecialized farm expendables (such as corn) are relevant; these salvage values rise and fall with their expected marginal value productivities and with farm product prices.

Both salvage and acquisition values for unspecialized farm durables rise and fall with farm product prices and their expected marginal value productivities as these change over the business cycle.

Salvage values for specialized farm durables are, essentially, zero; their acquisition costs, however, rise with the costs of items used in their production and, as nonfarm inputs are also used in their production, rise and fall more slowly than farm product prices and their MVP's but more rapidly than nonfarm prices.

The acquisition price of land is much above its marginal value productivity while its salvage price is zero (except in rural-urban fringe areas).

The acquisition price for family and operator's labor is, if relevant, generally above its marginal value productivity while its salvage value (appropriately adjusted for risk and personal wants and preferences) is below its marginal value productivity in depressions but above it during prosperity. As hired labor is a substitute for family and, operator's labor, the acquisition cost of hired labor is relevant here.

The acquisition price of hired labor, in addition to containing a secular upward trend, rises and falls faster than its marginal value productivity (on farms) with respect to changes in the general level of employment and business activity. Similarly its salvage value rises faster than its marginal value productivity when going into a prosperity period; its effective salvage value, however, may not fall as rapidly as its MVP due to certain institutional restrictions on the hiring of labor by nonfarm employers.

[b] In addition to the influence of the business cycle on acquisition costs, salvage values, and marginal value productivities, consideration should also be given to the influence of technological advance. For any given set of price relationships, improvements in technology increase the marginal value productivity of the inputs concerned relative to their acquisition costs and salvage value. Plus or minus signs denote influence of technological advance on employment.

Table 5.2. Ratio of Prices Received to Paid, Percent of Labor Force Employed and the Employment of Twelve Resource Categories, 1910 to Date

Year	Ratio prices rec'd./paid	Percent of labor force employed	Resource categories: Durables, Non-farm: Tractors	Durables, Non-farm: Machinery and equipment	Durables, Farm, Unspec.: Livestock	Durables, Farm, Spec.: Fruit and nut trees	Expendables, Farm, Spec.: Seed bought	Expendables, Farm, Unspec.: Feed fed	Expendables, Non-farm: Fertilizer and lime	Expendables, Non-farm: Operation of motor vehicles	Expendables, Non-farm: Other expenses	Land: Planted	Labor: Family	Labor: Hired
	1910-14=100 Percent	Percent	1,000's	Billions of 1910-14 dollars		Millions	Billions of 1910-14 dollars					Million acres	1910-14=100 Percent	
1911	96	97	4	1.5	6.0		65		166	12	569		100	99
12	98	98	8	1.5	5.1		74		161	20	595		100	100
13	101	99	14	1.6	5.4		62		182	27	625		100	100
14	98	95	17	1.7	5.7		62		208	35	645		99	101
15	94	94	25	1.7	6.2		62		172	46	648		99	101
1916	103	96	37	1.8	5.4		76		179	74	718		99	103
17	120	102	51	1.6	4.3		122		236	132	869		97	101
18	119	105	85	1.6	4.4		132		317	190	1,033		93	98
19	110	100	158	2.0	4.4	4.8	138		347	232	1,129		91	96
20	99	96	246	2.3	4.5	4.8	178		382	296	1,314		93	100
1921	80	87	343	2.6	5.0	4.8	123		221	254	1,098		93	100
22	87	90	372	2.4	4.0	4.9	109		212	252	1,057		93	101
23	89	96	428	1.9	4.2	5.0	111		230	271	1,065		93	100
24	89	94	496	1.9	4.0	5.0	120		231	305	1,049		93	99
25	95	95	549	1.9	3.4	5.0	136		250	377	1,056		94	100

1926	91	96	621	2.0	3.6	5.1	142	103.4	250	444	1,075		93	104
27	88	95	693	2.0	3.8	5.1	140	107.7	230	443	1,003		90	102
28	91	95	782	2.0	3.9	5.1	134	107.2	292	477	1,029		91	102
29	92	97	827	2.1	4.1	5.1	122	104.9	293	509	1,024	363	91	103
30	83	91	920	2.3	4.9	5.0	124	95.7	288	496	951	369	91	98
1931	67	84	997	2.2	5.0	5.0	177	103.8	202	420	873	370	93	93
32	58	77	1,022	2.1	4.9	5.0	79	111.0	125	384	735	375	96	87
33	64	75	1,019	1.8	4.3	5.0	65	91.8	128	374	679	373	97	86
34	75	78	1,016	1.5	3.9	4.1*	104	71.3	158	406	675	338	97	84
35	88	80	1,048	1.5	3.1	4.0*	108	94.1	177	435	667	361	100	87
1936	92	83	1,125	1.6	4.4	3.9*	147	75.4	196	459	687	360	98	94
37	93	86	1,231	1.7	4.0	3.9*	194	97.0	248	521	757	363	97	97
38	78	81	1,368	1.9	4.5	3.8*	206	98.9	226	533	750	354	97	97
39	77	83	1,447	2.1	4.8	3.8*	169	102.1	240	564	730	342	85	80
40	81	85	1,545	2.1	4.7	3.8*	197	108.0	261	584	766	347	82	79
1941	93	92	1,675	2.3	3.9	3.8*	203	118.7	292	645	858	347	79	78
42	105	101	1,885	2.8	4.1	3.8*	301	142.0	352	812	975	351	78	75
43	113	109	2,100	3.2	4.9	3.7*	406	138.8	423	932	1,041	361	79	72
44	108	111	2,215	3.3	4.9	3.7*	440	128.8	476	1,068	1,070	365	79	66
45	109	108	2,422	3.6	4.3	3.7*	435	132.8	562	1,048	1,103	356	78	62
1946	113	98	2,560	3.5	4.0	3.8*	428	122.6	675	1,295	1,257	352	80	64
47	115	98	2,735	3.4	4.1	3.8*	514	110.4	746	1,505	1,546	355	80	67
48	110	99	2,980	3.8	4.2	3.8*	81	120.0	811	1,697	1,678	359	79	69
49	100	95	3,315	4.4	5.3	3.4*	544	127.3	882	1,735	1,775	364	76	66
50	101	95	3,609	5.2	4.6	3.1*	536	129.8	927	1,901	1,810	353	71	61
1951	107	97	3,940	5.1	5.1	3.3*	646	131.6	1,022	2,045	2,125		69	58
52	100	98	4,170	5.7	6.4	3.3*		122.8					66	57
53	92	98	4,400[a]	5.9	5.4	3.2*		125.7					65	57
54		95												

*Commercial apples only.
[a] Preliminary.

insofar as resource use is concerned, ceteris paribus. This set of hypotheses is the least verified of the four sets dealing with the general level of employment and business activity as we have not had long periods of prolonged depression to use for testing. During the years 1921-29, agriculture, rather than the general economy, was primarily depressed. From 1929 to 1932, we were going into a depression. After 1937 or so we were recovering. How much contraction would occur under prolonged conditions similar to those that prevailed from 1933 to 1936 is not observable.

In general, the analysis indicates a stable supply of agricultural products over the business cycle given the price, acquisition cost, and salvage value patterns which usually occur. This does not mean that the elasticity of the aggregate supply curve is zero. It merely means that resource use and, hence, changes in output due to changes in resource use, ceteris paribus, do not change much in agriculture over the business cycle.

THE AGGREGATE SUPPLY CURVE FOR AGRICULTURAL PRODUCTS

While the above analysis explained the stability of aggregate agricultural output over the business cycle but told us essentially nothing about the aggregate supply curve, this general approach can yield some information about the supply curve itself.

We can, for instance, inquire about the consequences of, say, doubling farm product prices, ceteris paribus, for each of the four stages in the business cycle. Also we can inquire concerning the consequences of halving farm product prices at each of the four stages. While the available data do not permit hypothetical answers to these questions to be tested empirically as was done for Table 5.1, analysis in that case lends some confidence to the answers.

In Table 5.3 are the hypothesized relationships among acquisition costs, salvage values, and marginal value productivities with doubled "normal" farm product prices for each of four levels of business activity for each of the nine resource categories.

In Table 5.4 are the hypothesized relationships among acquisition costs, salvage values, and marginal value productivities with halved "normal" farm product prices for each of the four levels of business activity for each of the nine resource categories.

Tables 5.3 and 5.4 indicate that, ceteris paribus, the aggregate supply curve for agriculture:

1. Has an elasticity greater than zero at all of the four different levels of employment and business activity considered.
2. Is more elastic upward than downward.
3. Is more elastic upward at full prosperity and during recovery than during recessions and depressions.

Table 5.3. Some Hypotheses About Acquisition Costs, Salvage Values and Expected Marginal Value Productivities with "Normal" Farm Product Prices Doubled, for Different General Levels of Employment and Business Activity, by Resource Categories

Resource category	Recovery	Prosperity	Recession	Depression
Non-farm Durables				
Acq., MVP., Salv.[a]	MVP>Acq.	MVP>Acq.	Acq. $\overset{=}{<}$ MVP>Salv.	Acq. $\geqq$ MVP>Salv.
Employment[b]	Expanding +	Expanding +	Stab. or Exp. +	Stab. or Exp. +
Unspec. Farm Durables				
Acq., MVP, Salv.[a]	Salv. $\leqq$ MVP $\leqq$ Acq.	Salv. $\leqq$ MVP<Acq.	Salv. $\leqq$ MVP $\leqq$ Acq.	Salv. $\leqq$ MVP $\leqq$ Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Spec. Farm Durables				
Acq., MVP, Salv.[a]	Salv.<MVP>Acq.	Salv.<MVP>Acq.	Salv.<MVP>Acq.	Salv.<MVP>Acq.
Employment[b]	Expanding -	Expanding -	Expanding -	Expanding -
Unspec. Farm Expend.				
Acq., MVP, Salv.[a]	MVP $\geqq$ Acq.	MVP $\geqq$ Acq.	MVP $\leqq$ Acq.	MVP $\leqq$ Acq.
Employment[b]	Stab. or Exp. -	Stab. or Exp. -	Stab. or Contr. -	Stab. or Contr. -
Spec. Farm Expend.				
Acq., MVP, Salv.[a]	Salv.<MVP = Acq.	Salv.<MVP = Acq.	Salv.<MVP = Acq.	Salv.<MVP = Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Non-Farm Expend.				
Acq., MVP, Salv.[a]	MVP>Acq.	MVP>Acq.	MVP $\geqq$ Acq.	MVP $\geqq$ Acq.
Employment[b]	Expanding +	Expanding +	Stab. or Exp. +	Stab. or Exp. +
Hired Labor				
Acq., MVP, Salv.[a]	Salv.<MVP $\geqq$ Acq.	Salv.<MVP $\geqq$ Acq.	Salv.<MVP $\geqq$ Acq.	Salv.<MVP $\geqq$ Acq.
Employment[b]	Expanding -	Expanding -	Stab. or Exp. -	Stab. or Exp. -
Fam. & Opr.'s Labor				
Acq., MVP, Salv.[a]	Salv. $\leqq$ MVP	Salv. $\leqq$ MVP	Salv.<MVP	Salv.<MVP
Employment[b]	Stable -	Stable -	Stable -	Stable -
Land				
Acq., MVP, Salv.[a]	Salv.<MVP<Acq.	Salv.<MVP<Acq.	Salv.<MVP<Acq.	Salv.<MVP<Acq.
Employment[b]	Stable	Stable	Stable	Stable

[a]See para. 1, note [a] Table 5.1.
[b]See note [b] Table 5.1.

Table 5.4. Some Hypotheses About Acquisition Costs, Salvage Values and Expected Marginal Value Productivities With "Normal" Farm Product Prices Halved for Different General Levels of Employment and Business Activity, by Resource Categories

Resource category	Recovery	Prosperity	Recession	Depression
Non-farm Durables				
Acq., MVP, Salv.[a]	MVP$<$Acq.	MVP$<$Acq.	MVP$\leqq$Acq.	MVP$<$Salv.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Unspec. Farm Durables				
Acq., MVP, Salv.[a]	Salv.$\leqq$MVP$\leqq$Acq.	Salv.$\leqq$MVP$\leqq$Acq.	Salv.$\leqq$MVP$\leqq$Acq.	Salv.$\leqq$MVP$\leqq$Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Spec. Farm Durables				
Acq., MVP, Salv.[a]	Salv.$<$MVP$\leqq$Acq.	Salv.$<$MVP$\leqq$Acq.	Salv.$<$MVP$<$Acq.	Salv.$<$MVP$<$Acq.
Employment[b]	Stable -	Stable -	Stable -	Stable -
Unspec. Farm Expend.				
Acq., MVP, Salv.[a]	MVP$\leqq$Acq.	MVP$\leqq$Acq.	MVP$<$Acq.	MVP$<$Acq.
Employment[b]	Stab. or Contr. -	Stab. or Contr. -	Contracting -	Contracting -
Spec. Farm Expend.				
Acq., MVP, Salv.[a]	Salv.$<$MVP$=$Acq.	Salv.$<$MVP$=$Acq.	Salv.$<$MVP$=$Acq.	Salv.$<$MVP$=$Acq.
Employment[b]	Stable +	Stable +	Stable +	Stable +
Non-Farm Expend.				
Acq., MVP, Salv.[a]	MVP$\gtreqless$Acq.	MVP$\gtreqless$Acq.	MVP$<$Acq.	MVP$<$Acq.
Employment[b]	Uncertain +	Uncertain +	Contracting +	Contracting +
Hired Labor				
Acq., MVP, Salv.[a]	Salv.$>$MVP$<$Acq.	Salv.$>$MVP$<$Acq.	Salv.$\geqq$MVP$<$Acq.	Salv.$\geqq$MVP$<$Acq.
Employment[b]	Contracting -	Contracting -	Stab. or Contr. -	Stab. or Contr. -
Fam. & Opr.'s Labor				
Acq., MVP, Salv.[a]	Salv.$>$MVP	Salv.$>$MVP	Salv.$\geqq$MVP	Salv.$\geqq$MVP
Employment[b]	Contracting -	Contracting -	Stab. or Contr. -	Stab. or Contr. -
Land				
Acq., MVP, Salv.[a]	Salv.$<$MVP$<$Acq.	Salv.$<$MVP$<$Acq.	Salv.$<$MVP$<$Acq.	Salv.$<$MVP$<$Acq.
Employment[b]	Stable	Stable	Stable	Stable

[a]See para. 1, note[a] Table 5.1.
[b]See note[b] Table 5.1.

4. Is less elastic downward during prosperity and recovery than in recession and depression.

These generalizations can be checked against the 72 resource employment hypotheses in Tables 5.3 and 5.4.

SOME IMPORTANT FACTORS AFFECTING THE AGGREGATE SUPPLY CURVE FOR FARM PRODUCTS

In addition to cyclical instability which was considered in detail above, the aggregate supply function is affected by:

1. Technology
2. Intra-sector resource movements: (a) between geographic regions, (b) between firms, and (c) between enterprises within firms.
3. Changes in risk.
4. Redistributions of asset (rights, property and skill) ownership as a result of: (a) direct governmental action, (b) inflation and deflation, and (c) capital accumulation.

When the object is to predict output instead of to isolate the supply function, these supply shifters must be considered also. While space and time precludes adequate treatment, cursory analysis seems preferable to omission.

These supply shifters have a tendency to move together. Hence it is discouragingly difficult to differentiate empirically their separate influences. Technological advance makes inter-sector specialization and resource flows possible and necessary. It does the same thing with respect to intra-sector flows. Risk and technology, too, are related, as much technological advance is risk-reducing as is apparent when insecticides, fungicides, pesticides and vaccines are considered, not to mention timeliness and large-scale, fast, high-powered machinery. Technology, too, is an asset — it cannot be produced and used without influencing asset ownership patterns.

Technological Advance and Intersector Resource Flows

Both technological advance and specialization between the farm and nonfarm sectors can produce increases in agricultural output with no net increase in inputs.[14] Thus, the ratios of incremental output over incremental input which Schultz observes to be greater than one may be due to technology,[15] specialization, or a combination of the two.

[14] Reder, M. W., Studies in the Theory of Welfare Economics, Columbia University Press, New York, 1947, Chap. 2. The possibilities of increasing output without increasing inputs with constant technology through specialization as a result of applying the principle of comparative advantage are illustrated.

[15] Schultz, T. W., "Reflections on agricultural production, output and supply," Jour. Farm Econ., Vol. 38, Aug., 1956, pp. 748f.

Probably both are involved with the specialization often following technological change but with specialization sometimes being a precondition for adoption of a technological advance. Only a moment's reflection is needed to see how important inter-sector specialization has become in agriculture. Dean Young delivered a paper at the Helsinki meeting of the International Conference of Agricultural Economists which stressed the importance of supplying industries in achieving the productive level which U. S. agriculture has reached. At last winter's joint meeting of the American Economic Association and the American Farm Economic Association, John Davis stressed the inter-sector specialization (he called it vertical integration) which has occurred between the farm and nonfarm sectors in the production of marketing service. Whereas, a few years ago many marketing services were performed by farmers who prepared products for market, transported them to market and, sometimes, retailed them, many of these services are now being performed by the nonfarm sector.

Intra-sector Resource Flows

Geographic specialization as well as inter-sector specialization is also capable of increasing output without increased input. This has been known since before the days of Adam Smith.[16] While technological advance may encourage regional specialization and inter-firm specialization, it is by no means a prerequisite for it; in fact, specialization can be a prerequisite for adoption of a technological advance. The empirical importance of this shifter is shown in census reports for 1950,[17] presenting scatter diagrams for major farm products which indicate a large amount of regional specialization in recent decades.

While less adequate data are available to support the assertion, it is also clear that significant amounts of inter-firm specialization is occurring. Generally speaking, farms are less self-sufficing than formerly insofar as milk, eggs, vegetables and fruit, and possibly meat production, are concerned.

Risk and Capital Rationing

The discussion of the influence of risk on the aggregate supply curve for farm products must be very cursory. Certain points are worthy of speculation, however.

Of the many risks besetting agriculture, price risks associated with the business cycle are of prime importance. D. Gale Johnson and Schultz have placed great emphasis on price risks as a cause of capital

[16]Smith, Adam, The Wealth of Nations, The Modern Library, New York, ed. Edwin Çannan, pp. 415f.

[17]Agriculture 1950, A Graphic Summary, Special Reports, Vol. 5, p. 6.

rationing. In terms of the fixed asset definition employed in this paper, such risks can be interpreted as adding subjectively to acquisition costs thereby making acquisition costs greater than salvage value for a farmer even in a market as perfect as the one for money. Risk, then, becomes a basic cause of capital rationing.

It then follows that elimination of price risk eliminates asset fixities, thus making production more responsive, especially upward. In our economy, a significant reduction in price risks occurred in the late thirties as a result of price control programs and some recovery optimism. A further reduction in price uncertainty occurred with the outbreak of World War II and the Steagall Amendment. Some writers have attributed the expansions in agricultural production which occurred during these periods to widespread adoption of new technology. Inasmuch as these were periods in which (1) reduced price risk helped eliminate capital rationing and (2) considerable amounts of specialization occurred, all of the expansion in output probably cannot be attributed to technology.

Inflation, Asset Ownership Redistribution, and Capital Rationing

Capital rationing, as a general form of asset fixity, may be overcome in a number of ways, any one of which is capable of expanding output through: (1) permitting the use of more resources and (2) specialization in the use of the same quantity of resources. From 1933 to 1952, inflation has served repeatedly to overcome capital rationing, making possible both specialization and expanded resource use. Some of this expanded production was achieved through long available but unadopted technology. Economic conditions had to be conducive to adoption of the technology. Thus, in a sense, the expansion of production has more in the nature of an economic than a technological adjustment.[18,19] Technologies are not automatically adopted even if profitable and communicated to farmers; the "wherewithal" must be available.

Asset fixities may be overcome in other ways. The right to produce a product may gain value under production control programs and then be redistributed, thereby overcoming capital limitations.[20] Also, agencies such as the AAA, SCS, TVA, and PMA may redistribute rights,

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[18]See Hendrix, W. E., "Availability of capital and production innovations on low-income farms," Jour. Farm Econ., Vol. 33, 1951, pp. 66f., for discussion of economic conditions necessary for adoption of technology.

[19]If technological change is to be distinguished from economic adjustment, it seems desirable to define a change in technology as occurring when a new input is discovered. If x_i inputs, $i=1,\ldots,n$ are known to be useful in producing y, then for $y=f(x_1,\ldots,x_d|x_{d+1},\ldots,x_n)$, changes in the use of $x_1,\ldots,x_d$ are the subject matter of economics. In turn we have seen that the question of which inputs should be treated as variable is also economic. Defining technological change as the discovery of a new input which, like all other known inputs, is fixed or variable depending on economic conditions, yields an unambiguous distinction between technological change and economic adjustment in resource use. If ideas are regarded as inputs, as indeed they are, then new organizations can be regarded as technological changes.

[20]Thompson, James F., "Inter-farm and inter-area shifts in burley tobacco acreages under government control programs," Ky. Agr. Exp. Sta. Bul. 590, 1952.

income, and assets, thus overcoming certain asset fixities and capital limitation. The land-grant system should not be forgotten in this connection as an institution designed to produce and distribute information at public expense.[21] These asset redistributions can increase output by increasing inputs or without (if they make it possible to specialize) increasing inputs. Again we find more than one factor affecting the aggregate supply function often tending to shift the supply function in the same direction.

Summary

The general conclusion is that the supply shifters are numerous with highly inter-related impacts on the aggregate supply curve for agriculture.

Clearly, it is extremely hazardous for anyone to attribute the shifts in the aggregate supply function which have occurred in recent decades to any one of these shifters alone. It is also clear that further upward shifts in the supply curve are easily brought about.

The fixed asset theory used herein would indicate that a high proportion of the influence of these shifts on the aggregate supply function is only partially reversible.

SOME PROSPECTS FOR THE FUTURE

The above analysis indicates that:

1. Output should not be expected to change much as a net result of the complex set of price changes occurring with inflation, deflation, prosperity, and depression.
2. Farm output can be increased by raising farm prices, ceteris paribus.
3. Farm output could be reduced somewhat by lowering farm prices, ceteris paribus; however, the price reductions required to reduce output are larger than those required to bring about a corresponding increase in output.
4. Shifters play important but individually undetermined roles.
5. Shifters and the elasticity of the aggregate supply function are jointly capable of bringing about considerable expansions in output for the foreseeable future (Bonnen treats this matter, pages 116-27, in this volume.)
6. Expansions in production brought about by both the elasticity of the aggregate supply function and the shifters are difficult to reverse.

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[21] Schultz, T. W., The Economic Organization of Agriculture, McGraw-Hill, New York, 1953, Chap. 7, and Johnson, Glenn L., "Agriculture's technological revolution," U. S. Agriculture — Perspective and Prospects, Columbia University, New York, 1955, pp. 27f.

7. Instead of contractions in production, large-scale capital losses can be imposed on the owners of fixed assets (or assets which become fixed) as a consequence of losses in demand after production is expanded in response to war demands, temporary foreign demands, and price supports. The imposition of these gains and losses on farmers cannot be supported in terms of efficiency or general welfare criteria, a point, largely neglected elsewhere in this volume.

8. Needed empirical research on aggregative supply responses must consider the partial irreversibility of the aggregate supply function. This applies whether the simultaneous equations approach of Cromarty, the "synthetic" approach of Bonnen, or the Leontief approach of Carter is used. Also, it will be necessary to take into account the shifters (technology, redistributions of asset ownership, risk and specialization). Because of high inter-correlation among the shifters, the synthetic approach may be very useful.

9. Additional empirical research is needed with respect to the incidence on owners of fixed agricultural resources of gains and losses resulting from fluctuations in the demand for farm products.

10. Still other needed research would evolve institutional arrangements to reduce the incidence of capital losses on owners of fixed agricultural resources.

Chapter 6

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Some Additional Views on Demand and Supply

THIS paper is designed to do three things: (1) appraise and evaluate the rather technical papers on demand and supply presented by Collins and Mehren and by Johnson; (2) present some additional material on demand to gain an appreciation of the limitations and potentialities of demand expansion; and (3) make some informal judgments with regard to the outcome of the race between the aggregate demand for and the aggregate supply of farm food products in the years ahead.

COMMENTS ON THE GLENN JOHNSON PAPER

Not often does a man have a new idea, or do we have an opportunity to see a new idea unveiled. In the Glenn Johnson paper we have, I believe, an example of both. Johnson correctly argues that the weak spot in supply analysis has been the lack of a satisfactory theory of fixed inputs. I have had this feeling for some time; I was moving toward this conclusion at the Michigan State meetings in 1955, when with reference to the difficulty of estimating supply relations, I said: ". . . . second, and of greater complexity, the analyst must know which factors the decision maker treats as fixed for the period and unit of inquiry under consideration. . ." [1] But Johnson has done something about this shortcoming in supply analysis. He has presented us with a conceptual framework involving the relationship of the marginal value product of a factor to its acquisition cost on the one hand and its salvage value on the other. Where the marginal value product of a factor exceeds its acquisition cost, more of it will be added to the production process, for the unit of inquiry under consideration, and where the marginal value product falls below the salvage value it will move out of production. But where a factor's acquisition cost is substantially different from its salvage value, it can remain fixed in the production process while the price of the product it produces varies on wide ranges.

I like this. Here is a useful conceptual device for judging, or appraising, different categories of inputs, in different contexts, with regard

[1] "Conceptualizing the supply relation in agriculture," Jour. Farm Econ., Proceedings Number, Nov., 1955.

to their variability, or lack of variability, in the production process. Much as I am impressed with this idea, however, I do not see why it need invalidate all prior explanations of fixed inputs in agriculture. I still think that the fixed cost idea is useful in explaining the sustained employment of family labor and the purchase of inputs on long-term commitments. Also, the lack of alternatives argument, with the consequent perfectly inelastic supply function for the factors, still seems like a good explanation for the sustained use of hired labor and land. And I would not forget the occupational unity of functions argument of Brewster and Parsons. It seems to me that all of these arguments have a role to play in explaining the fixity of inputs in agriculture; they could, for example, play a role in formulating the 36 hypotheses in Table 5.1 of the Johnson paper, which they do not now.

The Johnson analytical framework for analyzing the degree of variability of an input is tidier, and perhaps more general in application, hence more soul-satisfying to economists, than the above more special explanations. Although here it is a little hard for me to see how the acquisition cost — salvage value dichotomy fits, for example, the category of family and operator's labor (and one of the footnotes to Table 5.1 would suggest that Johnson is vague on this point too). Typically we do not think of acquiring and salvaging family labor. I would suggest that the Johnson analytical framework will prove most useful in analyzing his first and third categories of inputs; nonfarm produced durables such as tractors, combines, and lumber on the one hand and specialized farm durables such as dairy cows, orchards, and breeding stock on the other. We customarily think of these inputs as having distinct acquisition costs and salvage values; we do not with respect to family labor, or such nonfarm expendables as gasoline, paint, and insecticides.

Having developed a conceptual framework for dealing with the fixed input problem, Johnson then uses this framework to analyze the aggregate supply function in agriculture. I am happy to say that he gets his unit of inquiry straight (something that many micro analysts do not); each category of resource inputs is appraised with respect to its acquisition costs to the farm sector and its salvage value for the farm sector. But the weak point in Johnson's positive argument is with respect to the hypotheses in Tables 5.1, 5.2, 5.3, and 5.4. These hypotheses rest upon two levels of generalization: one touched upon in the text, and one touched upon in a series of footnotes to Table 5.1. These hypotheses must be made to stand on something more substantial than the casual remarks mentioned above; these hypotheses are crucial to the entire argument and, as they stand now, their formulation is something of a mystery. Further, the formulation of so many of these hypotheses in a loose form (e.g., stable +, stable -, stable to contracting, stable or expanding) makes verification by the empirical analysis something less than convincing. More rigor, more analysis, and an improved presentation in this area are certainly required. In any event, Johnson's conclusions with respect to the aggregate supply relation for farm products over the business cycle are plausible and conventional.

With respect to the slope and position of the aggregate supply function, I would like to return to Johnson's review of earlier works (now reduced to one of the longer footnotes on record). In that review he correctly places, although this may sound strange to some, Schultz and myself in the same canoe. But he concludes that the bark is mighty leaky and that it will not carry us, or anyone else, very far. In fact, he says with complete assurance, referring to my analysis of the aggregate supply function, that "... it does not explain failures of aggregate output to contract or some of the resource flows both into and out of agriculture which, fortunately for Cochrane's analysis, have tended to cancel each other..." Now it may be a coincidence that the flow of labor inputs out of agriculture since 1920 has been just about offset by the flow of capital inputs into agriculture with total inputs holding constant. But the validity of my analysis does not rest on that coincidence, if coincidence it is. If for any one of the periods for which I derive an aggregate supply function, total inputs employed in agriculture increased in response to an increase in the level of farm prices, or decreased with a fall in the level of farm prices, the aggregate supply function would emerge with a positive slope (i.e., a nonzero elasticity). And for the period 1912-21, just such a supply function does emerge.[2] The aggregate supply function exhibits a positive slope during that period because total inputs employed in agriculture increased over that period in response to rising prices — primarily because of increased land inputs.

In summary, my analysis does not force a perfectly inelastic supply function for agriculture, as Johnson infers, and neither does it rest on a fortunate circumstance; if with the changing resource mix over the past 35 years, total inputs had increased with increasing farm prices, the aggregate supply relation in my analyses would slope upward and to the right as all good supply curves are supposed to do. But the hard facts are that total inputs employed by farmers have remained almost constant since 1920, and the modest changes that have occurred seem to be random in nature, or inversely correlated with price level changes.

Now let us open the real Pandora box in all of this — namely, the question of farm technological advance. Johnson argues that farm technological advance explains, in part, shifts in the aggregate supply over the years, but other shifters have played their roles too — namely, intrasector resource movements, risk, and redistribution of assets. At this point, I believe, Johnson is confused, hence is wrong. In the above classification of supply shifters, Johnson confuses cause, or incentive, with effect, and he confuses the same phenomena when viewed from different vantage points.

First, what do we mean by farm technological advance? Johnson argues in footnote 19 that a technological advance must always involve the discovery of a new input. I would agree that farm technological advance generally involves the use (at the farm level, discovery does not affect the process under consideration) of inputs new to the production

[2] *Op. cit.*, p. 1170.

process. But, a new configuration in the use of old inputs, too, can lead to technological advance at the production level. The important thing to keep in mind with respect to farm technological advance is that it must always involve a new organization of inputs which gives rise to a new production function where output per unit of input is increased.

Now this does not mean that farm technological advance is limited to that case of the first farmer in the community, the innovator, who substitutes a general purpose tractor for a team of mules and increases his output per unit of input. Farm technological advance is involved as each farmer in the community makes this substitution and increases his output per unit of input. Innovator versus noninnovator is not the issue here — the key consideration is whether the farmer moves to a new and more productive production function.

Next, farmers who first substituted wheat for cattle grazing and then cotton for wheat on the high Texas plains may have been involved in intrasector resource movements, or regional specialization, but insofar as output per unit of input increased, this change in production practices (assuming constant factor and product prices) resulted in farm technological advance. The celebrated pin manufacturing example of Adam Smith may illustrate the advantages of the division of, or specialization of, labor, but insofar as some advantages did result from the new organization of resources — from the new and more productive production functions — technological advances occurred here, too.

Turning to another question, when do farmers typically adopt new practices that lead to increased output per unit of input? They do so when prices are good, when price and income expectations are good (i.e., risk is minimized) and when the asset position of farmers is good. Now why is this true? A new practice that will reduce costs no doubt is as desirable in hard times as in good times. But the adoption of new practices, involving new input combinations, which increase output per unit of input typically requires the acquisition of additional capital inputs involving additional cash outlays or financial commitments. Reduction of risk provides the incentive to invest in new techniques and production practices, and a good asset position provides the means of financing such investments. In other words, reduction of risk and improved asset position do not in some mysterious way shift the supply function. They speed up the adoption of new techniques and practices, requiring capital expenditures, which in turn increases output per unit of input and shifts the supply function.

In summary, technological advance permeates much, or all, decision-making in American agriculture; it assumes an infinite number of forms; its force stems from a variety of sources (e.g., low priced food policy, profit incentive, scientific achievement, widespread extension service); it is the key variable in American agriculture. As I see it, technological advance is the only real shifter of the supply function.

COMMENTS ON THE COLLINS-MEHREN PAPER

I read this paper twice before writing these comments, and each time, as I read through the first six pages, I wondered: (1) what the program planners had in mind for this paper, and (2) what purpose Collins and Mehren had in mind when they prepared this paper. The six-page introduction is scholarly; there is no question about that. But I doubt if it contributes much to this conference. Appreciation of this rather extended introduction requires a knowledge of demand theory, familiarity with past empirical efforts to extrapolate into the future, sufficient experience with both to be aware of the many problems involved, and last but not least, thorough enjoyment of obscure writing. Since this is a farm management conference, I doubt that this is the case.

The major point of the first part of the paper, if I get it, is, however, a proper one; namely, because static consumption theory provides little help with respect to the tastes and preferences problem, because we do not have a growth theory which enables us to specify the relevant economic growth model, because the econometric model becomes too complex to handle and to understand where we go into any real detail, and because mortal man is not omniscient, we cannot do a very good job projecting demand, in the aggregate and by commodities, say to 1965, for production people to use. We can make some informed, and I believe useful, guesses with regard to the aggregates, but we do not place much confidence in the individual commodity extrapolations.

Now this should really not surprise us. So long as man is mortal, which will, I believe, be the case for some time to come, he cannot peer into the future and pinpoint future events, or specific relationships in this case. The best that we can do is make some informed judgments concerning the probable future developments based on past relationships and trends.

This is precisely what Collins and Mehren do in the second part of their paper, and in my judgment they do it well. They point out that the major determinant of the demand for food is population growth — "in food-demand projections," they state, "population is the crucial series." But they also point out that current and "reasonable" population projections as of 1965, or 1975, are dangerously wide. The demographers, too, lack omniscience — and the extrapolation of past population trends is a tricky business. With the major determinant of the future demand for food, in the aggregate or by commodities, as of 1975, thus running wild, we cannot project quantities demanded with any assurance. The best that the analyst in charge of projections can do is make estimates of food requirements under "reasonable" but <u>alternative</u> rates of population growth.

Collins and Mehren next point out that the income elasticity for farm food products (i.e., embodied farm resources) is extremely low, +.15 to +.20, and possibly is becoming lower. Hence, changes in average personal disposable income over the next 10 or 25 years, barring a major economic depression, can have little effect on the quantity of food demanded at any level of prices.

Bearing in mind these considerations, Collins and Mehren present in Table 4.2, food consumption estimates as of 1975 under four different population assumptions (one Daly's, three their own). All suggest that the total demand for food will increase by at least 40 percent by 1975, with the four projections ranging between 40 and 48 percent. Most students of the problem would not quarrel with these estimates. Population growth alone assures estimates of this general magnitude. Further, I would say that such over-all estimates are useful; they provide some general, but needed guideposts for the future. With regard to the individual commodity extrapolations in Table 4.3, I am more dubious. The insoluable problem of changes in tastes and preferences raises its ugly head at this level.

Finally, I like very much the final paragraphs and final sentences of this paper, which slam the door on current daydreams and transcendental thinking with regard to expanding demand as a solution to the farm problem (i.e., eating our way out of the farm surplus problem). Many low-income people in the United States, perhaps 50 to 60 million of them, would increase their consumption of animal products substantially, if by government subsidy, or by some miracle, their incomes were increased substantially. But we have no evidence to suggest that a lot of people in the United States, if told that their diets need improving, or that beef tastes good, will reallocate their expenditures and purchase more high-resource-using food out of their present incomes. Such a development is contrary to all experience; once the consumer has filled his belly, given the cultural context of his society, he seeks new experiences and tries to satisfy other appetites, before refining his tastes and preferences for food.

Thus, I reach the same conclusion as Collins and Mehren: the "adjustment of production is the mechanism to be analyzed." Farmers, and their leaders, and I presume that this includes us, have to find a way to adjust production to demand, commodity by commodity, to yield reasonably good, and stable farm incomes. Consumers are not interested in such adjustments — why should they be? But farmers must be; hence, the burden of adjustment is on them.

THE ADVERTISING APPROACH TO DEMAND EXPANSION[3]

Farm people and farm leaders are asking more and more often: Can the tools of sales promotion and advertising that have been used so effectively in the nonfarm economy be used with corresponding effectiveness in agriculture? Or as proponents of sales promotion and advertising have stated it: Can agriculture through increased sales promotion and advertising make Americans want more farm products, and thus initiate a movement to eat our way out of the farm surplus problem? More and more this question is being answered affirmatively. Secretary Benson and Jim Roe in a recent issue of Successful Farming[4] seem to

[3]Adapted from the brief article "Advertising — fact or fancy," Farm Policy Forum, Vol. 8, No. 5, 1956.

[4]Aug., 1955.

suggest that the answer to these questions is yes. And the various eat-more-egg weeks, eat-more-pork weeks, and so on, sponsored by the U. S. Department of Agriculture represent the sales promotion approach to the surplus problem. But before we make sales promotion and advertising an integral part of farm policy let us take a closer look at this approach.

First, it is reasonable to suppose, given a sufficiently large and persuasive sales promotion and advertising effort: that Idaho potato producers could persuade the average consumer to buy their potatoes instead of potatoes from other regions (to the extent that Idaho producers could supply them); that Swift packed meats could displace the meats of other packers; that oleomargarine could finish the job on butter or that butter could win back its place in the sun; or that any food item could gain a larger place in the average consumer's stomach by replacing close substitutes. But no one knows the cost of any one of these goals, or any part of one of these goals, hence whether it would pay producers to embark on such a policy. Basically this is not what farmers and farm leaders have in mind anyway. Most farm people want to expand the consumption of their product through sales promotion <u>without</u> substituting their product for another farm product.

Second, food processors, through sales promotion and advertising, can sell a lot of nonfood services — packaging, processing, and "ready to eat" meals — along with food itself. They have already done this, and budget studies suggest that they can continue to do it. Domestic kitchen help now comes in this form, and with rising real incomes and more working wives, we can expect families to purchase more and more of these nonfood services — built-in conveniences — along with food itself. But is this what farmers and farm leaders have in mind when they talk about sales promotion? Maybe, but if it is, they are being fooled. Selling spaghetti dinners in the place of dried spaghetti, frozen peas in the place of canned peas, and frozen packaged chicken breasts in the place of whole chicken increases demand and consumption of nonfarm, rather than farm, resources.

Third, consumers do not need to be "informed" about the useful qualities of food; their stomachs inform them of this regularly three times a day. Consumers also do not need to be "informed" about the desirable qualities of, say, pork chops or beef steak or fresh peaches; they know that these expensive food items taste good. The facts are that high income consumers eat all they want of these expensive items, and low income consumers eat them sparingly because they cannot afford to eat more of them. Lack of income, rather than lack of knowledge, limits the consumption of expensive animal products and fruit and vegetables among low-income families.

Fourth, no important consuming groups in the United States are under-consuming food as measured by calories. In short, no widespread group of American consumers need to be informed through a promotional campaign that they are starving, or need to be given food to increase their caloric intake. The average consumer in the United States, <u>and</u>

the average low-income consumer as well, is overeating in terms of calories (perhaps a promotional campaign is needed to make consumers more aware of this fact; however, the medical profession seems to have accepted the challenge of this problem). The diets of many Americans, perhaps 20 to 40 percent, are deficient with respect to calcium, certain vitamins, and protein. But these deficiencies could be corrected in most cases with no increase in the demand for farm products; they could, in fact, be corrected with a considerable contraction in the demand for farm products, hence farm resources. A few calcium tablets, a dash of fish oil, and a shift to whole wheat bread would eliminate the most glaring nutritional deficiencies in American diets.

Much confusion exists with respect to the relationship between the demand for farm food products (i.e., per capita expenditures for food) and the nutritional adequacy of diets. A nutritionally adequate diet need not be expensive. It can be composed of five food items — wheat flour, lard, cheese, cabbage, and carrots — at a cost of less than 40 cents per day per person, or it can be composed of choice cuts of meat, expensive dairy and poultry products, and a variety of fresh fruits and vegetables at a cost of five dollars or more per day per person, or at some level of cost between these extremes. In other words, the goal of nutritionally adequate diets does not insure a strong demand for farm food products. A strong demand for farm food products depends upon consumers wanting a diet heavily weighted with animal products and having the ability to purchase such a diet.

The point at issue is that some 30 to 60 million consumers in the United States (no one knows the exact number) would like to increase their consumption of animal products substantially — and they would do so if by some magic their incomes were increased immediately. But given their present day taste and preference patterns (that is, what they want in each consumption line) and their incomes, they are unable to purchase more red meat, poultry, and dairy products. Thus, the question is: Can sales promotion and advertising change the taste and preference patterns of these low to middle income consumers so that they will increase their consumption of animal products out of existing incomes?

To accomplish the above goal, sales promotion and advertising must cause these consumers: (1) to substitute expensive animal products for inexpensive foods such as bread and baked goods, potatoes, fats, and sugar, with which they are currently filling their stomachs and (2) to decrease their spending in nonfood lines — to buy fewer, or cheaper, TV sets, fishing poles, health insurance plans, clothes, vacation trips, and the like.

The first consumption adjustment is necessary to find a place in the human stomach to put the increased animal products, since even low-income consumers, on the average, are consuming more food, in terms of calories, than good nutrition dictates. The second adjustment is necessary to finance the first adjustment. Granted the necessary income, the first adjustment would take place easily, for this is the substitution route that consumers do take when their incomes permit. But the second adjustment would be like extracting wisdom teeth — costly and painful. Sales promotion and advertising would need to bear the burden of making consumers want to increase their expenditures for food and decrease their expenditures of nonfood items out of given incomes.

This latter adjustment runs counter to the whole process of economic progress: As real incomes rise consumers first reduce the proportion of their incomes going to necessities (food and shelter) and increase the proportion of their incomes going to manufactured goods; then as real incomes continue to rise consumers reach a point where they cease to allocate any more funds to necessities, the proportion going to manufactured goods declines and the proportion going to all kinds of services increases. With rising real incomes, consumers the world around increase their expenditure allocations first to hard goods and then to services; this is the other side of Engel's celebrated law. Sales promotion and advertising might reverse this process, but it would certainly take a large and costly promotional campaign to do it. And it is a safe guess that advertising and sales promotion will not reverse it.

If we are really serious about increasing the total consumption of farm food products, we should turn to where it can be increased, namely, among the 30 to 60 million low to middle income consumers who would like to increase their consumption of animal products. But, in so doing, we must recognize that lack of purchasing power is the reason that these people are not eating more fresh fruit, meat, and dairy products currently. Hence, we must stand ready to subsidize the increased consumption of these more expensive foods among low-income consumers.

THE FABULOUS MARKET FOR FOOD SERVICES[5]

Expenditures for food in the United States increased dramatically over the 20-year period 1935-55 — by some 400 percent. However, when the effects of inflation are removed from these food expenditure data, the dollar value of the increase is reduced substantially — to some 120 percent. But a real increase in total food expenditures of 120 percent still represents a large expansion in the market for food products. This market expansion resulted from two principal developments: (1) a rapid rate of population increase, and (2) an important increase in consumer incomes.

When these food expenditure data are put on a per capita basis, the increase in food expenditures is reduced still more. Real, per capita expenditures for food increased 68 percent between 1935 and 1946, fell between 1946 and 1948, and have been rising since. Finally, the index of per capita food consumption, which measures the quantity of food consumed (on a value basis, not in pounds), shows only a modest increase for the period, 1935-55. It increased 16 percent between 1935

[5]Adapted from the article "Food services have expanding market," Minnesota Farm Business Notes, No. 375, Sept., 1956.

and 1946 and has been fairly constant since 1946. We conclude, then, that the market for food products narrows sharply once the expanding effects of population increase are removed. The market for raw food products at the farm level for the average consumer expanded only modestly between 1935 and 1946, and not at all since then.

Something must explain the difference between a 68 percent increase in real, per capita expenditures for food, and a 16 percent increase in the consumption of farm food products. That something is food service — those services built into, and associated with, food purchased at the retail level (e.g., storing, transporting, packaging, processing of all kinds, restaurant service, etc.). While the average person in the United States increased his consumption of farm food products 16 percent between 1935 and 1946, he increased his consumption of nonfarm food services by about 50 percent.

Since 1946, real, per capita expenditures for food have not increased. However, farm prices have declined significantly, permitting the consumer to spend an increased share of his food expenditure for food services. With this expanded market for food services and the fierce competition among food distributors and processors for the consumer's food dollar, a steady stream of new food products, new packages, and new methods of handling food have been poured on the market since 1946. Thus, the revolution in the kitchen has continued unabated.

As families move into the $4,000 to $5,000 income class they begin to spend their food dollars differently. They eat more expensive foods, of course; but what is significant to agriculture and to the marketing system is that they also begin demanding and buying a lot of processing in their food. Instead of buying a whole chicken to be cut up and apportioned at home, they buy a package of frozen chicken breasts, or better still, go out for a chicken dinner. The modern American family wants not only good food, but convenience built into that food as well.

The relentless pursuit of convenience items has been the most dramatic change in the food market since 1946. Most of the food purchased today is prepackaged. An important share has been precooked and apportioned as well. The American housewife substitutes these conveniences built into food items for kitchen help and tiresome hours spent in the kitchen. Thus, the purchase of services, or conveniences, built into food products is now enabling the housewife to follow the cook and the maid in their flight from the kitchen.

In buying food at retail the consumer really buys two different kinds of products: (1) a bundle of resources developed into a farm food product, and (2) a bundle of resources developed into nonfarm food services. The consumer behaves very differently with respect to these very different products. A recent study at the University of Minnesota,[6] which breaks the total food bill into two categories, expenditures for farm food products and expenditures for nonfarm food services, makes this

[6]See the article entitled "On the income elasticity of food services" by Bunkers, E. W., and Cochrane, Willard W., Rev. Econ. and Stat., May, 1957.

very clear. The income elasticity for farm food products in the United States runs as low as .25, whereas the income elasticity for nonfarm food services ranges between 1.0 and 1.3.

In other words, the average consumer increases his expenditures for food itself only modestly as his income rises. But he increases his purchase of food services proportionately, or even more than proportionately, to his income increase. The rapidly expanding market in the food field, then, is not for food itself. The fabulous market is to be found in food services.

We are thus forced to the following conclusions. First, rising real incomes in the past have not greatly expanded the market for farm products at the farm level. The big element in expanding demand for farm food products in the past has been population increase. Second, as the incomes of more and more families rise — reach the income level now approximating $5,000 — further increases in income will have little or no expanding effect on the demand for food itself. After this income level is reached, increased expenditures for food products growing out of increased income go largely into the purchase of more services associated with food. Third, in the foreseeable future, a further widening of the market for total farm food products (raw produce at the farm level) is likely to become dependent on population increase alone.

In short, we are approaching the time in the United States, perhaps by 1975 and certainly by 2000, when the income elasticity for farm food products will have declined to zero, but the proportion of disposable income allocated for food is increasing because consumers are demanding more and more services associated with, and built into, their food.

THE LONG-RUN RACE BETWEEN THE AGGREGATE DEMAND FOR AND THE AGGREGATE SUPPLY OF FARM FOOD PRODUCTS[7]

By way of pulling together the various ideas and relationships under consideration, it is helpful to summate the decisions of all producers of food products into an aggregate supply relation, and the decisions of all consumers into an aggregate demand relation. As is generally recognized, each of these aggregate relations is highly inelastic, and when related in a demand and supply analysis, these highly inelastic relations "explain" the dramatic fluctuations in the farm product price level. Each is so inelastic that a small change in one relative to the other gives rise to a large change in the farm price level. For example, a 4 percent contraction in the aggregate demand for farm food products in a free market situation could cause the farm price level to fall by 40 to 50 percent.

The point to be made is the following: wide swings in the farm price level and in gross returns to farmers are the norm for agriculture.

[7]Adapted from "The agricultural treadmill" in the forthcoming book, Farm Prices — Myth and Reality, University of Minnesota Press, 1958, Chap. 5.

Those swings are generated by the highly inelastic aggregate demand and supply relations for farm food products, where one relation shifts only modestly relative to the other.

It would be wrong, however, to visualize these aggregate relations shifting back and forth in a static, no-growth context. Over the long-run, both of these aggregate relations have been expanding; we have had a race between the aggregate demand relation and the aggregate supply relation. Changes in the farm price level growing out of shifts in the relative positions of the aggregate demand and supply relations have most often resulted from unequal rates of expansion in these aggregate relations. The race has rarely been equal, and at times it has been very unequal with extreme income consequences.[8]

Further, as earlier sections of this paper make clear, the long-run race between aggregate demand and aggregate supply in fact is a race between population growth and farm technological advance. Population growth and farm technological advance have in the 1950's become the shifters of aggregate demand and aggregate supply respectively. Since, however, none of us are omniscient, it is impossible to demonstrate that population growth will outrun technological advance between 1955 and 1975, or the converse. Those who are more impressed with the capacity of Americans to reproduce themselves than to create new ways of producing goods and services will probably conclude that population growth will win the race. But others who are more impressed with the inventive genius and the adoptive propensities of Americans than with their procreative efforts will probably put their money on technological advance.

But which wins is extremely important to American farmers. If population growth outraces technological advance, other things being equal, aggregate demand will press against supply and push the level of farm prices upward, as between 1895 and 1915. But if technological advance outraces population growth, other things being equal, aggregate supply will press against demand and drive farm prices downward, as has been the tendency since 1948.

Some evidence can, however, be adduced as to the outcome of the race between aggregate demand and aggregate supply over the period 1955-75, where proof is impossible. Over the period 1951-56 total population in the United States increased by exactly 9 percent. Over the same period the total output of marketable farm products increased by 13 percent. Now the figures in this comparison change somewhat depending upon the exact years chosen and the output index used, but the general picture does not change. The total output of farm products in the first half of the 1950's is outracing population growth. This increase in total farm output occurs in the face of a declining farm price level, and with no significant increase in the total inputs employed.

[8]For a good discussion of the unequal rates of growth between aggregate demand and aggregate supply, see Schultz, T. W., Agriculture in an Unstable Economy, McGraw-Hill Book Co., 1945, Chap. 3.

A major study by James T. Bonnen (reported upon elsewhere in this volume) looking forward to 1965, which assesses the output expanding potential of all "known and almost known technology," suggests that the trends of the early 1950's will not be reversed.[9] Assuming that the farm price level is maintained at the 1955 level, which relatively speaking is a low level, Bonnen estimates that total agricultural production will increase by 30 percent between 1955 and 1965. Using an estimate of a 15 percent increase in population over the period, and a 4 percent increase in per capita food consumption, the Bonnen model indicates that the annual rate of farm surplus which stood at 8 percent of total supply in 1955, would increase to 12 percent as of 1965. In other words, this study which takes a comprehensive forward look to 1965, concludes that output expansion will increase its lead over demand expansion in the years ahead. In terms of the 1955 farm price level, the total farm surplus will increase from 8 percent in 1955 to 12 percent in 1965.

In summary, it is the judgment of this writer that the rate of aggregate output expansion can easily exceed the rate of aggregate demand expansion over the period 1955-75. In this probable event, one of two things must happen: (1) the annual accumulation of surplus stocks by government must increase, or (2) the farm price level must fall precipitously. The capacity to expand farm output beyond the needs of the population is there and, unless counteracted in some effective way, this capacity will further intensify the general income problem in agriculture.

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[9]From the paper "The structure of agriculture," presented before the North Central Farm Management Research Committee, Chicago, Mar. 18-19, 1957.

PART III

Adjustments Related to Structure

Chapter 7

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The Structure of Agriculture*

SURPLUS production and associated income and resource difficulties which stem from a structural imbalance in agriculture currently constitute our major adjustment problem. The magnitude of the adjustment required depends upon the structural characteristics of agricultural demand and supply. The questions to be examined are: What are the magnitudes of the short-run elasticity coefficients for the supply and demand functions, quantities which are important in determining the intensity of the income and resource adjustment problem over short periods? Over longer periods of time will expanding production continue to outpace the growth of demand, causing a continued problem of imbalance; or, as some people suggest, will population growth offset output potential and restore more favorable incomes in agriculture? What quantities of products, resources, and farms are consistent with the volume of farm production likely to be demanded over the next decade?

The quantitative estimates of this chapter, contributed jointly from two different research undertakings, shed some light on these questions and on other relationships which are important for the adjustment problem. It is believed that the methods utilized in the two studies will be of signal interest to any future analysis of adjustment to the structural characteristics of agriculture. The first paper develops the present economic structure of agriculture and indicates how a knowledge of this structure might be used in the process of adjustment. The second paper builds a structure for agriculture in 1965 based upon certain assumptions and interrelated projections of demand factors, input requirements, and technology changes. On the basis of this structure, estimates of an equilibrium of production and consumption are made for various agricultural commodities. This second paper attempts to throw some light on the direction, size, and nature of the necessary adjustment to structural change to attain an equilibrium of production and consumption in 1965.

A SHORT RUN MODEL[1]

A knowledge of the forces which generate demands, supplies, and

*Journal Article No. 2062 of the Michigan Agricultural Experiment Station.

[1]This section is by William A. Cromarty. A more complete analysis is available in Cromarty, William A., "Economic structure in American agriculture," Michigan State University unpublished Ph.D. dissertation, 1957.

prices within agriculture is necessary if the effects of alternative adjustment policies are to be observed and understood. For example, what are the effects of substituting factors in production or products in consumption, of changing price support programs, of technological development, or of varying factors which are external to agriculture such as wages, income, or marketing costs? We do have some knowledge of the effects, much of it being qualitative and a lesser amount quantitative.

The object of this paper is to present some additional empirical results on the major macrorelationships existing within agriculture and between agriculture and the remainder of the economy. The relationships are termed macro since they are concerned with national data as compared with the individual farm, and are termed major since only the more important relationships are considered for the most important commodities. The procedure followed is to disaggregate agriculture into twelve product categories of which the first eleven have somewhat homogeneous demand and supply conditions while the last one is a miscellaneous category. Supply and demand functions are developed for each category with significant interactions between categories being permitted to exert their influence.

The categories are:

1. Feed grains (corn, oats, barley, sorghum)
2. Dairy products
3. Beef cattle
4. Hogs
5. Eggs
6. Poultry meats
7. Wheat
8. Soybeans
9. Cotton
10. Tobacco
11. Vegetables
12. Miscellaneous

Observations on these product categories are fitted for the 1929-53 period, using crop years for all crops and calendar years for all livestock products. The method of estimation varies between categories, but in general, limited information maximum likelihood estimates (LISE) are obtained for all relations except for the supply functions of crops for which single equation, least squares (LS) estimates are made. The total model, or system of equations, is formed from thirty-five structural equations plus several identities. The data are represented by time series on one hundred and ten variables.

In general, for each product category one supply relation is estimated. By contrast, several demand outlets may be considered covering commercial, government, and inventory demands. Quantities exported are treated independently of the model. In order to observe some of the major interactions between the demands and supplies of related commodities the first six product categories are fitted simultaneously as a subsystem. This represents the feed-livestock sector of agriculture. The remaining five product categories are fitted as independent subsystems.

The estimated prices and production for each product category may be aggregated to develop indexes of prices received by farmers and physical production. They may also be used to develop estimates of gross farm income for each category and for agriculture in total. Because production inputs are not available by product categories, production expenses and consequently net farm income cannot be estimated by product categories. However, aggregate production expenses may be estimated and subtracted from aggregate gross farm income to derive an estimate of net farm income.

Supply Relationships

In all cases the estimated supply relations represent behavioral rather than technological functions. For lack of space each particular relation is not expressed explicitly but the general procedure followed is presented. In the case of crops an attempt is made to include: (1) the effects of price expectations as measured by lagged product prices, (2) the prices of alternative crops, (3) costs of items used in production, (4) weather, by including critical climatic factors, or unharvested acreages if no single climatic factor can be distinguished, and (5) technological advances as measured by physical units of equipment or changing cultural practices. For the non-crop product categories the supply relations attempt to measure the effects of: (1) costs of items used in production, (2) the level of fixed assets, (3) price expectations as measured by lagged product prices, and (4) in some cases technological improvements. For the technology and weather variables the data used are inadequate but are better than complete omission or oversimplification which accompanies the use of a linear time trend.

Price elasticities of supply are presented in Table 7.1. The relevant prices are indicated in column (2). In the case of cotton, flue cured tobacco, and burley tobacco, the relevant price is assumed to be whichever is higher, the market price for the previous year or the announced

Table 7.1. Estimates of Price Elasticities of Supply

(1) Product category	(2) Relevant price	(3) Elasticity
Feed grains	ratio feed grains to wheat lagged one year	.364
Beef cattle	current price beef	.037
Dairy products	current price milk	.212
Hogs	current price hogs	.130
Eggs	price eggs for December of previous year	.298
Poultry meat	price broilers lagged one year	.678
Wheat	ratio wheat to feed grains, weighted average of previous three years	.129
Soybeans	price soybeans lagged one year	.171
Cotton	price cotton lagged one year	.361
Flue tobacco	price flue tobacco lagged one year	.516
Burley tobacco	price burley tobacco lagged one year	.381
Fresh vegetables	price fresh vegetables lagged one year	.316
Processed vegetables	price processed vegetables lagged one year	.416

support price for the current year. The price elasticity for soybeans is too low relative to other commodities, and this may be due to the rapidly changing structure of soybean production. It is also recognized that the responsiveness of beef production to prices of a previous time period has not been captured in the supply elasticity.

Demand Relationships

When appropriate, in each product category three distinct but interrelated demand outlets have been considered. These are termed commercial demand, inventory demand, and government demand. The technique of simultaneously estimating the demand relations permits observation of interactions between demands.

Commercial Demand. Commercial demand is defined as the quantities of commodities consumed by persons or industries in the private sector of the economy. In general, the demand relation associates the quantity taken with: (1) the current price of the product, (2) prices of close substitutes, (3) a measure of marketing charges, (4) per capita disposable income, (5) the general price level, and (6) in some cases, a time trend to remove some of the effects of changing tastes. The demand relations are unique in the sense that data on income and the price level are not observable but are built up by solving a more aggregative model[2] of the national economy. In this way a series of multipliers may be constructed to observe how the effects of changes in the nonagricultural sector (e.g., in wages, profits, tax structure) may be transmitted to the agricultural sector. As an alternative to presenting the complete system of commercial demand equations, elasticities of demand or price flexibilities are presented in Table 7.2.

Table 7.2. Elasticities and Flexibilities of Commercial Demand

Product category (1)	Price elasticity (2)	Income elasticity (3)	Price flexibility of demand (4)	Price flexibility of income (5)
Beef cattle			-1.329	.311
Dairy product			-1.484	.782
Hogs			- .422	.038
Eggs			- .965	1.409
Poultry meat			- .288	.395
Wheat	- .518	1.426		
Cotton	- .300	.953		
Flue tobacco	-5.759	2.678		
Burley tobacco	-1.325	.767		
Fresh vegetables			- .586	1.684
Processed vegetables			- .175	1.510

[2]Klein, L. R., and Goldberger, A. S., An Econometric Model of the United States, 1929-53, North Holland Publishing Co., Amsterdam, 1955.

Price and income elasticities are rather well known concepts. Price flexibility of demand is the ratio of the percentage change in price to the associated percentage change in consumption, and is estimated for those categories in which price rather than quantity is considered to be the "dependent" variable. (The reciprocal of this relationship does not equal the price elasticity of demand since, in assuming an equality between production and consumption for the livestock and vegetable categories, inventory changes are not considered). Price flexibility of income is the ratio of the percentage change in price to the associated percentage change in income and is estimated for those product categories in which price, rather than quantity, is considered as the "dependent" variable.

Inventory Demand. For the feed grains, wheat, and cotton product categories, estimates are made of the quantities carried over by the private sector at the end of the crop year. Naive relationships are established basing the carry-over on current prices, production, crop prospects for the wheat category, and foreign supply in the case of cotton. The price elasticities of demand for storage are presented in Table 7.3. In the case of feed grains and cotton they fall slightly below the commercial demand elasticities while for wheat they are slightly above.

Government Demand. Government demand is considered to be the amount of a commodity moving under loan or purchase agreement programs. Wheat, feed grains, cotton, flue cured and burley tobaccos represent the product categories covered. In each case the hypothesis used is to express government demand as a function of the difference between the support price and what the market price would be in the absence of government programs.[3] Since this latter price is an hypothetical one, being determined by demand and supply conditions where government operations do not exist, it cannot be measured directly; hence, it is estimated in terms of observable variables.

The validity of such estimates as those given above may be tested only by making forecasts and checking them against subsequently observable values. For the present, elasticities based upon such empirical results can be computed as a test of consistency with observed situations. For the above relationships, elasticities relating government demand to the supply of the crop and the price support level are computed in Table 7.4.

The validity of such elasticities is unknown since similar independent estimates are not available for comparison. However, in all cases the amount of a commodity moving under loan appears to be sensitive to changes in price support levels and production.

An Application of the Model

The fact that interactions between categories are permitted in the

[3]This method is discussed in the following two publications: Hathaway, D. E., "Effects of the price support program on the dry bean industry in Michigan," Mich. Agr. Exp. Sta. Tech. Bul. 250, 1955; Johnson, G. L., "Burley tobacco control programs," Ky. Agr. Exp. Sta. Bul. 580, 1952.

Table 7.3. Price Elasticities of Demand for Storage

Product category	Elasticity based upon current prices
Wheat	- .601
Feed grains	-1.776
Cotton	- .211

The estimated structural relations which measure some of the factors influencing the amount of a commodity moving under loan programs are given below for the feed grains, wheat, cotton, and burley tobacco product categories. The estimated standard errors appear in parentheses.

Feed grains

$$(1.1)\quad Y_{24} = 1327 + \underset{(.483)}{1.686Z_{26}} - \underset{(.336)}{.0335Y_{32}} - \underset{(4.221)}{8.434Y_{42}} - \underset{(.464)}{.184Y_{52}} + \underset{(1.054)}{1.160Z_{25}} + \underset{(.955)}{.796Z_{21}}$$

Wheat

$$(1.2)\quad Y_{17} = -585 + \underset{(.180)}{.474Y_{11}^{*}} + \underset{(.151)}{.107Y_{21}} + \underset{(.211)}{.386Z_{49}} - \underset{(.304)}{.650Z_{41}} - \underset{(3.278)}{.603Z_{36}} + \underset{(1.252)}{2.799Z_{16}}$$

Cotton

$$(1.3)\quad Y_{97} = -7021 + \underset{(.149)}{.610Y_{91}^{*}} + \underset{(1.423)}{1.60Z_{95}^{*}} + \underset{(3.601)}{1.310Z_{99}} + \underset{(12.769)}{18.576Z_{98}} + \underset{(4.998)}{1.079Z_{41}} - \underset{(4.063)}{8.032Z_{36}}$$

Burley tobacco

$$(1.4)\quad Y_{11,4} = -314 + \underset{(.129)}{.791Y_{11,1}} - \underset{(.073)}{.199Z_{41}} + \underset{(.198)}{.610Z_{11,12}} + \underset{(.146)}{.183Z_{11,3}}$$

Definition of variables

Y_{24} = CCC loans and purchases of feed grains
Z_{26} = average support price for corn
Y_{32} = price of beef cattle
Y_{42} = price of milk
Y_{52} = price of hogs
Z_{25} = number of animal units fed beginning October 1 of previous year
Z_{21} = available supply of feed grains
Y_{17} = CCC loans and purchases of wheat
Y_{11}^{*} = available supply of wheat
Y_{21} = production of feed grains
Z_{49} = average hourly marketing charges for food products
Z_{41} = per capita disposable income
Z_{36} = general price level index for United States
Z_{16} = national average support price for wheat
Y_{97} = quantity of cotton placed under loan programs
Y_{91}^{*} = total supply of cotton
Z_{95}^{*} = supply of cotton outside U.S.A.
Z_{99} = production of synthetic fibers
Z_{98} = national average support price for cotton
$Y_{11,4}$ = quantity of burley tobacco pledged for loans
$Y_{11,1}$ = current burley production
$Z_{11,12}$ = burley manufacturers' ratio of stocks to disappearance
$Z_{11,3}$ = national average support price for burley tobacco

Table 7.4. Elasticities for Government Demand

Product category	Elasticity based upon supply	Elasticity based upon support price
Feed grains	4.535	5.934
Wheat	30.050	3.677
Cotton	4.005	1.252
Burley tobacco	11.809	1.553

estimating process increases the usefulness of the model in tracing the effects of internal or external shocks which the system might receive. An example of such a shock is traced using the elasticities computed in the previous sections.

Suppose that in year t the price of feed grains increases 10 percent. Based upon the estimated elasticity of supply production would, ceteris paribus, increase 3.62 percent in year t + 1. This increase in supply would be utilized in one of the three demand outlets — commercial, inventory, or government. In looking at the livestock sector a 3.62 percent increase in the supply of feed grains would cause a .49 percent increase in hog production and a .83 percent increase in beef cattle slaughterings. The meat production increases would, in turn, cause a .21 and 1.10 percent decline in the respective prices of hogs and beef. The decline in beef and hog prices would decrease the demand for feed grains an estimated .07 percent, which would cause the total supply of feed grains to increase 3.7, rather than 3.6 percent. The 3.7 percent increase in supply would now be allocated to inventory and government demands. Based upon the computed elasticities for these demand relations, inventory demand would increase 1.0 percent, while the remaining feed grains would increase government demand by 16.7 percent. A 10 percent increase in feed grain prices and its consequent production increase would cause little change in commercial or inventory while government demand would increase by approximately 17 percent.

A second example of the usefulness of the model is presented by tracing through the system the effects of a 10 percent increase in the announced support price of burley tobacco when the support price is the relevant price upon which producers act. Based upon a supply elasticity of .529, production would increase 5.29 percent. (Under an established acreage allotment program the elasticity may be high since the total production increase must come for increased yields per acre).

It is estimated that the market price for burley would decline .89 percent, and this would increase the commercial demand for burley by 1.19 percent. The net increase in supply would thus amount to approximately 4.10 percent, and this would be absorbed by increasing government demand. Based upon the demand elasticity given in Table 7.4, government demand would increase 48.4 percent.

The above examples illustrate the usefulness of the model for a relatively short period. If the model is to be applied to longer time periods, then the flow of resources between the agricultural and nonagricultural sectors of the economy must be given more emphasis. At this stage such flows are not assumed to be very effective in changing resource use for a one or two-year time period.

A LONG RUN MODEL: ECONOMIC ADJUSTMENT TO A DECADE OF STRUCTURAL CHANGE, 1955-1965[4]

The model constructed in this study estimates output and consumption for American agriculture in 1965. The estimates are based upon an effort to measure and project a limited number of structural changes of primary importance to the long-run future of agriculture. Such structural changes include the land-use pattern, livestock inventories, technology, population, and per capita consumption, as well as a number of structural changes in the general economy, which are also assumed or projected. The major emphasis of the study, however, is on the effort to estimate the impact of technological change upon the supply side of the model.

The model-building procedure has three distinct stages: (1) In stage one tentative production and consumption projections are made independently of each other for 32 commodity categories. Only a few commodities involving major surplus problems are presented here. The basic structural changes in agriculture are determined in this stage and provide the basis of the output and consumption projections. (2) In stage two, the imbalances implied in the independent projection of production and consumption are analyzed, and an equilibrium estimate of production, price, and consumption is formed. Available research reports on individual commodity demand and supply response are used in resolving the imbalance between the tentative projections of production and consumption. The degree of pressure which various structural changes exert on an equilibrium are determined at this stage. (3) In the final stage of analysis, individual commodity equilibriums are aggregated to obtain estimates for "all farm products" and portions of "all farm products" such as "all food products," "livestock products," and "fats and oils." Structural interrelationships of commodities with high substitution possibilities and groupings of these commodities are analyzed for consistency in the aggregation process.

Stage One: Tentative Demand Projection

In analyzing the relationship between output and consumption in 1965, let us look first at the tentative projection of demand. We need to know: (1) the assumptions upon which the projection is based and (2) the

[4]This section is by James T. Bonnen. It is in the process of revision in order to allow the use of more recent and final data from the USDA. The revised and complete model, "A Balanced United States Agriculture in 1965," by James T. Bonnen and John D. Black will be published by the National Planning Association.

method of projecting structural changes in demand to 1965. The assumptions and the immediately related projections which are used for the subsequent analysis are as follows:

	1955[5]	1965
1. Population (millions)	165.3	190.3[7]
2. Total labor force (millions)	68.9	79.2[8]
3. Armed forces (millions)	3.0	3.0[9]
4. Work week (hours)	39.8[6]	38.0[10]
5. Growth in GNP man-hour over the decade (percent per annum) = 2.5		
6. Gross National Product (billions)	390.9	550.4
7. GNP per capita (dollars)	2364.8	2892.3

8. It is assumed that no major war will occur over the decade, but that present international tensions will continue.
9. A continued high level of economic activity is assumed. In short, we assume that fluctuations in the business cycle will not be great enough to cause unemployment of more than 4 percent of civilian labor force.
10. No change in the basic tax structure and no rationing or government allocation of materials is assumed.
11. The price and production base assumed is that of 1955. The economy on balance did not exhibit any appreciable inflation or deflation over this year, although prices of agricultural products continued the decline which began in early 1951.

The consumption projected for individual commodities is actually the product of two projections, population and per capita consumption. The Bureau of the Census population projection "A" of a population of 190 million for 1965 is accepted for this purpose.[11] For per capita consumption three hypothetical rates are projected within the framework of our assumptions as to per capita income and prices:

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[5]Except as noted, for historical data, see "The economic report of the President," Council of Economic Advisors, Washington, D. C., Jan. 23, 1957, pp. 126, 140.

[6]An average of the monthly data reported in Current Population Reports, Bureau of the Census, Series P-57, Nos. 151-62, but adjusted by the technique outlined by Gerhard Colm in "The American economy in 1960," Planning Pamphlet No. 81, National Planning Association, Washington, D. C., Dec., 1952, p. 119.

[7]Zitter, Meyer, "Revised projections of the population of the United States, by age and sex: 1960 to 1975," Current Population Reports, Bureau of the Census, Series P-25, No. 123, Oct., 1955.

[8]Bancroft, Gertrude, "Projections of the labor force in the United States, 1955 to 1957," Current Population Reports, Bureau of the Census, Series P-50, No. 69, Oct., 1956.

[9]Projected on the basis of assumed world conditions and manpower expectations.

[10]Assumes a continuation of the linear trend from the period 1945-55.

[11]Current Population Reports, Series P-25, No. 123, Oct., 1955.

1. The historical rate of change in per capita consumption (allowing for changes in real income and prices) is projected to 1965 from the period 1925-55.

2. In many instances clear changes occur in the time trend after 1925. The consumption pattern of many commodities shifted in the late 1930's and of others in the later 1940's. These shorter and more recent trends are projected to 1965.

3. A zero rate of change in per capita consumption is projected.

On the basis of the present study, historical data, and other available analyses of changes in consumption for particular farm products, subjective probabilities are attached to the consumption projections and to the intervening ranges between to form a distribution of probabilities. Thus, the result is a tentative, "most probable" projection of consumption.

Stage One: Tentative Supply Projection

The tentative projection of supply is based on the assumptions and related projections which follow:

1. Average weather conditions are assumed.

2. Existing "excess" stocks are assumed to be liquidated by 1965. Ultimate arbitrariness cannot be avoided in allowing for "excess" stocks in either definition of "excess," in the economic process of disposal, or in its timing; consequently, the assumption is selected for its simplicity. Adjustments for more complex assumptions can be applied to the final model, if desired.

3. The calendar year of 1955 is again used for the price and production base.

4. The agricultural labor force is projected from 6.7 million (census series) in 1955 to 5.2 million persons in 1965. This projection is made on the basis of trends in the relationship of the agricultural labor force to a total population, farm population, and to population and labor force composition. The assumptions of full employment and absence of major wars and certain data on technological change also condition this projection.

5. Some preliminary assumptions are made for land use and livestock numbers in the first stage of the analysis, while production is handled as the only major dependent variable. For this purpose the 1965 trend value of land use and livestock numbers is used where a fairly clear long-run pattern of change is exhibited. For commodities where no clear pattern of change is evident, an average of the post-World War II years is assumed during the first stage of the analysis for 1965. The land-use pattern and livestock inventory are freed from the first stage assumptions and are treated as dependent variables in the second stage of the analysis.

The production for individual commodities is the product of a number of projections. The production projections for crops are constructed from harvested acreage and yield projections. Output projections for livestock include some measure of the number of head in inventory, the efficiency of feed utilization, and the average live weight produced per head. (Some particular livestock items are, for obvious reasons, projected in different form. In hog production, for instance, changes in technology have been related in different ways to live weight produced per pig saved, the number of pigs saved per litter, the number of sows farrowing, and the efficiency of feed utilization. Consequently, all of these production variables are projected to 1965.)

One of the primary goals of this study is to measure and project the impact of technological change upon each commodity. No satisfactory single index of technological change exists for either livestock or crops, nor has a single index of technological change as such been constructed here; but rather a procedure was developed for measuring the impact of technological change on the major structural production characteristics which are being projected.

Estimates of the potential impact of technological change upon yield, inventory, and output were constructed for each crop and livestock product on the basis of data from the following sources:

1. Scientists at the Beltsville Agricultural Experimental Station. These scientists provided detailed evaluations of the impact of current research-in-progress and research completed in the last few years on crop yields, labor, capital, and land inputs for individual commodities; livestock output per animal, livestock efficiency of feed utilization, and labor, capital, and land inputs for individual livestock enterprises. The most complete and reliable evaluations concerned crop yields, livestock output per animal, and the efficiency of feed utilization. The scientists were asked to inventory anticipated innovations and to evaluate the impact of the individual innovations as well as their effect in sum. For crops they were asked to express in two forms their evaluation of a changing technology's impact on yields: (a) an estimate of capacity or highest yield possible under optimum physical conditions and (b) an estimate of what yield would probably be realized considering problems of adjustment. For livestock the evaluations centered around the efficiency of feed utilization and output per animal, and the estimates, as with crops, were framed in two forms: (a) an estimate of capacity or an optimal conditions estimate and (b) an estimate of the impact considering the problems of adjustment. This process of evaluation of the impact of technology was repeated in the USDA with agricultural economists who are commodity specialists. The process was repeated for confirmation of the reasonableness of the technological expectations and to insure the consistency of the estimates with the economic assumptions of the model.

2. Yields of experimental research collected from the experiment station publications of the various states. The yields were identified

in time sequence and used as timed optimum capacity statements. These were compared with an adjusted series of realized yields, and the implied historical rates of adaptation to potential capacity were applied to provide a check on the quantitative evaluations which the crop and livestock specialists provided. Where evidence conflicted, the more objective measure, yields of experimental research, was usually used.

3. The Land Grant College — USDA cooperative productivity committee projections of 1950 and 1955 production and yield possibilities. These projections provide implicit evaluations of change in technological capacity and the rates of adaptation to available technology. The estimates are published in detail by individual states. United States and regional aggregates are published by the USDA.[12]

4. Information from individual evaluations of the impact of current research-in-progress from the state agricultural experiment stations over the United States.

Since something not in existence cannot be evaluated, even as an idea, projections based on technological change are limited to "all known and almost known technology." By "almost known" technology is meant that research now in progress which is clearly coming to fruition.

Assumed land-use patterns and projected yields provide the tentative projections of crop production. For livestock, assumed inventories, projected efficiencies of feed utilization, and the average live weight produced per animal provide the tentative production projections.

Stage Two: Resolution of Projected Structural Imbalances

When consumption and production projections are made independently of each other, the quantitative results rarely balance. Stage two of the analysis compares these preliminary projections of production and consumption and resolves the resulting imbalances. At this point two previously posited assumptions are discarded. The assumption of constant relative prices for the different products is dropped, and the degree of pressure that the projected imbalance exerts on the price of the commodity is evaluated. The land-use pattern and livestock inventories assumed in stage one are also dropped. It is to be noted that the imbalances are resolved (the equilibrium is estimated) on the basis of an additional assumption: namely, that the controls and administrative action which are necessary to attain an equilibrium are undertaken, are in general accepted by farmers and farm organizations, and are effective. This is an heroic, if not totally unrealistic, assumption in the light of agricultural policy experience over the past three decades. However, the reason for analyzing 1965 agriculture in terms of an

[12] "Peacetime adjustments in farming: possibilities under prosperity conditions," Misc. Publ. No. 595, USDA, Washington, D. C., Dec., 1945; and for 1955 see "Agriculture's capacity to produce," Agr. Inf. Bul. No. 88, USDA, Washington, D. C., June, 1952.

equilibrium of production and consumption is that equilibrium is the publicly stated and continuing rational goal of national agricultural policy and is a goal of major importance in an era of chronic production surplus.

The available empirical material on the demand and supply response characteristics of specific commodities is used in the resolution of projected imbalances. This empirical material provides an additional basis for judging the probabilities of various solutions. With some commodities the imbalance can be evaluated in terms of price elasticities of demand and of supply. A base year "demand-supply response ratio" can be computed from available empirical estimates of elasticity.[13] The impact of major structural changes upon this "response ratio" is estimated to obtain the "demand-supply response ratio" for 1965. This study's final results are not the product of a completely rigorous model. Indeed, they cannot be, considering the nature of the problem faced.

Stage Three: Aggregation

Aggregates of production and consumption are constructed from the individual product equilibriums. Indices are constructed with production value weights obtained by applying 1955 prices to the sum of 1954 and 1955 production. Production for both 1954 and 1955 is used to average out single year departures from normal production. The individual commodity balance from stage two is not necessarily the final one; commodities with high substitution possibilities (e.g., edible oils) are aggregated, a balance of production and consumption is determined, and commodity interrelationships are checked for consistency and reasonability. The final balance or equilibrium includes many of the feedbacks and

Table 7.5. Wheat Situation

	1955	1965	Percent change
Acreage harvested (thousands)	47,285	44,100	- 6.7
Yield (bu./acre)	19.8	20	+ 1.01
Production (thousand bu.)	934,731	882,000	- 5.6
Average price ($/bu.)	2.02	1.60 to 1.70	-18.3
Annual surplus (thousand bu.)	61,731	None	
Total consumption (thousand bu.)	873,000	882,000	+ 1.03
Domestic civilian	471,000	467,000	- 0.58
Military	9,000	10,000	+11.1
Non-food and seed	116,000	130,000	+12.1
Export	277,000	275,000	- 0.7
Lbs. per capita domestic consumption	172	150	-12.8

[13]Demand-supply response ratio = $\frac{\text{price elasticity of supply}}{\text{price elasticity of demand}}$

direct interrelationships which condition the actual process of demand-supply equilibration. This procedure provides a check on products with high substitution possibilities, and it frequently results in revision of individual product equilibriums. This model does not simply cut off the production projection at the point where it equals the projected level of consumption, as do most projections for future time horizons.

Table 7.6. Feed Grains Situation
(Corn, Oats, Barley, Sorghum)

	1955	1965	Percent change
Acreage harvested (million acres)	146	128	-12.3
Yield (tons/acre)	.89	1.05	+17.9
Production (million tons)	130.2	134	+ 2.9
Produced for grain (million tons)	120.7	123.4	+ 2.2
Average price ($/ton)	44.67	42.7 to 46.7	0.0
Annual surplus (million tons)	8.5	None	
Total consumption (million tons)	112.2	123.4	+10.0
Food use	4.6	4.9	+ 6.5
Nonfood use	102.6	113.5	+10.6
Exports	5.0	5.0	0.0

Empirical Results of the Model

Final equilibrium estimates of production, consumption, prices, and acreage harvested are presented for a number of commodities with serious surplus difficulties (Tables 7.5-7.8).

Table 7.7. Cotton Situation

	1955	1965	Percent change
Acres harvested (thousands)	16,928	11,584	-31.6
Yield (lb. lint/acre)	417	480	+15.1
Production (thousand bales)	14,721	11,584	-21.3
Average price ($/lb.)	.3217	.26 to .29	-14.5
Annual surplus (thousand bales)	3,290	None	
Total consumption (thousand bales)	11,431	11,704	+ 2.4
Mill consumption	9,202	8,704	- 5.4
Net exports	2,229	3,000	+34.6
Net imports	140	120	-14.3
Lbs. per capita consumption	26.5	22	-17.0

Table 7.8. Tobacco Situation

	1955	1965	Percent change
Acres harvested (thousands)	1,494	1,115	-25.4
Yield (lbs./acre)	1,467	1,650	+12.5
Production (million lbs.)	2,193	1,839	-16.1
Average price ($/lb.)	.51	.44 to .46	-11.8
Annual surplus (million lbs.)	258	None	
Total consumption (million lbs.)	2,055	1,969	- 4.2
Domestic	1,408	1,469	+ 4.3
Exports	647	500	-22.7
Imports	120	130	+ 8.3
Lbs. per capita consumption (for persons 15 yrs. and over)	11.9	11	- 7.6

The input resource flows for land and labor have been quantified and are presented in Tables 7.9-7.11. Note the flow of resources between farm and nonfarm economies.

Table 7.9. United States Land by Uses (Millions of Acres)

Land use	1950[a]	1955[b]	1965	Percent change between 1955 and 1965
Land in farms				
Cropland	409	399	366	- 8.3
Cropland used for pasture	70	66	80	+21.2
Open pasture and graze	415	460	497	+ 8.0
Woodland pastured	135	121	145	+19.8
Woodlands not pastured	85	76	90	+18.4
Other uses	45	36	30	-16.7
Total	1,159	1,158	1,208	+ 4.3
Land not in farms				
Grassland pasture and graze	215	173	165	- 4.6
Woodland pastured	185	180	160	-11.1
Woodlands not pastured	201	238	210	-11.8
Other uses	144	155	161	+ 3.9
Total	745	746	696	- 6.7
Total land area of U. S.	1,904	1,904	1,904	0.0

[a] "Agricultural statistics, 1953," USDA, Washington, D. C., 1953, p. 550, and Supplement to "Major uses of land in the United States," USDA, Washington, D. C., Sept., 1953, pp. 61-62.

[b] "Major uses of land in the United States, summary for 1954," Agr. Inf. Bul. No. 168, USDA, Washington, D.C., Jan., 1957, p. 5.

The net farm-nonfarm transfer of land results in a slight increase in the total land area in farms. The farm land increase occurs in woodlands and pasture, while the amount of cropland declines. As might be expected, changing composition of labor force involves a continued increase in nonfarm labor force and a decline in agricultural labor force. Farm labor force declines from 10.2 percent of total civilian labor force in 1955 to 6.8 percent by 1965.

Table 7.10. Harvested Crop Acreage Adjustment for a 1965 Equilibrium (thousands of acres)

Crops	1950[a]	1955	1965	Acre change 1955 to 1965[b]
Wheat	61,610	47,285	44,100	- 3,185
Feed grains	144,038	146,203	128,000	-18,203
Cotton	17,843	16,928	11,584	- 5,344
Tobacco	1,599	1,494	1,115	- 379
Total	225,090	211,910	184,799	-27,111
Other crops	115,756	124,490	124,201	- 289
Total harvested acreage	340,846	336,400	309,000	-27,400

[a]The 1950 data are from Agricultural Statistics, 1954, USDA, Washington, D.C., 1954, p. 443. The 1955 data are from "Crop Production, 1956 Annual Summary," USDA, Washington, D.C., Dec. 1956, pp. 3-4.
[b]Average quality land.

The model provides no direct basis for estimating aggregative capital flows, either within agriculture or between agriculture and the rest of the economy. However, the commodity-by-commodity analysis of technological change gives many indications of the direction and nature of these changing capital flows.

Table 7.11. Labor Force (in millions)[a]

	Total labor force	Armed forces	Total civilian labor force	Employed			Unemployed
				Total	Agriculture	Nonagriculture	
1955	68.9	3.0	65.9	63.2	6.7	56.5	2.65
1965	79.2[b]	3.0	76.2	73.2	5.2	68.0	3.00

[a]Individual figures do not add to totals due to rounding. 1955 data are from "The economic report of the President," Council of Economic Advisors, Washington, D.C., Jan. 23, 1957, p. 140.
[b]Bancroft, Gertrude, "Projections of the labor force in the United States, 1955 to 1975," Current Population Reports, Bureau of the Census, Series P-50, No. 69, Oct. 1956.

Aggregative Conclusions of the Equilibrium Model

Different types of models and projections can be derived from the research reported here: technological capacity projections, economic capacity projections, and various types of equilibrium models positing different economic paths and policies for adjustment of projected disequilibria. One such equilibrium model is presented in this chapter.

The aggregative indices computed for the equilibrium model provide the following estimates of total production and consumption for the United States:

	1965 consumption index	1965 production index
All agricultural products	117	112.5
All food products	119.8	116.3

The surplus of production over consumption in 1955 is estimated at 4 percent for all agricultural products and 3 percent for all food products.[14] The model aggregates imply a per capita food consumption increase of 4 percent over the decade. Also implied in the model is a decline in the income elasticity of demand for food from 0.23 in 1955 to 0.20 in 1965.

We may draw a number of conclusions from the model and its related analysis. The annual surplus of production is a structurally chronic condition destined for a decade of continuous growth unless far more effective production control measures are taken than at present. The combined indices of crop yields and the efficiency of feed utilization indicate an expected increase of 23 percent over the decade. Most awesome, however, is the estimated potential increase in yields and efficiency of feed utilization, aggregating better than 60 percent by 1965. This contrasts with the 12 to 13 percent increase in agricultural output that can reasonably be absorbed by the economy in 1965. In practically every commodity group, yields will increase more than production needs by 1965. We are not going to "eat our way out" through increases in per capita consumption and population; the total effect of both of these factors will raise food consumption no more than 20 percent. On the basis of computations from the model it is estimated that, with no production controls and 1955 prices, a 30 percent increase in food production by 1965 would be well within the bounds of possibility.

[14]All surplus figures in the model understate the annual surplus rather significantly. No provision is made in the estimates for the effect of the subsidy and donation programs which account for a significant volume in some agricultural markets. Specifically, there is no allowance for the P.L. 480 and Section 32 funds, the school lunch program, I.C.A. activities, and the other export subsidy, promotion, and barter activities of the federal government. Not only are meaningful data unavailable, but important conceptual difficulties arise in defining surpluses under these conditions. The actual surplus is probably somewhere on the order of twice the size of the model figures.

The adjustments implied are fairly obvious. Technological change in agriculture will have the usual effect of raising the minimum size of an optimum production unit. While the labor force declines from 6.7 to 5.2 million persons, the average size of the American farm still must increase about 20 percent if income is to be adjusted effectively to expected changes in technology and productive capacity. This implies a decline in the number of farms from around 5 million in 1955 to a little more than 4.25 million by 1965. The model indicates a decline in farm prices of around 5 to 10 percent to attain the projected equilibrium of production and consumption. The 1965 equilibrium appears to involve a parity ratio of between 75 to 80, although this is at best a very rough estimate.

Any attempt to alleviate the structural imbalance by moving large amounts of one resource, such as land, out of agricultural production is doomed to failure. Other resources (fertilizer, pesticides, irrigation water, equipment, and even labor) are simply substituted for land; and with higher yields production remains at high levels or increases still further. The soil bank technique by itself is no solution; in fact, as presently set up, the soil bank is undoubtedly production increasing. It is estimated from the model that a minimum of between 50 to 60 million acres would have to be taken out of production permanently before such efforts could achieve anything close to an equilibrium of production and consumption in 1965. And, even then, the effectiveness of such techniques can reasonably be doubted when employed by themselves. Much the same may be said of proposals for a solution by moving only labor out of agriculture. Labor has been moving off the farm at a fantastic pace over the past decade, yet production has increased even more rapidly. The substitution of capital for labor and land has been a characteristic feature of agriculture's technological and organizational revolution. Any effective effort to reduce production must involve the simultaneous transfer of some combination of labor, land, and capital resources to nonagricultural pursuits.

It makes economic sense in the face of chronic production surpluses to move resources toward the production enterprises which require the greatest investment of resources per pound of output. Thus, shifting production toward livestock products tends to reduce the annual surplus. The suggestion sometimes made that the entire "surplus problem" could be absorbed by the livestock economy has been tested using the model of this paper.[15] The model indicates that only about a quarter of the annual production surplus could be absorbed without serious consequences to the livestock industry. Certainly no other sector of American agriculture has even this potential capacity of expansion and resource absorption. A relatively large animal product enterprise also provides a reservoir from which resources can be drawn in times of war and other catastrophes.

[15] Bonnen, James T., and Witt, Lawrence W., "What is American agriculture geared to produce?" Proc. of Sixth Ann. Nat. Inst. of Anim. Agr., Purdue University, Lafayette, Ind., Apr., 1956, pp. 49-63.

Additional hypotheses as to the effects of different resource mixes may be tested in this model. The hypotheses so far tested show that the structural imbalance implied by the model is a serious long-run problem which will have to be faced honestly and thoughtfully by American agriculture if a generally satisfactory adjustment is to be attained.

Contrast of Models

By comparison both models recognize economic structure in agriculture, the first as a formal system of equations from which empirical coefficients are derived and the second as a structural system in the sense that it quantifies long-run changes in interrelationships and evaluates their effects in a systematic manner, but within a partially, not totally, rigorous system. The objectives of both are primarily the same, aside from length of run — to determine the structure which generates demands and supplies of agricultural commodities and to obtain empirical estimates of the structure. The empirical estimates form a basis for determining the effects of various changes which occur in the system.

The first model evaluates the structure in terms of annual changes, while the second involves a period of ten years. Because of this the second model gives more emphasis to some of the resource flows which are likely to occur between the agricultural and nonagricultural sectors of the economy. These resource flows do not affect the structure of the first model to as great a degree. For instance, the size of farm and nonfarm labor forces and their composition do not change much over a period of only a year, but over a decade significant changes occur.

These are provided for in the long-run model. Similarly, land-use patterns are altered significantly over the long run, with shifts of land resources between farm and nonfarm uses. Major capital flows change in size and composition over long-time periods. Explicit long-run changes in management efficiency were estimated. Additional structural changes due to technology are included for the long-run model. Over the long run the substitution of leisure for income is included by projecting the trend for the average length of the work week. Population change is allowed for in both models. Tastes also change. A time trend is used to account for change of tastes in the short-run model. For the long-run model a number of the more obvious long-run time trends were projected and additional information used in selecting the final, most probable trend estimate.

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Discussion

CHAPTERS 4 and 5 on demand and supply have laid the groundwork for this discussion of the adjustment in agriculture to the economic growth in the years ahead.

Bonnen and Cromarty recognize the same limitations that have been discussed previously, namely that we are still lacking in basic statistical data and in an adequate conceptual framework to solve all agricultural problems precisely.

The first part of the paper by Dr. Cromarty presents an analysis of the economic structure with an indication of the usefulness of this procedure in short-run adjustments. The grouping of agricultural products into 12 categories seems logical. It might be advantageous to group livestock products in one category (similar to the grouping of feed grains) since there is considerable substitution among the livestock products. However, Cromarty has recognized the interaction between these products.

I would question the significance of determining demand elasticities for each of the three outlets — commercial, inventory or storage, and government. Government purchases hardly represent a demand in the usual meaning of the term. These purchases merely represent the fulfillment of the government promises to purchase the total production of those producers who meet the requirements (stay within acreage allotments) at a predetermined price. The three outlets for farm products do not seem to be independent components of demand.

Cromarty's estimates of the elasticity of supply and demand are similar to those arrived at by others. If the basic data can be provided that will give such analysis a fairly high degree of reliability, the process can become very useful. The effect of agricultural price policy could then be tested in advance and a policy could be adopted that would at least point in the right direction.

Dr. Bonnen's part in the paper represents the long-run approach to adjustments in agriculture. His projections for the U. S. economy to 1965 are similar to those determined by others (Table 4.2 in the Collins-Mehren paper). Bonnen projects demand and supply to 1965 for the same 12 categories of farm products used by Cromarty, then in the third stage of his analysis aggregates the projected production and consumption of agricultural products. In spite of an increase in population of 15 percent by 1965 we would have to reduce cropland approximately 30 million acres, shift 14 million acres to woodlands not pastured, and reduce by 50 million acres the land not in farms but used for agricultural uses. Other shifts within the agricultural uses would be necessary. The agricultural labor force can be reduced 1.5 million workers or 22 percent. Recognizing the lack of adequate data and the effect of this on his analysis, Bonnen concludes that we will not "eat our way out," at least not by 1965.

Bonnen's qualifying assumptions are clearly stated. One limitation in the analysis is the impact of technological changes. Bonnen has of necessity limited himself to the "known and almost known" technology. However, the impact of the unknown technological innovations may be a major disturbance.

Some questions can be raised regarding the general approach. Most of my questions would focus on the inadequacy of our basic data and conceptual framework of analysis. Does our analysis of supply and demand adequately measure the response to price of both consumers and producers? We know that farmers in one region will respond differently from those in another area. The wheat farmer with few alternatives will respond differently to a change in price of an alternative product when marketing quotas are in effect on wheat than he will in a period of free wheat production. Do we have adequate measures of the response of consumers to changes in price under various conditions? The relatively low elasticity of demand for farm products tends to reduce the importance of such changes but does not remove their significance entirely.

The authors have not assumed to have solved all adjustment problems. They set out merely "to shed a little light." This they have done. If we can develop more refined procedures and compile more adequate data and further test the reliability of this procedure we may find a very useful tool. We need to explore many new avenues if we want to solve the surplus problem. The authors are to be commended for their work.

Chapter 8

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Institutional Rigidities and Other Imperfections in the Factor Markets

THE economic health of commercial agriculture is the focus of our discussion here. Adjustments in production and in resources used in agriculture have not been rapid enough to enable farmers to share equally with the rest of the economy the increased production resulting from our economic growth. From a national standpoint, resources are being used to produce a surplus of farm products. Consumer welfare can be improved by a transfer of resources out of agriculture. Two adjustments appear necessary: (1) an increase in the size of farms and enterprises, and (2) greater resource mobility — particularly for labor, within agriculture and between agriculture and nonagricultural sectors.[1] The first adjustment assumes that the optimal farm and enterprise size is larger than the present average or modal size. Both adjustments imply certain institutional rigidities, imperfections in the factor market, and resource immobilities. Our task is to develop and to discuss what rigidities, imperfections, and immobilities in factor markets, other than for labor, impede needed resource transfers and what can be done about them.

Certain institutional rigidities arose quite unfortuitously out of our program to aid and develop agriculture, i.e., through the Homestead Act, price support legislation, and farm credit legislation. Other rigidities arose from accepted customs, such as those inherent in tenure and leasing arrangements. Also, rigidities and imperfections may stem from conflicting objectives in legislation where short-run-income distribution objectives have subordinated optimal allocative objectives; the 160-acre limitation on Bureau of Reclamation projects, loan restrictions from federal credit agencies, and acreage allotments from certain other agricultural programs are cases that illustrate this point. Other factor market imperfections arose out of federal legislation that, in a certain sense, created monopolies, i.e., Bureau of Reclamation irrigation projects, federal grazing and timber lands under the Bureau of Land Management and the Forest Service.

If our economic goals are, first, that of optimal resource allocation and, hence, maximization of the social product over time and, second,

[1]Also, we must accelerate and, along the path of acceleration, stabilize non-farm economic growth to aid in facilitating adjustments in commercial agriculture.

that of income distribution, then, with the focus on commercial agriculture, the former goal subordinates the latter.[2] To achieve our ultimate goal of optimal resource allocation, one of our intermediate goals, then, is to adjust commercial agriculture to economic growth. Various means have been suggested and used to aid agriculture.[3] Some of the measures, such as the price support program with its high level parity prices and acreage allotments, have impeded, rather than facilitated, adjustments.

We shall be concerned with the rigidities and imperfections that some of these programs have built into agriculture, and we shall suggest possibilities for improvements to aid agriculture in adjusting to economic growth.

Fundamentally, factor market imperfections and institutional rigidities stem from successful attempts to gain protection for loss of sunken costs (protection from economic growth), which is one of the adjustments to risk and uncertainty. In one sense, uncertainty causes inefficient production, because in the absence of it, the same product could be produced with fewer resources and an optimal distribution of the product could be achieved. When the degree of information is less than perfect, farmers and others use resources inefficiently because they are unable to predict future outcomes with certainty. From a within-the-firm standpoint, the farmer is unable to determine ex ante the optimal output which would yield maximum returns ex post; furthermore, the farmer is confronted with the reactions of others to his situation. These reactions may affect the terms and amount of external capital available to the firm, a phenomenon that has been called external capital rationing, or risk aversion, describes the effect of uncertainty upon the farmer's decision regarding the amount of resources to employ in production.

CAPITAL MARKET IMPERFECTIONS THAT AFFECT AGRICULTURE

What is the agricultural credit and capital market situation? Farmers and certain agricultural experts, fundamentalists and otherwise, hold that the capital market is not functioning properly for agriculture.[4] Specifically, the claim is that short-term loans are not adapted

[2]A rich country can afford deviations from optimal use, but let us recognize these deviations and let us make decisions with respect to probable benefits and costs.

[3]Examples are the price support program, the soil bank program, production control, federal crop insurance, federal credit agencies, extension education, experiment station research, changes in tenure arrangements, changes in tax laws, moving labor, homesteads in reverse, rural industrial development, etc.

[4]Schultz, T. W., Production and Welfare of Agriculture, Macmillan, 1949, Chap. 12; Schickele, R. W., Agricultural Policy, McGraw-Hill, 1954, Chap. 6; Johnson, D. Gale, Forward Prices for Agriculture, The University of Chicago Press, 1947, Chap. 5; Castle, Emery N., "Research problems relating to credit for areas of high risk and uncertainty," Proceedings of a Research Conference on Risk and Uncertainty in Agriculture; Kristjanson, B. H., and Brown, J. A., "Credit needs of beginning farmers in selected areas of North Dakota," N. Dak. Agr. Exp. Sta. Bul. 386, 1953; North Central Land Tenure Research Committee, "Improving land credit arrangements in the Midwest," North Central Regional Publication 19, Purdue Agr. Exp. Sta., 1950.

particularly to farmer needs, and that intermediate type loans for production purposes are scarce; indeed, non-government institutional lenders are not directly in the field at all.[5] Further, long-term credit is available, but on fixed and rather inflexible terms.[6] Equity requirements are often high and in some areas mortgage funds are not available from institutional lenders.[7] In any case, restrictive arrangements, legal or self-imposed, are claimed to restrict the flow of funds to agriculture.[8] On the other hand, many farmers evidently do not make full use of the sources of credit available to them.[9] Farmers forego profitable opportunities rather than incur financial obligations. Some fear possible reverses; others attach moral connotations to debt.

Imperfections in the Long-Term Credit Market

The volume of farm mortgage loans in 1955 was at an all-time high of 8.2 billion dollars.[10] This sounds high, but the total value of farm land and buildings was 91.3 billion dollars; thus, 91 percent of the equity was in the hands of farm owners. Approximately 40 percent of the real estate mortgage debt was held by private individuals, not institutional lenders. Also, 9.8 billion dollars in non-real estate debt was outstanding, while non-real estate assets were valued at 71.8 billion dollars.[11] Thus, this debt is approximately 13 percent of the value of these assets. Farmers have held this relatively low debt position over time. Agriculture's over-all equity position would seem to indicate ability to support a much larger debt load, but other factors affect the situation — small farm size and high income variability, to mention a few. High-income farm managers throughout agriculture tend to use a much greater proportion of borrowed capital. The agricultural sector has the equity to secure capital but apparently cannot get the capital or does not want it, i.e., capital is rationed externally or internally or both.

Productivity studies on commercial farms indicate that the marginal productivity of current expenditures and working capital investments is considerably above its cost.[12] Machinery, equipment, and motor vehicle investments have increased many fold in the past 15 years and no let up is indicated for the near future. Apparently, acquisition of these items is profitable for farmers.[13] Farm real estate in recent productivity

[5]Schickele, *op. cit.*, pp. 78-82.

[6]"Improving land credit arrangements," pp. 5-13.

[7]*Ibid.*

[8]Schultz, *op. cit.*, pp. 129-33, and Johnson, *op. cit.*, pp. 62-66.

[9]Johnson, *ibid.*, pp. 62-66.

[10]Agricultural Statistics, U.S. Department of Agriculture, 1955.

[11]For the first time, in 1949, and since that time, non-real estate debt has exceeded real estate debt in agriculture. Also, the relative value of farm real estate to non-real estate assets is declining.

[12]Schultz, *op. cit.*, pp. 52-62; Johnson, *op. cit.*, pp. 105-6; Heady, Earl O., "Production functions from a random sample of farms," Jour. Farm Econ., Vol. 28: 4, Nov., 1946; Heady, Earl O., and Shaw, Russell, "Resource returns and productivity coefficients on selected farming areas of Iowa, Montana and Alabama," Iowa Agr. Exp. Sta. Res. Bul. 425, 1955; Strand, E. G., and Heady, Earl O. "Productivity of resources used on commercial farms," USDA Tech. Bul. 1128, 1955.

studies has been yielding lower marginal returns than working capital investments, but real estate returns appear to be equivalent to the cost of funds for acquiring real estate. The farm land market also has been bearing up well. Farm land prices have been increasing even while farm incomes have been falling.[14] Rising land prices can be attributed in part to "land using" technological developments that have increased the relative price of land and to underpricing of land relative to its earnings.

While the over-all capital and credit market for agriculture seems to be functioning properly, closer examination indicates that institutional adjustments are needed. Attainment of these adjustments does not necessarily assure the movement of more capital into agriculture. However, these adjustments can be expected to change both the distribution of capital and credit within agriculture and the proportions of credit held by various lending groups.[15]

Let us look at farm mortgage arrangements more closely. Evidence indicates that farm real estate credit tends to be rationed by non-price criteria. The interest rate (price of loanable funds) tends to be fettered and regulated by governmental controls and by habits and customs. Contracts tend to be tailored to the lenders' need for regularity, safety, and liquidity. The use of relatively flat interest rates (the same rate for all lenders) encourages the use of other allocating devices such as high equity requirements, exclusion of loans to high risk firms or to high risk areas, and use of short loan periods with consequent high annual repayment requirements. Repayment arrangements also tend to be inflexible through time, i.e., many contracts lack satisfactory arrangements for postponing payments.[16] This inflexibility appears to stem from risk and its costs. With flat interest rates (the maximum of which is usually legislatively fixed), the lender cannot pass on the risk costs of a loan.[17] Therefore, either the loan is not made at all or is based on a relatively safe portion of the equity and includes arrangements to protect the equity of the lender. Loans tend to be based on the need to preserve the safety of the lenders' funds rather than on potential productivity. Hence, loans are governed by the collateral offered by the borrower. Arrangements are needed for allocation of funds on the basis of the expected value of the gain in production exceeding the expected value of the loss.

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[13]Schultz, T. W., "An alternative diagnosis of the farm problem," Jour. Farm Econ., Vol. 38: 5, 1956, pp. 1143-44.

[14]Agricultural Statistics, U. S. Department of Agriculture, 1955.

[15]Less would probably be held by private individuals who now hold 40 percent of the farm mortgage paper outstanding and an undetermined amount of other paper; much of this farm mortgage paper is held involuntarily.

[16]"Improving land credit arrangements," pp. 5-15.

[17]The actual mortgage rate is now below the maximum rate. The mortgage rate has steadily fallen, with the Federal Land Bank and its affiliated National Farm Loan Associations leading the way. The Land Bank has achieved one of its main objectives, namely, providing farmers with a low rate on mortgage funds if they have a large equity; otherwise the farmer does not obtain funds. Other mortgage firms have followed; thus the inevitable has happened: a low price has distorted the distribution and affected the relative supply of loanable funds to agriculture. The limited funds go to those who have the necessary equity and thus results in safety consistent with the low interest rate.

If farm mortgage funds are to be allocated to their best use, the price (interest rate) should be returned to its position as an allocative agent. This can be accomplished in at least these two ways: (1) free the interest rate and remove other institutional restraints, if not generally, at least in the agricultural sector and (2) introduce insured loans (a) at rates proportional to the risks involved or (b) at level rates.

Under (1), the freed interest rate, after sufficient time for adjustments, would vary with the risks involved in a given loan. Lender and borrower could make their decisions relative to the expected gains and losses. Risk costs would become imbedded more explicitly in the cost and asset structure of the firm and loanable funds would tend to be channeled into their highest productivity uses consistent with the risks involved. If existing lending institutions failed to adjust to this new situation, the present farm credit system or new private institutions could be encouraged to enter the high risk loan field (high risk from all standpoints, i.e., low equity, high weather variability, high income variability, etc.). The Federal Land Bank led the way in agriculture to low interest rates with the consequence that capital was rationed to farmers on a nonprice basis; high risk operators did not obtain funds and other operators received loans proportional to a safe amount of their equity. A low interest rate is consistent with the costs and risks for high equity, low income variability, near optimal sized firms. But, funds should be available at gradually increasing rates as equity decreases and as other risks increase; in this manner funds are made available to those entrepreneurs who feel the value of expected gains from farm investments are greater than the value of expected losses. Society loses when high productivity, high risk investments are not made, and present farm credit arrangements are not conducive to such investments.[18]

In alternative (2)(a) (insured loans at rates varying with the risks), the resource effects should be the same as in (1), for in (2)(a) the rate structure would be proportional to the expected loss. Thus the risk cost becomes a part of the cost of obtaining loanable funds. Graduated insurance schedules, with the rate as an increasing function of the expected loss, is an accepted institutional arrangement in other fields. For example, at a price, fire insurance can be purchased on almost any structure. On most commercial farms where competent farm managers feel that the expected gains exceed the expected losses, is it inconceivable that capital funds could be loaned at a price, which increases as the risk increases? A successful insurance scheme needs a reliable actuarial basis, or in lieu of that, impregnable financial reserves. Only the government could provide the latter. Perhaps the government could underwrite a portion of the expected loss of a program such as (2)(a).[19]

[18]I am not suggesting that farm mortgage rates be raised under present arrangements, but I am suggesting that institutional arrangements could be changed to provide additional funds at rates proportional to the risks involved. If this is done, loanable funds may be channelled into those uses where their marginal value productivity is highest.

[19]The federal government underwrites excess losses in the Federal Crop Insurance program and, similarly, is proposing to underwrite a proportion of the loss in the Federal Flood Indemnity program.

In the case of (2)(b) where the insurance cost is a level across-the-board rate, the rate is not proportional to the risk.[20] Under this plan, borrowers who could escape the rate would do so and, thus, the scheme would result in an adverse selection. Also, for those who do take out the loan and insurance, the poorer risks would be subsidized at the expense of the better risks. Under this proposal, non-price allocating devices would be introduced because rates are not proportional to the risks.

If the insurance scheme not only guaranteed the loan but provided for payments to the lender when conditions prevented the borrower from making regular payments, the flexibility needs of the farmer and the liquidity and other risk problems of the lender could be met. The cost would be transferred explicitly to the borrower.

These services, conveniences, and risks are costs that must be borne. It is unrealistic to suggest that they be borne by the lender without adjustments in the costs of credit (interest and insurance). If the lender is asked to bear them, he will shift or circumvent them and the result will be a decrease in the supply of loanable funds and an increase in non-price allocative arrangements.[21]

Imperfections in Short and Intermediate Term Credit

As has been indicated earlier, a close look reveals that short and intermediate term (credit and market) arrangements are unsatisfactory and tend to promote less than optimal resource allocations within agriculture.[22]

Farmers must adjust their operations to the credit institution pattern rather than the latter adjusting its pattern to agriculture. Thirty, sixty, and ninety day notes are not particularly satisfactory for most farmers. Again safety and liquidity are of prime importance to the lender. The lender may not wish to have any part in "risky" loans or, if he does, he may not be able (because of rate restrictions) to cover and spread the costs of handling them; thus, these loans are rejected either in whole or in part. An increasing amount of the short and intermediate term credit in agriculture is supplied by companies that can cover the cost of handling "risky" credit by hidden charges and/or reduce the risks by providing some managerial services.[23] If small loan companies are used as a source of financing, as is often the case with machinery and motor

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[20]This type of insured loan is becoming more widely used, e.g., Federal Housing Administration home loans, Farmers Home Administration farm ownership loans. The rate in both cases is one-half of one percent.

[21]Much of the literature on improving farm real estate credit arrangements ignores this point. See "Improving land credit arrangements."

[22]See the previously cited production function studies and the following specific studies: Diesslin, Howard, "Financing modern Midwest agriculture," Purdue Agr. Ext. Serv. Bul. 415, 1956; Kristjanson, B. H., *op. cit.*

[23]Much of the broiler industry's financing is provided by feed companies which assume part of the risk, receive part of the profit, and provide field men.

vehicles, credit is costly; the net cost to the farmer ranges from 10 to 36 percent per annum.[24] I do not wish to imply that small loan people are gouging their clients, but it is a fact that such loans are costly to administer per dollar loaned. These costs must be borne, and if resources are to be allocated optimally these risks and other loan costs must become part of the cost structure.

Resource allocation will be improved when farmers finance more of their current expense needs by budgeted loans, i.e., loan agreements in which the farmer specifies in advance the magnitude and distribution of his credit needs. Repayment should be synchronized with the income flow.[25] Budgeted loans could also carry insured loan provisions. This type of arrangement would remove some of the uncertainties a farmer faces and would facilitate more orderly planning of his business.

To finance working capital items, like machinery and breeding stock, farmers need loans that are repayable over the productive life of the investment. This type of arrangement permits repayment from the earnings of the assets. Under existing formal arrangements, the financing of large capital items requires (a) a high rate of saving over a short period and/or (b) disinvestment of other capital items. A high rate of savings may be accomplished at a sacrifice in living standards with no long-run malallocation of resources. Capital disinvestment to acquire other capital items may or may not result in malallocation of resources depending on replaceability of the asset, social and private costs, etc.

In summary, the capital and credit market has obstacles and imperfections that tend to exert a form of price (interest) control over loanable funds and to encourage the use of non-price allocating devices. We need to unfetter this market and encourage adoption of the changes in institutional arrangements discussed above. The possibilities are: insured loans on a wide scale and/or a freed interest rate (at least within agriculture); removal of other restrictions; budgeted loans; flexible payments; lower equity requirements; and longer repayment periods. The latter recommendations would likely follow readily if either of the first two were instituted.[26]

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[24]A $1,000 note payable in 12 monthly installments at an implied 6 percent interest rate usually means that $60 interest is paid for the privilege of having on the average only half of the amount loaned. Thus, the actual annual rate of interest paid in this example is 12 percent (2/1000 x 60). Likewise, where the interest is stated as 2 percent a month on the unpaid balance, the actual per annum rate is 24 percent.

[25]Some banks, credit unions, and PCA's are offering loans of this type.

[26]In the above discussion I have dealt mainly with the imperfections in the capital market facing agriculture; I wish to add that it is my opinion that the capital market facing the whole economy is hamstrung with rigidities, thumb rules, and customs that inhibit optimal adjustments. But the non-farm economy has developed risk capital financing as an important source of capital, whereas this alternative has not been utilized much in agriculture. The corporate device and common stock financing is a possible institutional arrangement that may aid in correcting some of the resource adjustment problems in farming. Since capital accumulation can be a slow process, the corporate farm with common stock financing is an important alternative for financing our larger farms.

THE EFFECT OF MONOPOLISTIC ELEMENTS ON AGRICULTURAL ADJUSTMENTS

Monopolistic elements tend to misallocate resources, reduce aggregate welfare, and redistribute income in favor of the monopolists. Monopoly elements in non-agricultural sectors have been blamed for contributing to many problems in agriculture, but I believe this contention has been much over-emphasized.[27] With respect to the factor side of agriculture, elements of monopoly are present in the purchase of electricity, telephone, transportation services, farm machinery, supplies (e.g., fertilizer and sprays), water in the case of irrigation, and grazing land in the case of western ranchers. If regulations are effective, with respect to electricity and telephone services, resources in these industries will be paid what they would earn in alternative uses. Their pricing policy, though, may still be detrimental to optimal resource use.

The market for transportation services, farm machinery, and supplies appears in the main to be functioning satisfactorily.[28] However, there are exceptions; for example, certain machinery companies suffer from some of the same problems as agriculture, namely too many resources with consequent low returns to the residual claimants and with some unemployment of other factors. Small town business and property owners are bearing the brunt of the population adjustments in some agricultural areas. The chemical industry, namely manufacturers and suppliers of agricultural chemicals, appear to be enjoying relatively high but possibly short-run returns.

Pockets of resource malallocation do continue to exist with respect to irrigation water and grazing land; resources here are not allocated in a manner to equalize marginal value productivities between firms and between uses.

The federal government holds monopoly control over much of our western water resources. Water contracts to irrigators tend to be made so that water is allocated on the basis of non-price criteria. Optimal resource use suggests that resources should be priced in a manner that is conducive to equalizing the marginal value product in all uses. Equal water allocation per acre to all farm headgates in a project ignores differences in productivity on different farms as well as differences in costs in distributing the water to various farms. A flat water charge regardless of the amount used also is conducive to waste and non-optimal use. Neither riparian nor appropriative water rights promotes the optimal use of water. In most western states water rights are often fixed to the land and cannot be bought, sold, or transferred; again, this arrangement does not facilitate optimal use between firms and uses. Since allocations between farm and nonfarm uses are not determined in

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[27]Harberger, A., "Monopoly and resource allocation," Amer. Econ. Rev., Vol. 44, No. 2, pp. 77-87.

[28]Schultz, *op. cit.*, pp. 1137-43.

practice on a productivity basis, water may become fixed in relatively low productivity uses.

To facilitate adjustment in water use within agriculture and between agriculture and non-agricultural sectors, either (1) free market pricing of water or (2) devices that simulate free market pricing is needed. If (1) is used, the only information required is the cost of delivering water to farmers. The main argument against free market pricing lies in the area of external economies and diseconomies. If prices are to do their job of allocating resources, impediments to their operation should be removed. Thus, pricing irrigation water on the basis of cost would be a step in the right direction. The free transferability and sale of water rights would also encourage more optimal use. As opposed to letting free pricing do the job, (2) is suggested. As a guide in making optimal use of our water resources over time and space, water monopolists need to know for each project, river, or basin the demand for the final products, the technology of converting resources into products, and the supply functions of all factors.

FIXED ASSET PROBLEMS

Static economic analysis indicates that fixed costs do not affect the nature of the marginal cost curve. Also, to the extent that the marginal cost of output provides the basis for the firm's supply response, fixed or sunken costs need not determine the nature of adjustments in output or resource use. Wide swings in output and resource use can occur if marginal costs are known and prices can be predicted accurately. High fixed costs, an important characteristic in most agricultural firms, imply only that production should be maintained when the expected price exceeds the average variable costs. Thus, high fixed costs in agriculture mean essentially that farmers tend to maintain high production levels even if prices decline by relatively large amounts. The farm firm tends to continue production during depression or during declining economic conditions as do non-agricultural firms. This fact does not mean, however, that agriculture has a completely inelastic supply curve (zero elasticity). Production will continue as long as the price is greater than the minimum average variable costs, and greater adjustments would be made if the price did not cover variable costs.

Two observations should be made regarding the relationship between sunken investments in agriculture and problems of adjusting commercial agriculture. One is that large fixed investments in buildings and machinery and the experience and education of the operator tend to hold resources in agriculture long after the time when their opportunity return would be greater in alternative enterprises on the same farm, on other farms, or outside agriculture. Uncertainty, in part, explains this tendency to hold resources in present uses, for many farmers are reluctant to give up low for higher returns in alternative opportunities where the "risks" to them are unknown and presumably higher.

The second observation is that farmers and other groups in society, through political or other group action, have made many successful attempts to gain protection from the loss of "sunken" costs. These successful attempts create new rigidities in our economy that impede adjustments. Thus, laws that prohibit marketing or allow confiscatory taxes on a particular item, as in the case of oleomargarine, prevent optimal resource adjustments and preserve, or did preserve, butter-fat producers' investments for a few generations. External trade barriers, such as tariffs and quotas, and internal trade barriers, such as unreasonable inspection and grading laws, protect and preserve investments, even encourage more investments, which in many instances represent misallocations of society's resources. Of course, once a group has been successful in its attempt to gain protection for loss of its investments, via some form of legislation or monopoly power, the obstacle will become more difficult to remove later; the farm price-support program is a good example. The hope in the future lies in keeping channels open and in removing existing impediments and establishing no new ones. Compensating resource owners who are suffering loss or destruction of assets due to changes may be less costly to society than providing protection.

FARM CONSOLIDATION AND ASSET OWNERSHIP PATTERNS

Farm consolidation is another adjustment problem in agriculture. Out of our historic past a patchwork pattern of farms has developed on our landscape. Farm size adjustments are impeded by the random way in which farm tracts become available for addition to the acreage of a given farm. Acreage adjustments are by no means smooth, regular, and orderly. The pressure to expand acreage due to the development of "land using" technology, decreased risks and other factors may have forced many operators to dissipate much of the gain from an upward size adjustment through transportation, supervision, and other costs associated with farming two separated tracts. Presumably, the individual operator will expand — even to inconvenient and costly locations — if the expected value of the gains exceeds the costs, other things being equal. In most cases, tenants or owners can afford to pay more for the use or ownership of contiguous than for non-contiguous land. Farming non-contiguous tracts increases the costs of farming and reduces the individual and social product.

A system of taxes and subsidies might be used to discourage more costly operation of non-contiguous tracts and to encourage less costly operation of contiguous tracts. In this way the economies of farm size could be preserved rather than be dissipated and lost to society in the adjustment process. The tax power could thus be used to facilitate a more optimal use of society's limited resources. The social costs of operating tracts in remote areas may make the forming of such units uneconomic if all costs and returns are considered. Zoning laws are a possibility in such situations.

LEASING AND TENURE ARRANGEMENTS

Leasing and tenure arrangements represent a major area of inefficiency in agriculture. Over time, numerous arrangements and customs for share or cash leasing have evolved which cause the farm operator to use capital, labor, and land resources in an inefficient manner.[29] The economic effects of the cash lease are similar to those for unencumbered farm ownership, if the cash lease provides arrangements for adequate compensation for unexhausted improvements, security of tenure, and effective arbitration. Optimal resource use under share leases requires that the optimum programs for each leasing party must be the same as the optimum program for the farm as a whole.[30]

To reduce or remove obstacles to adjustment in tenant farming, landlords and tenants need to know their mutual interest. In addition, state legislation is needed which provides for compensation, arbitration of landlord-tenant conflicts, increased security of tenure, and otherwise specifies the rules of the game in the farm rental market.

SUMMARY

Institutional rigidities and imperfect factor markets tend to misallocate resources, impeding adjustments in agriculture. Economists, in the main, agree on the adjustments needed to promote optimal resource use, but disagree on the means. Many of the rigidities and market imperfections that have developed stem from uncertainty and actions to counteract economic change and growth. The main possibility for removing rigidities, obstacles, and imperfections lies in aiding resource markets to operate freely. If free market pricing is impossible, then devices that simulate the results of free market pricing are needed. Let prices allocate resources; that is their function. Use the government to regulate and adjudicate. Information and continuing education are needed to aid in reducing the effects of custom, habit, and tradition in impeding optimum adjustments.

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[29] Johnson, D. Gale, "Efficiency of share-leasing contracts," Jour. Polit. Econ., Vol. 27; Heady, Earl O., "Economics of farm leasing systems," Jour. Farm Econ., Vol. 29.

[30] Specifically, this calls for: (1) the arrangements for sharing costs and production for each particular crop must be the same, (2) the shares of all competitive crops must be the same, (3) the prospects for returns over time, considering normal uncertainties of weather and the market, must be the same under the lease as they would be in its absence, (4) the share of income going to each party of the lease must represent the product of the resources furnished by this person. See Heady, Earl O., "Marginal productivity of resources and imputation of shares for cash and share rental farms," Iowa Agri. Exp. Sta. Bul. 433, 1955.

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Discussion

DR. HAVER in his paper defines his task as one of discussing institutional rigidities, factor market imperfections, and resource immobility as they relate to the resource (other than labor) adjustment problem in agriculture. In such a broad range of topics we should not expect an exhaustive treatment of the many problems in this area.

In outlining his framework for analysis, Dr. Haver explicitly tells us that the goal of optimal resource use should take precedence over the goal of optimum income distribution. I would like to know somewhat more about the goal that is to take "second place" to that of efficiency. I would only mention that our tendency, as economists, to place the efficiency goal higher than might be tolerated by less partial observers, is a reflection of the fact that our analytical tools for handling efficiency problems are more elaborate than those used for analysis of personal income distribution problems.

Dr. Haver indicates that professional agricultural economists rather generally are of the opinion that short-term and intermediate loans are not particularly adapted to farmers' needs, and that restrictive arrangements (legal or self-imposed) impede the flow of funds to agriculture. Clearly, we need to develop criteria of adequacy in the credit market that would enable us to distinguish more clearly between the cases which have come to be known as internal capital rationing, on the one hand, and external capital rationing, on the other.

Given the risk preferences of the lending and borrowing firms, I presume that if equilibrium is reached by the borrowing firm with no restrictions from the lender (perfectly elastic supply of funds at the going interest rate), we have internal capital rationing. If the lender reaches an equilibrium consistent with his supply funds and risk preferences, but the borrower "needs" more funds (i.e., he would borrow funds if he could get them at the going rate), then, I presume, we have external capital rationing. I would like to have seen in this paper a more complete development of the framework in which we are to decide which kind of a restriction on credit use is more important. This distinction makes a considerable difference in the delineation of problem areas. A framework which can make this distinction may show that some of the "non-price" criteria will perform satisfactory "price" functions. The need for such a framework becomes evident when Dr. Haver examines current aggregate equity positions:

1. Real estate — 91 percent of the total value of the property in the hands of farm owners.
2. Non-real estate — 87 percent of the total value of the property in the hands of owners.

It is suggested, albeit tentatively, that the high aggregate equity position would support a much larger debt load. Even these high aggregate equities could mean that the current debt loads of some farmers may prove to be excessive. Since at least some of the farm owners are not operators, the real estate equity position, as an indication of ability to absorb debt load by farm operators, may be somewhat misleading.

Concerning productivity estimates for various classes of inputs, Dr. Haver observes that marginal returns on land are approximately equal to the cost of funds. This observation must assume an expectation of a constant marginal value productivity of land into the future for a relevant period. I am confused by the statement that land prices are "bearing up well." The prevailing belief in some communities is that land is selling too high in relation to its long-term income. On the basis of informal observations, I would think that this condition is a more serious problem than credit availability. If land indeed is currently overvalued, some of the suggestions in Dr. Haver's paper might aggravate the situation.

The crux of Dr. Haver's argument regarding credit turns on the restoration of the interest rate to its allocative role by permitting it to vary more widely (at least in the agricultural sector). I would like to see Dr. Haver, at a later time, perhaps, develop in somewhat more detail the analytical procedure for deciding whether we need more variation. We, of course, have some variation now among areas, types of loans, etc.

In the discussion of imperfections in short and intermediate term credit, we find that "farmers adjust their operations to the credit institutions rather than the latter adjusting to agriculture." An historical analysis to determine why the particular current institutional configuration evolved would be of interest. The reasons for its development then could be checked against the current situation to see if Dr. Haver's changes would achieve the desired results.

Finally, we should keep in mind that given the demand elasticity assumption in Professor Johnson's paper, the effect of Dr. Haver's recommendations, if successful, would require an even higher migration rate.

PART IV

The Labor Resource

Chapter 9

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Adjusting the Labor Force of Agriculture

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

CHANGE IN THE LABOR FORCE AND AGRICULTURAL OUTPUT

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

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

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

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

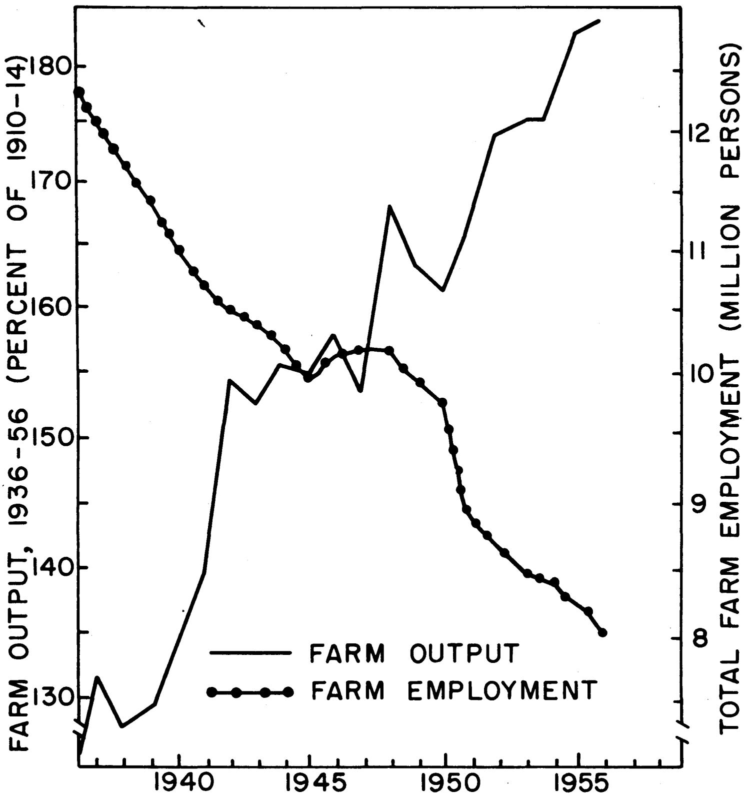

Fig. 9.1 - Index numbers of farm output and total farm employment, United States, 1936-56.

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

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

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

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

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

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

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

COST ADVANTAGES

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

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

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

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

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

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

Item	160 acres	270 acres
Annual family labor supply (hr.)	3,955	3,955
Family labor supply in critical months		
May	375	375
June	375	375
Sept.	300	300
Oct.	300	300
Nov.	300	300
Family labor used in critical months		
May	156	375
June	100	375
Sept.	115	300
Oct.	243	300
Nov.	215	300
Acreage[a]		
Row crops	73	122
Small grain	24	42
Hay and rotation pasture	24	42
Permanent pasture	33	54
Number livestock		
Litters hogs	15	15
Cattle fed	32	80
Costs		
Total variable costs	$6,221	$12,718
Total fixed costs	2,125	2,372

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

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

Patterns of Expansion and Capital

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

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

GAINS AND SACRIFICES OF FARM GROUPS

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

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

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

(2) $$\text{MP of } X_1 = \frac{\Delta Y}{\Delta X_1} = \frac{ab_1X_1^{b_1} \quad X_2^{b_2}X_3^{b_3}}{X_1} = \frac{b_1Y}{X_1}$$

(3) $$k = b_1aX_2^{b_2}X_3^{b_3}$$

(4) $$MP = \frac{k}{X_1^{1-b}}$$

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

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

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

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

With the marginal product of labor being

$$MP = k - 2cX_1$$

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

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

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

Groups Affected

We are now at the point of recognizing three particular groups that may be affected by adjustments resulting in sizeable reductions in the labor force. First is the group which moves from farming to nonfarm employment. To the extent that these persons possess little capital and operate inefficient units, transfer to employments of higher real incomes can increase their welfare. Second is the consolidating group which remains in agriculture. To the extent that they expand farm size and increase volume of sales and reduce unit costs relative to any decline in product prices, they also will gain from a reduction in the labor force. Third is the group which both remains in agriculture and is unable to expand farm size. Their relative welfare may be depressed further if product prices continue to decline because of continued growth in output. If time could be telescoped and this group could be inventoried, we would expect to find that it includes farm families unable to adjust because of age, health, skills, capital limitations, lack of knowledge, or similar considerations. It is to this group especially that compensation needs to be directed if society is obligated to redress losses stemming from economic progress.[6]

FAMILY FARM PROSPECTS

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

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

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

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

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

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

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

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

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

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

the family farm is labor supply; total labor input cannot exceed specified proportions of the family labor supply.[11] Hence, an absolute limit is attached to the per firm use of this resource. In the main, farms in the United States do not approach this limit because they use so little labor. Should they ever approach the limit, the picture might be that suggested in Figure 9.2. The positively sloped curves are isoclines denoting points of equal slope on successive product or income isoquants. Accordingly, they are expansion paths, indicating the proportions in which land and labor should be combined to attain each output or income level at minimum cost. In the absence of capital rationing and restricting definitions, expansion would follow one of these (say, I_1) denoting equal substitution and price ratios for factors, until the marginal value products of resources are equated with their prices. A definition restricting labor input below this level then would also restrict land input per farm and allow existence of more farms, with the relative numbers of farms hinging on the slope and curvature of the isocline. But given the fact that farms generally do not use resources at levels equating value products and prices, a highly restricting definition of labor input might push the firm to extensification of land use — and to fewer farms. For example, suppose that the definition limits the labor input to om_1. The firm has the typical farm goal of pushing resource use and output to a level consistent with (a) a particular standard of living or (b) a budget or isocapital line defined by the funds available. If it wishes, or has funds, to attain the isoquant ST, it can follow the least-cost expansion path only to the restraining level R. Hence, to attain isoquant ST, it must extend land input up the hybrid isocline RH. Attaining ST in this fashion limits labor input to om_1 but extends land input to oa_2. Allowing expansion along the isocline, I, labor input would be increased to om_2, but acreage would be lessened to oa_1, and more farms could exist.[12] While possibilities of these restricting definitions do not pose near-term problems in farming, they have been mentioned because of the widespread fear expressed in farm groups, namely, that the adjustments being forced by the market mechanism may encourage corporation farming and strangulation of the family unit — unless manpower per farm is limited by strict legislation.

PRODUCTS OF LAND WITH HIGH INCOME ELASTICITIES AND SPECIALIZATION OF FARMING

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

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

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

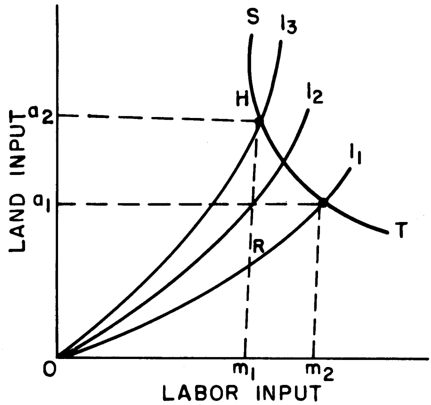

Fig. 9.2 - Effect of family farm definition.

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

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

Types and Locations of Farms

Contrasting trends in types of farms may be expected as economic

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

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

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

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

Here is a further clue to possible spatial adjustments in agriculture: To the extent that aggregate output conforms more nearly to demand through (a) change in farm numbers or types and (b) withdrawal of land from commercial uses, the adjustment will come largely in areas of industrial and population concentration. As an indication of the longer run trend, the amount of land in farms for the four states of Massachusetts, Connecticut, Rhode Island, and New York declined by 25 percent between 1920 and 1950. Any slackening of upward trends in farm output, from adjustments to balance agriculture with population and economic growth, will come from shifting land use in the agricultural-industrial transition areas, rather than from withdrawal or extensive use of land in concentrated agricultural areas. This front, with land devoted more particularly to residences, trees, etc., will move further westward into the Corn Belt with consequent output-contracting tendencies. Within concentrated agricultural areas where land is retained in farming, some reduction in physical volume of output can be brought about as land is shifted to those products associated with a more extensive agriculture and having a higher income elasticity of demand than the products which they replace. These within agricultural shifts will or should be in fringe locations defined largely by comparative advantages which relate to soil and climate. Examples are shifts from wheat to grass and beef in fringe areas of the Great Plains, or from annual crops to woodland in more of the Southeast and New England.[14]

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

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

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Discussion

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

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

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

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

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

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

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

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

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

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

Chapter 10

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Labor Mobility and Agricultural Adjustment

BY almost any standard, except perhaps for one that is so dear to at least some economists, the rate of mobility of the farm population for the past 16 years has been almost phenomenal. Data on net migration from farm to nonfarm indicate a net movement of 8.6 million persons for the period 1940-50 and of 5.1 million persons for 1950-56. These data, however, substantially underestimate the amount of mobility if we define mobility to include both change of residence and a change of occupation from a farm to a nonfarm job that occurs without a change in residence.

If we assume that a worker who changes from a farm to nonfarm occupation but continues to reside in a farm area has the same number of dependents as the average member of the labor force living on farms, the changes in occupation without a change in residence would have involved about 1.8 million persons for 1940-50 and 1.3 million for 1950-56.[1] Thus mobility has involved an average of about one million persons annually for the sixteen-year period from 1940 to 1956.

RELATIVE INCOMES

Since 1940 farm employment has declined 28 percent if we accept estimates made by the Department of Agriculture or by 31 percent according to the Bureau of Census. During the same period the per capita income of the farm population increased only moderately, in relative terms, from 38.2 percent of the per capita income of the nonfarm population to 44.2 percent in 1956. In absolute terms, the deflated per capita income of the farm population increased 50 percent between 1940 and 1956, hardly an insignificant improvement. Since such a large portion of the income of the farm population now comes from nonagricultural sources, a more appropriate comparison might be between the average annual farm income per farm worker and some other group in the economy. Using the USDA's estimate of farm employment to compare

[1]Estimates based on USDC and USDA, Series Census-BAE, Nos. 14, 21, and 23. The estimate for 1940-50 ignored the farm workers doing public emergency work in 1940. Estimates for 1940-50 are probably affected by the change in the definition of the farm population between the two censuses.

earnings of farm workers with those of employed factory workers, we find essentially the same situation as in the comparison with nonfarm per capita income — 39 percent in 1940 and 43 percent in 1955.

These comparisons are not particularly helpful since any comparison of these two sets of income series does not indicate whether there is a discrepancy between the real returns to labor of equal ability or capacity in agricultural and nonagricultural employment. While one major farm organization believes that per capita incomes should be as high for the farm as for the nonfarm population, I know of no economist who holds this view. However, we must admit that we know far too little about the relative income levels that would be consistent with an efficient allocation of labor between agriculture and the rest of the economy.

In this paper I shall consider only the per capita income series and I shall attempt to approximate an answer to the following question: What level of per capita income of the farm population relative to nonfarm would provide equal real returns for comparable labor engaged in agriculture and in the rest of the economy? The analysis is based upon the situation as of 1950 since this is the most recent date for which we have the necessary data on the composition of the farm and nonfarm populations and on the relationships between the relevant characteristics and income. The results are necessarily tentative since the basic data are not entirely suited for our purposes. The income data used are from the 1950 Census of Population. Median money incomes are used for the relevant classifications and include all money income rather than income from labor alone. The inclusion of all money income tends to introduce an upward bias because nonlabor earnings are relatively more important in the older age groups, who are relatively more important in farm than in nonfarm areas.

In arriving at the estimates in Table 10.1, I have compared several characteristics of the farm and nonfarm population that affect either relative earning ability or the relationship between labor earnings and per capita incomes. In addition, the effects of differences in the purchasing power of income and of the impacts of the federal income tax are reflected. These calculations indicate that if per capita farm incomes are 68 percent of per capita nonfarm incomes, labor of equivalent earning ability would be receiving the same real returns in the two sectors of the economy. Because of the crudeness of the data and the estimating procedure, it might be safer to argue that the equivalent level is somewhere in the range of 65 to 70 percent.

A possible implication of these results is that per capita farm incomes would have to increase about 54 percent from the 1956 level, assuming nonfarm incomes did not increase, if comparable labor is to receive the same returns in the farm and nonfarm sectors. This is a substantial discrepancy. However, such an average entirely obscures the very wide interregional differences in the level of farm income in the United States. In 1950 the average labor return of workers employed in Southern agriculture was 74 percent of the average for all agriculture, while the average for the non-South was 24 percent above the national

Table 10.1. Relative Per Capita Farm and Nonfarm Incomes Consistent With Equal Real Returns for Comparable Labor

Characteristic	Nonfarm relative to farm
Sex composition[a]	0.96
Age composition[b]	1.08
Labor capacity[c]	1.11
Dependency[d]	1.11
Relative share of labor earnings[e]	0.86
Purchasing power of income[f]	1.25
Income tax payments[g]	1.07
Product	1.47
Reciprocal	0.68

[a]Sex composition of labor forces:

	Male	Female
Farm	79.6	20.4
Nonfarm	69.6	30.4

Sources: Farm data, USDC and USDA, Farm Population, Series Census AMS, P-27, No. 23, p. 2. Nonfarm data, U.S. Bureau of Census, U. S. Census of Population, 1950, Vol. 2, Table 118. Data refer to civilian labor force. Full-time labor earnings of females are assumed to be 0.65 of males. The estimate is based on incomes of urban workers who worked 50-52 weeks. See ibid., Table 141. Data are for 1950 and 1949.

[b]Because of inadequacies of the census data on the female labor force in agriculture and income earned by females, the age distribution and income data refer to males only. Data are for 1950 and 1949.

Age	Percentage farm	Distribution nonfarm	Median income farm	Median income nonfarm
14-19	10.1	4.6	356	462
20-24	10.1	10.1	1,090	1,772
25-34	18.9	25.4	1,719	2,850
35-44	20.7	23.6	1,850	3,207
45-54	17.7	18.6	1,697	3,140
55-64	14.0	12.7	1,354	2,766
65+	8.5	5.1	789	1,246

Source: Ibid., Table 118. Based on data for civilian labor force.

[c]See Johnson, D. Gale, "Comparability of labor capacities of farm and nonfarm labor," Amer. Econ. Rev., Vol. 43, No. 3, June, 1953, p. 311. I here assume that this figure reflects differences in capacity due to difference in race composition, in education, and any other factors responsible for difference in labor capacity.

[d]The degree of dependency is measured by the relative proportions of the farm and nonfarm populations in the civilian labor force. In 1950 the farm population was 25,058,000, of which 9,711,000 (38.8 percent) were in the labor force. The nonfarm civilian population was 124,424,000, of which 53,388,000 (42.9 percent) were in the labor force. The ratio 1.11 is 42.9 divided by 38.8.

Sources: Series Census - AMS, P-27, No. 23, p. 1, and Statistical Abstract.

[e]Based on work sheets for Johnson, D. Gale, "The functional distribution of income in the United States, 1850-1952," Rev. Econ. and Stat., Vol. 36, No. 2, May, 1954, pp. 175-82. In the nonfarm sector 79 percent of total income is labor income, and for the farm population as a whole 66 percent of the income received from agriculture is labor income. However, in 1949 farm residents received $5,200,000,000 from nonagricultural sources compared with $14,651,000,000 from agriculture. Of the income from nonfarm

sources, I have estimated that 72 percent is labor income. Thus for the total income of the farm population, 67.6 percent is labor income. This adjustment is necessary because we are attempting to adjust per capita incomes to provide a basis for determining relative labor earnings of comparable workers.

[f] This is a fairly crude estimate based on Nathan Koffsky's work on 1941 data. See Koffsky, N., "Farm and urban purchasing power, studies in income and wealth," Vol. 11, Nat. Bur. Econ. Res., 1949, and comments on this article by Reid, Margaret, Grove, E. W., and Johnson, D. Gale, pp. 156-219. Since 1941 the relative importance of home-produced food in farm income has declined, but I believe that Koffsky's estimate of equal housing costs is incorrect. I have assumed that these two factors are approximately offsetting.

[g] Based on Stocker, F. D., "The impact of federal income taxes on farm people," USDA, ARS 43-11, July, 1955, p. 13.

average. Some of the differences in the levels of labor return is due to differences in the characteristics of the labor forces. Nonetheless, the implication remains that the disequilibrium in labor earnings is much less in the non-South than is implied by the comparison of per capita earnings for the country as a whole.

A second major problem in interpreting income data as it relates to the question of migration and mobility is that some income differential is required to induce a given rate of mobility. About all we know is that such a differential would be positive, but we know little or nothing about the magnitude. Many difficulties are involved in trying to ascertain empirically the relationship between the income differential and the mobility rate, but perhaps the greatest difficulty is in determining the income expectations of members of the farm labor force. It seems fairly obvious that a person who changes occupation, especially if it involves a change in residence, does not do so solely on the basis of relative incomes in a given year. The individual must surely have some conception, hazy though it may be, of the long-run earning opportunities of the various alternatives. But there is no direct way of observing such expectations, and to my knowledge there have been no empirical studies of the migration process that have attempted to use an expectation model other than one involving the income of one or two years.

CHARACTERISTICS OF FARM MIGRANTS

Perhaps the most striking characteristic of migration from farm to city is the age selectivity of the migration process. The effect of age selectivity has been to create a rather significant modification in the age distribution of the farm population between 1940 and 1956. Table 10.2 presents data on the migration rates for certain age categories and the age distribution of the farm population for 1940, 1950, and 1956.

Two questions probably arise at once concerning the effect of the age selectivity of migration. One question relates to the effect of out-migration on the age distribution of the farm population compared with some other resident group, such as the urban population. The urban age distribution differs from the farm distribution in that urban areas have a substantially smaller proportion under 20 years (33.7 percent compared with 41.9 percent on farms) and a substantially larger proportion in the age group 25 to 44 (29.7 percent compared with 22.3 percent). The percentage over 65 is 8.8 percent for the urban population.

Table 10.2. Outmigration Rates, 1940-50, and Age Distribution of Farm Population, 1940, 1950, and 1956.

Age group[a]	Migration rate[b]	Age distribution[c] 1940	1950	1956
			Percent	
0-14	32.8	31.5	32.4	33.1
15-19	55.1	11.3	9.1	8.8
20-24	39.8	8.3	6.4	5.0
25-44	17.9	24.1	24.1	22.3
45-64	24.3	18.3	19.7	21.2
65+	32.7	6.5	8.3	9.7

[a]For migration rate, age in 1940.
[b]Calculated from Bowles, Gladys K., "Farm population — net migration from the rural-farm population, 1940-50," USDA, AMS, Stat. Bul. No. 176, June, 1956, p. 17.
[c]Calculated from USDC and USDA, Series Census-BAE, No. 14 and Series Census — AMS, P-27, No. 23. Data in original source used age groupings of under 14 and 14 to 17. According to 1950 Census of Population, 2.1 percent of farm population was 14 years old. This was assumed to be true for both 1940 and 1956.

The other question may perhaps be phrased as follows: Has the very high rate of migration in the age groups 15-19 and 20-24 significantly lowered the rate of migration that we can expect in the future? In other words, if the differentials between farm and nonfarm incomes and all other factors, except the age distribution of the farm population, were to remain unchanged, would we expect a lower rate of migration from the farm population today than we would from, say, the 1940 farm population? My first impression was that the age distribution of 1956 would be substantially less mobile because of the change in age distribution. However, if the age distributions are weighted by the migration rates by age for 1940-50, the somewhat surprising result is that the migration rate would be affected only slightly by the changes in age distribution. Following this procedure, the age distribution of 1940 would imply a migration rate of 30.8 percent per decade, that of 1950, 30.1 percent; and that of 1956, 30.1 percent. Thus we can assume that for at least another decade the age distribution of the farm population will not, by itself, prevent a high rate of migration. It may be noted that the absolute annual rate of migration has averaged 850,000 for 1950-56 compared with 860,000 for 1940-50, even though the farm population was more than a quarter smaller in 1950 than in 1940. Thus the rate of migration has been substantially higher during the fifties than during the forties.

During 1940-50 the rate of migration of nonwhite persons was substantially higher than for whites. The migration rate for nonwhites was

42.2 percent compared with 28.8 percent for whites.[2] The higher migration rates for nonwhites than for whites may be a function of race or it may be due to income since nonwhites are concentrated in low income agricultural areas. An examination of data for Southern state economic areas with nonwhite population indicated that in only 8 out of 122 Southern state economic areas was the white migration rate higher than the nonwhite.[3] This would indicate that some specific aspect of race was responsible, in part at least, for the higher migration rates for nonwhites.

Available data for the 1940's show the selectivity of migration with respect to the income levels of the area of origin of the migrants. Let us again refer to Gladys Bowles' excellent work on farm migration.[4] She found that the migration rate for medium income and high income farming areas was 28.0 percent, while for low income farming areas the rate was 33.8. Within the low income farming areas the rate increased from 27.8 for moderate low income areas to 36.9 for serious low income areas.

THE MAGNITUDE OF THE TASK

During the past 17 years the rate of mobility from agriculture to the rest of the economy has been sufficient to permit farm people to achieve approximately the same or slightly larger gains in real per capita incomes as the nonfarm population. Any gap that may have existed in the levels of real returns to comparable labor resources has not been narrowed. A reduction in farm employment of 30 percent during this period has apparently been required to stabilize the relative return to agricultural labor. If we were to accept a simple extrapolation of the basic factors influencing agriculture, this would imply that farm employment might decline by about 30 percent by 1975 without resulting in any increase in relative returns to farm labor. Absolute returns would increase substantially, of course.

If the rate of decline in farm employment for the period for 1950-56 were to continue until 1975, farm employment would decrease by between 30 and 35 percent from the 1956 level. The implication of this tenuous reasoning and its not too substantial empirical base is that farm incomes relative to nonfarm may not improve substantially by 1975. Such a result is not inevitable since the rate of increase of other inputs used in agriculture might be significantly less than the rate of increase of the past half dozen years. If this were true, then farm prices could increase

[2] Bowles, op. cit., p. 17. The migration rates for nonwhites were higher than for whites during the 1930's as well. The nonwhite male migration rate was 17.1 per cent, while the white male rate was 9.0 per cent. The migration rates for females were 22.4 for nonwhite females and 14.0 for white females. See Bernert, Eleanor H., "Volume and composition of net migration from the rural-farm population, 1930-40, for the United States, major geographic divisions and states," USDA, BAE, Jan., 1944 (mimeo.), p. 8.

[3] Bowles, op. cit., pp. 157-60.

[4] Ibid., p. 13.

substantially compared with recent levels. But here our crude model breaks down since we do not know how higher labor returns from farming would affect the rate of decline of farm employment.

The recent changes in the age distribution of the farm population indicate farm employment will decline somewhat more rapidly than would be implied by current rates of migration or mobility. In 1940 the percentage of the farm population 45 years of age or older was 24.8; by 1950 this percentage had increased to 28.0 percent and by 1956 to 30.9 percent. The proportion from 15 to 24 had declined from 19.6 percent in 1940 to 13.8 in 1956. Thus more people will be retiring from farming and fewer will be entering working ages during the next five years than during the past decade and a half. However, it must be noted that the percentage of the farm population under 15 has increased slightly from 31.5 in 1940 to 33.1 in 1956. Thus the future course of farm employment is going to depend upon the mobility of young people who are now 15 or less. We might also expect that social security will result in more farm people retiring at age 65 than in the past.

ALTERNATIVES TO MIGRATION

I was asked to discuss certain alternatives to migration as a means of increasing the incomes of farm people. One of the alternatives is the payment of a subsidy to those groups in the farm population that have a very low rate of potential mobility. Existing knowledge seems to indicate that a low rate of potential mobility is associated primarily with age. The age group with the lowest rate of migration is 30 to 49. The next lowest migration rates are in the 25-29 and 50-54 age groups. Available evidence also indicates that certain groups of individuals with very low educational attainment are relatively immobile.

If we were to pay subsidies on the basis of past migration rates for persons classified by age and area, we would find that the lowest migration rates are concentrated in the age group 30-39 in the high income farm areas. The much more mobile but much poorer Negro in the Mississippi Delta would fail, in all probability, to qualify for the subsidy. I have been unable to devise any meaningful criterion that might serve as a basis for such a subsidy, assuming the subsidy idea were desirable. With the exception of a fairly limited number of mentally or physically handicapped in agriculture, there is undoubtedly a fairly close negative association between the rate of mobility and the absolute (as well as relative) level of earnings in agriculture. Migration rates are lower in the higher income farm areas, and the peak level of income of farm people is in the 35-44 year bracket with 25-34 a close second. There may be reasons other than income why low mobility rates are found in these particular age groups, but income must be one of the major factors affecting the differences in mobility rates between areas. Studies made by Charles Berry and Karl Fox emphasize another variable, namely the replacement rate, as being closely associated with migration or mobility rates.[5] However, we find that the highest replacement rates are found in low-income areas in general and in areas with large Negro populations in particular. As both Fox and Berry point out, there is a very close empirical, and probably causal, relation between replacement rates and long run levels of income. The relationship is an inverse one, of course.

A second alternative is that of changing the ratio of capital to labor. One of the functions, or at least effects, of mobility is to increase the amount of capital per worker and thus the marginal physical productivity per worker and, if the absolute amount of capital remains unchanged, the value of the marginal product of labor. I have difficulty imagining how to go about changing the ratio of capital to labor in agriculture, except by making capital and capital goods either more or less expensive than it otherwise would be. With the same quantity of labor, the marginal return to farm labor would probably rise if we could restrict the flow of capital into agriculture. If the price elasticity of demand for agricultural output is no more than 0.25, it seems likely the elasticity of substitution between labor and capital is greater than this. Consequently, the proportional increase in produce prices resulting from a reduction in capital would be greater than the fall in the marginal physical product of labor. The value of the marginal return to labor would increase. But, as noted above, I doubt if the employment of capital in agriculture can be restricted except by raising the prices of capital goods and increasing the cost and difficulty of acquiring credit. I am confident that no Congress nor any Secretary of Agriculture would even consider such a suggestion!

A third alternative is to reduce the flow of new technology into agriculture, or at least the flow of technology that substantially reduces the relative value productivity of labor in agriculture. I suspect that in the final analysis any specific technological advance in agriculture lowers the value productivity of farm labor until resource adjustments are made. If we could have technological advances that reduced costs of production, other than labor and land, but did not permit an increase in output, labor and land engaged in agriculture might receive higher returns. But I find it difficult to imagine a technological innovation that carries with it a built-in output control. It would have to be a technique that did not increase output per acre of farm land, either directly through crop yields or indirectly through increasing livestock output per unit of feed. This statement is somewhat extreme since a decline in farm prices due to a given increase in output could be more than offset by a reduction in costs. However, it is my opinion that the substitutability of capital and other purchased inputs for labor is sufficiently high that technical

[5]Berry, Charles, "Occupation migration from agriculture, 1940-1950," unpublished Ph.D. dissertation, University of Chicago, 1956 and Fox, Karl, "Low-income problems in a high-employment economy," Jour. of Farm Econ., Vol. 37, No. 5 (Dec., 1955), p. 1087. The concept of replacement rates is used somewhat loosely here to indicate the relationship between the number of persons who would enter the labor force relative to the number now in the labor force if there were no migration from the area during the period under consideration.

changes that reduce the cost per unit of output for such inputs will result in an increase in their employment and a decline in the returns to labor unless labor employment is reduced.

But perhaps more important than the above is the fact that American agriculture is but one part of a dynamic, growing economy with a continuous flow of new technology and capital forms. I see no way to isolate agriculture from these developments. I do not see how we can restrict the adoption of new techniques in agriculture without stopping or restricting technological developments in many other areas — drugs, chemicals, automobiles, road building machinery, electricity, to mention only a few. I am confident also that, in the long run, farm people gain from the growth of real income in the economy as a whole.

My conclusion, admittedly arrived at prior to the above biased analysis, is that there is no satisfactory alternative to greater mobility of labor if agricultural incomes are to be increased relative to nonagriculture. Labor must be made more expensive by making it scarcer.

INCREASING MOBILITY

I have nothing new to say about programs for increasing mobility.[6] The measures required to increase mobility certainly include the following:

1. More and improved primary and secondary education is needed in rural low-income areas to increase the productivity of rural youth and to increase their understanding of the total economy and society.

2. More adequate information about nonagricultural job opportunities should be available. This information should be of a general nature dealing with the level of earnings in various jobs and occupations in terms of probably lifetime earnings, the type of training and capacities required for the various jobs and occupations, and the general location of the particular occupations (city size, region, or area). In addition, the information should be specific at any given time with respect to the types of job openings that are available in a given place or area. (This would require a true federal employment service or much more extensive cooperation between state employment services than now exists).

3. For those who wish such assistance, employment agencies should be in a position to help individuals determine the types of jobs for which they may be suited in terms of training, innate skills, and temperament. Employment agencies should perhaps make arrangements for jobs for individuals prior to movement from the home area, especially if the move involves a considerable distance.

4. In many low-income agricultural areas, outmovement would be

[6]Johnson, D. Gale, "Policies and procedures to facilitate desirable shifts of manpower," Jour. of Farm Econ., Vol. 33, No. 4 (Nov., 1951), pp. 722-29. See also "Development of agriculture's human resources," A Report on Problems of Low-Income Farmers prepared for the Secretary of Agriculture, USDA, 1955, esp. pp. 25-38.

increased if loans or grants were made to finance movement to nonfarm jobs. The cost of such a program should be quite small compared with the amount now being spent on agricultural programs. Even the suggestion of my colleague, Prof. T. W. Schultz, for homesteads in reverse involving a cash payment of $5,000 for any full-time farm family that would leave agriculture and locate in a city, involves a relatively small cost compared with the recent scale of agricultural programs.

Since Mr. Ruttan has discussed the possibilities and promise of local industrial and economic development, I shall not comment upon this means of increasing mobility from agricultural to nonagricultural employment.

While greater labor mobility will increase the incomes of those persons who leave agriculture in the vast majority of the cases, additional resource adjustments are required in low income areas if those who remain in agriculture are to realize equal gains. Farm enlargement, farm reorganization, and the acquisition of additional labor and managerial skills are necessary. In the higher income areas such adjustments seem to occur with relatively little difficulty. In the low income areas greater mobility is not all that is required, but greater mobility is a prerequisite for the other adjustments that must be made.

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Discussion

PROFESSOR JOHNSON has presented a systematic analysis of problems of labor mobility in agriculture. He reminds us of the very large movement of persons out of agriculture during the last 16 years — nearly 17 million persons. Using the equilibrium model as a norm, even this has not been fast enough. While per capita income of the farm population at the beginning of the period (1940) was 38 percent of the per capita nonfarm income, at the end of the period it stood at 44 percent. Barring any peculiarities of the base year (1940) and ending year (1956), I have difficulty in reconciling this apparent improvement in the relative position of agriculture with a statement in the conference outline that adjustments have not been sufficiently rapid to allow farmers to share equally in the increased production. Even in reference to the real returns to labor, Professor Johnson indicates that the gap has not narrowed, which to me is something different from a deterioration of the position of agriculture.

Professor Johnson points out that, in an equilibrium context, the comparison between farm and nonfarm per capita incomes has little meaning if we wish to compare real returns to the labor input in agriculture and nonagricultural occupations. After adjustments for a variety of factors, he estimates that an increase of approximately 54 percent in per capita 1956 farm incomes would be needed to equate returns to comparable labor. One adjustment which he makes entails the imputation process in determining the relative share of labor earnings. The important point is that estimates of productivities of the other resources are required and that the imputation problem has not been avoided by computing an adjustment for the per capita income figure.

Problems of interpretation of this 54-percent necessary increase in relation to labor mobility are complicated by the grossness of the data and the magnitude of the differential necessary to induce a given rate. He cites determination of income expectations as the greatest problem in relating income differential to mobility rate. His emphasis on long-run earning opportunities would be important if expected trends among alternatives differ widely. Otherwise, the immediate income differential may be quite satisfactory. The income differential-mobility rate schedule would, of course, be also dependent on the absolute level of incomes. This might be expected to vary with the prevailing community values.

Has the very high rate of migration in the age groups 15-19 and 20-24 significantly lowered the expected rate of migration in the future? Weighting the current age distribution by 1940-50 migration rates, Professor Johnson's analysis indicates little change in the expected migration rates for the next decade. This prediction depends, of course, on the maintenance over a 15-year period of similar values held by farm people with respect to those factors affecting migration associated with age, but not explicitly included in the analysis. Certainly such factors as the impact of World War II must have had some differential effect on the migration rates among age classes. In other words, the 1940-50 weights for the current age distribution could probably be sharpened by adjustment for those characteristics associated with age that are relevant for prediction.

In discussing the effect of income on migration, the point is made that outmigration is quite high in serious low-income areas but is lower in the low-income areas than in any of the other areas. This relation between income and migration is also not likely to be a net one. In a high-income area in central Illinois a study of 146 farms over approximately the same period under consideration here indicated that the ratios of the marginal productivities of labor with respect to its costs had dropped significantly but cash balances available for family living were sufficiently high to provide little incentive for outmigration.[1]

To help close the farm-nonfarm income gap, Professor Johnson discards several alternatives to improving labor mobility and then states his recommendations for increasing mobility which he is fair to indicate are not new; but with each retelling the proposals do become more convincing. Recommendations dictated by the equilibrium norm to increase mobility rate must, in general, be tempered by consideration of the geographic variability in rate of migration. Some very high rates of rural outmigration were reported for 1940-50. For example, 61 of the 102 Illinois counties had rural outmigration over 10 percent, but one county in southern Illinois lost 36.3 percent of its rural population. Such high mobility rates cause considerable strain on the remaining population and their community organizations.

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[1]Swanson, Earl R., "Resource adjustments on 146 commercial Corn Belt farms, 1936-53," Jour. Farm Econ., Vol. 39, pp. 502-505, May, 1957.

Chapter 11

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The Labor Market and the Employment Service

THE function of the labor market is to guide the allocation of labor among uses. The labor market is the medium through which information relative to alternative uses of labor is transmitted. The market is operating efficiently when laborers with equal productive capacities receive the same real (marginal) return in all employment.[1] In addition to occupational choice, labor use decisions include choice of location and choice of amount of investment in the human agent. Information relative to costs and returns is needed for making each of these decisions, and the labor market must transmit this information.

The economic progress of the United States is a tribute in large part to the effectiveness with which the labor market has operated in transferring labor among uses. As real incomes of people have increased, the demand for nonfarm goods and services has expanded more than the demand for farm products. Birth rates have been relatively low in urban centers where the bulk of the industrial goods and services are produced. In addition to the comparatively high birth rates in rural areas, changes in farm technology have made it profitable for farmers to substitute large quantities of capital for labor in the production of farm commodities. Thus, the labor market has been called upon to transfer large quantities of labor from farm to nonfarm employment in order to produce the goods and services in greatest demand.

The astounding rate of growth in the productive capacity of the United States economy has called for complex adjustments in industrial location and labor migration. Between 1920 and 1954, the net change from farm to nonfarm residences in the United States was about 24,000,000 persons.[2] Since 1950 the average net migration from farm to nonfarm residences has exceeded one million persons per year.[3] In spite of this phenomenal rate of migration, little progress has been made in closing the gap in returns for comparable labor services in farm and nonfarm employment.

Agricultural economists have complained for two decades that labor is underemployed in agriculture and have contended that the most

[1] Johnson, D. Gale, "Functioning of the labor market," Jour. Farm Econ., Vol. 33, Feb., 1951, p. 75.

[2] "Farm population — migration to and from farms, 1920-54," AMS-10, USDA.

[3] This does not include the large number who have maintained farm residences but who have transferred to nonfarm employment.

efficient organization of the economy can be attained only by transferring labor from farm to nonfarm employment at an increased rate. This conference is concerned with ways of decreasing the gap in returns for comparable labor in farm and nonfarm uses. This paper will concentrate on the operation of current employment services and indicate some of the areas in which labor market operations need to be improved.

COMPARABILITY OF APPARENT REAL INCOME

Decisions regarding labor use involve appraisal of returns to the owners of labor from alternative uses of the labor. Thus, information which enables the decision maker to decide when one situation is preferable to another must be transmitted by the labor market. If people are able to determine the conditions under which they are willing to exchange one occupational situation for another, the labor market problem becomes one of transmitting information relative to returns that will enable individuals to obtain equal satisfaction from alternative labor uses. If the individual is provided with sufficient information to rank the situations available to him, he can allocate his labor to its most efficient use.

However, supplying people with the income data necessary for making occupational decisions is not easy. Suppose, for example, that an individual is considering migrating from a farm to a nonfarm residence. The prospective migrant may wish to know the level of income which will be required in the urban setting to provide him with the same level of utility as he received in the rural setting. It is difficult for labor market agencies to provide him with this type of information. The potential migrant is interested in the differences in costs of obtaining a particular level of living in an urban as compared with a rural environment. The problem involves construction of an index of cost of living.[4]

One approach to this problem is to take the bundle of goods and services purchased at the farm level and to price it in terms of the prevailing prices in the urban area. This would provide the individual with information concerning the income that would be required to purchase in the urban setting the same quantity of goods and services as he had previously purchased in the rural area. This would be a simple problem if the relative prices of farm and nonfarm products were the same in the rural and urban locations, but relative prices of farm and nonfarm goods likely will differ in rural and urban locations. If relative prices in the two locations differ, a migrant would not purchase the same quantities of goods and services in the urban location as he purchased in the rural location even though he had just enough income to purchase the same quantity of goods and services. In an urban location the prices of nonfarm products would be relatively lower than in a rural location and the prices of farm products would be relatively higher. Under these price conditions, a migrant to an urban area would be

[4]See Stigler, G. J., Theory of Price, Macmillan Company, New York, 1954, pp. 87-91.

expected to purchase more nonfarm products and less farm products than he purchased as a farm resident. In doing so, he could attain a higher level of utility than he would if he purchased the same combination of goods that he purchased in the rural location. Therefore, this method of estimating differences in costs of living overestimates the amount of income that will be required to provide an incentive for transfer of labor from farm to nonfarm employment.

An alternative method of estimating the amount of income necessary to provide the same level of living in urban as in rural areas is to estimate the income that would be required in rural locations to purchase the same quantity of goods and services as are purchased by urban residents. Again, the problem is complicated by differences in relative prices of farm and nonfarm products in the two locations, which would result in changes in consumption patterns. Pricing of the goods and services consumed in urban locations in terms of the prices existing in rural locations underestimates the amount of income that would be needed by a migrant to attain the same level of living as he had in the rural location.

If prices differ in two locations, money incomes must be reduced to an equivalent basis in order to estimate income needed to maintain a particular level of living. This, we have seen, is a difficult problem. It is further complicated by the fact that the extent to which purchases of farm and nonfarm products are changed in response to price changes varies among individuals. Hence, the degree of error in using the above methods of estimating incomes needed in urban areas to attain the same level of living as in a rural area will vary among individuals.

In spite of the weaknesses of cost-of-living indexes, a great deal more work is needed in this area. More work is needed in the construction of budgets for specific quantities of goods and services purchased by representative families. Also needed are studies of the experiences and consumption patterns of migrants who have roughly comparable purchasing power in urban areas as they possessed in rural areas. Such studies should also provide insights into the changes that take place in preference functions after migration. These are problem areas in which interregional research should be especially beneficial.

Insofar as money incomes are concerned, two other adjustments are necessary in establishing actuarial equivalence of incomes. Resource use decisions should be based on net returns for resource services. Any transfer costs of migration and other additional costs of changing occupations must be considered if returns in alternative uses are to be comparable.

Actuarial equivalence is especially difficult to establish in the case of decisions to increase investment in the human agent. The number of income periods and the distribution of income over time must be considered. A person would not be expected to invest in increasing the productivity of his labor unless the difference between the present discounted value of his expected earnings after investment and the present discounted value of his earnings without the investment exceeds the amount of the investment. This brings up a point which should be stressed. Actions taken in the labor market are not independent of conditions in the capital market. The labor market transmits information with respect to the returns for labor services. Decisions regarding investment in the human agent, however, must be concerned with the price of capital and the opportunity return from alternative uses of capital. As the productivity of labor depends upon the amount of capital combined with labor, capital and the labor markets are directly linked. Capital must be available to provide farm labor with the training and skills needed in nonfarm employment and to finance migration to nonfarm employment. The problem is complicated by the fact that families with low productivity labor in agriculture have less capital to finance changes in labor use than families which are already employing labor in its most productive uses. In fact, one reason for the low productivity of labor is the small amount of capital used per worker.

Another major consideration in labor use decisions is the fact that the degree of risk associated with some occupational choices is greater than with others. The importance of risk in labor use depends upon the degree of risk associated with choices and the value of additional income to individuals. Friedman and Savage have pointed out possible effects of risk for individuals placing different values on additional income and have indicated certain conditions under which resource use of low-income families would be highly stable as compared with resource use of high-income families.[5]

NONPECUNIARY ASPECTS OF EMPLOYMENT DECISIONS

Another complicating factor in the problem of occupational choice is the fact that migration and occupational decisions are based upon levels of utility and that these include nonmonetary components as well as monetary components. Information transmitted in the labor market, therefore, must concern the total bundle of conditions, cultural factors, and other so-called sociological conditions, as well as money returns. An individual may be unable to attain the same level of utility in urban as in rural locations even if he purchases the same quantities of goods and services. The whole cultural complex may differ among communities, resulting in differences in community status, and, consequently, in levels of utility even when the same bundle of goods is consumed.

Marshall called attention to the fact that since labor must be delivered by the seller, nonpecuniary considerations are likely to be more important in the choice of uses for labor than for other resources. The prospective migrant must be informed of the conditions existing in urban employment and urban life if he is to make rational decisions in regard to labor use. Again, by analyzing the experiences of migrants, we may

[5]Friedman, M., and Savage, L. J., "The utility analysis of choice involving risk," Jour. Polit. Econ., Vol. 56, pp. 279-304.

be able to improve our theory and to provide more adequate information for migration decisions.

CURRENT LABOR MARKET INFORMATION

Employment services have been created to improve the operation of the labor market. The Employment Service Division of the U. S. Department of Labor provides labor market information on employment conditions throughout the United States. Interoffice and interstate communication systems enable the employment service to act quickly in transmitting information relative to job opportunities from one office or area to another. Most industrial areas in each state are canvassed monthly to determine trends in the labor market. Changes in employment during recent months are noted, and employment during the next few months is projected. The number of jobless people in each area also is estimated. In the event that an industry needs employees, the employment service advertises through the press, the radio, and television in an effort to provide this information to prospective employees.

The employment service disseminates much of the information currently available concerning labor market conditions. It provides information on employer, the location of the job, the hours of work, rate of pay, expected duration of employment, and location and characteristics of the job, whether it involves union membership, the terms of transportation to the job, and general living conditions in the area in which the job is located. The occupational title and number of openings are also specified. Under the heading of "living conditions," housing accommodations and costs in the vicinity of the job are indicated. Other information on costs of living and on sociological conditions are not provided.

The employment service does not have a current detailed file of job opportunities in each area. Such a file would be very expensive to maintain, and it is questionable whether the additional gains would exceed the additional costs. Some people are of the opinion that the volume of long-distance migration is not sufficient to warrant maintaining an active file on job opportunities in distant areas. More information on the distance mobility and occupational mobility of farm people is needed as a basis for determining the types of labor market information that are likely to be most useful in making occupational choices.

The continued stream of migrants from low-income agricultural areas to nonfarm areas is evidence that the labor market is functioning to transfer labor in the direction that would be expected on the basis of returns for labor services. On the other hand, the fact that the return for labor services in low-income areas continues to be much less than the return for labor services in other areas suggests that improvement is needed in transmitting labor market information. There is other evidence of lack of knowledge with respect to labor market conditions. For example, prospective employers invariably find that the quantity of labor available for employment in a plant located in a low-income agricultural area is substantially greater than had been estimated prior to location in the area. Estimates of the supply of labor probably are even less accurate than estimates of the supply of farm products. More household analysis is needed to obtain a better understanding of the supply of labor.

More accurate information with respect to labor market conditions also is needed by rural people if the labor market is to function efficiently. For example, a study in North Carolina indicates that during 1950, when nonfarm employment opportunities were expanding rapidly as a result of the Korean War, only 2 percent of the adult members of farm-operator families living on low-production farms in the Southern Piedmont area of the state attempted to obtain nonfarm employment through local employment service offices. In 1951, however, after being questioned in a survey about their visits to local employment offices, persons from 15 percent of the families attempted to obtain nonfarm employment, and approximately 10 percent of the families transferred to nonfarm employment during that year.

Smith provides even more striking evidence of the malfunctioning of the labor market in transmitting accurate information in regard to job opportunities.[6] In a study of recent migrants to Indianapolis, he found that only 13 percent of the Negro migrants to Indianapolis had accurate information on availability and nature of employment prior to migration. Seventy-six percent of them reported that they obtained employment more easily than they had anticipated, and 11 percent had more difficulty than they had anticipated. Twenty-eight percent of the Southern whites possessed accurate information on the nature and availability of employment prior to migration, compared with 54 percent who encountered less difficulty than they had expected, and 8 percent who encountered more difficulty. A higher percentage of the Northern whites (55 percent) had accurate information, indicating that proximity to employment influences the accuracy of labor market information.

Figures such as these lead us to believe that the rate of migration from agriculture would have been higher if farm people had more accurate information in regard to the nature and availability of employment. Unfortunately, such a conclusion is not warranted. In spite of the fact that most of the migrants had encountered less difficulty in obtaining employment than they had anticipated, Smith found that 44 percent of them "were dissatisfied to the extent that they were hoping or actively planning to return to farming."[7]

It is doubtful, of course, if such a high percentage of the migrants will return to farming. On the other hand, the fact that they were dissatisfied indicates that their expectations with respect to urban employment have not been realized.

The operation of the labor market in transferring labor from farm

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[6]Smith, Elton D., "Nonfarm employment information for rural people," Jour. Farm Econ., Vol. 38, pp. 813-27.

[7]Ibid, p. 820.

to nonfarm occupations can be improved through closer coordination of the agencies working in the labor market area to provide better data with respect to costs of living, living conditions in urban areas, problems in urban adjustments, and through improved screening and advising of migrants. It would be interesting to know the percentage of migrants that seek the counsel of employment agencies in making migration decisions and that are resettled in urban areas with the guidance of social welfare organizations. The work of these agencies currently is hampered by the opposition of those who think they will suffer losses as a result of migration. Economists can help to provide a more objective attitude toward migration through study of the mobility potential of farm people and through analysis of the potential effects of large scale emigration and immigration.

Providing information relative to investment in the human agent is another area in which the labor market performs very poorly. Long-term decisions, such as those involving investment in the human agent, probably are based on even less accurate information than current occupational choices. Very little research information is available concerning returns from investment in the human agent. We need only look at our colleges and universities to see how poorly information currently is transmitted to students in regard to potential costs and returns from various occupations. The extremely high proportion of engineering students who are unable to meet the requirements for degrees currently is a cause for great concern in most of our land-grant colleges.

We need more information on the productive capacity of rural people. The work of D. Gale Johnson suggests that the nonfarm labor capacity of farm people is about 90 percent of the earning capacity of urban residents.[8] Work at North Carolina suggests that nonfarm earnings of farm and nonfarm residents are about equal after farm residents have as much as five years of nonfarm employment experience.[9] Both of these studies represent crude estimates and more refined studies are needed to determine the mobility potential of farm people and to provide a better basis for investment decisions.

We also need to conduct studies to determine the employment potential in agriculture. Very little information is available on the demand for people trained in agriculture. Most studies have stopped after pointing out that additional labor needs to be transferred from farm to nonfarm employment. We know that there is more labor on farms than can be employed in agriculture at rates of return approximately equal to the earnings of comparable labor in nonfarm employment. Policy makers and industrial employers want to know how much labor needs to be transferred from agriculture to equalize returns.

Since long-run forces determine income possibilities in farm and

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[8]Johnson, D. Gale, "Comparability of labor capacities of farm and nonfarm labor," Amer. Econ. Rev., Vol. 43, June, 1953, pp. 296-314.

[9]Bishop, C. E., and Sutherland, J. G., "Resource use and incomes of families on small farms," N.C. Agr. Exp. Sta. A.E. Series 30, 1953, p. 35.

nonfarm occupations, we need to provide reliable outlook information to farm youth as a basis for occupational choice. Information is needed relative to the number of people who can expect to earn incomes in agriculture equal to or greater than they can earn in industry. Broad aggregate data will not be sufficient. The types and sizes of farms and the amount of capital required to develop an efficient agriculture must be spelled out in sufficient detail for use by professional agricultural workers and by individual farmers in local economic development.

The labor market faces a difficult task during the next decade. The demand for farm products will not expand fast enough relative to the supply to cause strong upward pressure on the prices of farm products. This situation will provide a continued incentive for transfer of labor from farm to nonfarm employment. Local industrial development will not take place at a sufficiently high rate to reduce greatly the need for long-distance migration of labor. The labor market will continuously face the problem of large-scale resource transfers to bring together jobs and labor in a manner consistent with realization of the economic potential of the nation.

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Discussion

PROFESSOR BISHOP has done a thorough job of setting forth the conceptual aspect of the labor market, spelling out the information needed by the potential migrant, and indicating the problems of providing this information.

The decrease in the number of agricultural workers from 10,890,000 in June, 1940, to 7,876,000 in June, 1956, is significant evidence that the labor market is functioning. However, in spite of this large outflow, agriculture finds itself with more labor than is needed.

How can the functioning of the labor market be made more effective in transferring still more of the labor resource out of agriculture?

The most formalized machinery through which the labor market functions is the employment services. Two other important informal media are, first, the communicative services such as newspapers, radio, and television, and second, information transmitted through relatives and friends who have migrated.

To learn if the employment services could be of more assistance I contacted the research director of the Ohio Employment Service to find out how the public employment agency is organized and functions. The basic approach is similar in most states. In each state the employment service is state administered but federally financed. It is primarily organized to process claims for unemployment compensation, to take applications for employment, and to provide information on employment opportunities and the labor supply. The establishment of a local office of the service depends primarily upon the number of claims for unemployment compensation. Since agricultural labor is not eligible for unemployment compensation, full-time or part-time offices are seldom situated in counties that are predominately farm. The exception to this is that some offices are established to service farm employers of labor or agricultural processors, such as canneries. The funds for this type of service, provided by Congress to recruit and supply labor for agriculture, were formerly administered by the Department of Agriculture. Currently, they are administered through the Department of Labor. The objective of this service is to provide labor for agriculture and not to draw labor out of agriculture. Viewed from the standpoint of the individual farmer this is a desirable service. Viewed from the economy as a whole it may be considered as an obstacle to the draining off of surplus labor from agriculture; at least it is not a positive force.

The typical local employment office designed to handle unemployment claims and requests for employment information is generally staffed by local people. The person in charge in most offices is paid $300 or less per month, which seldom is enough to attract the level of ability needed to obtain and handle essential information and to counsel effectively with potential migrants. Offices rarely engage in active recruiting because of the attitude of local employers, merchants, and other vested interests. This attitude of the local interests, stemming from fear of a decline in labor supply and an increase in wage rates, a shrink in consumers and a loss of political constituency, generally prevents the local office from conducting recruitment programs that might cause adverse reaction. Consequently, the offices usually only receive applications from potential migrants. Few farm people, as Bishop pointed out, approach an employment service until stimulated by some means to do so. However, studies indicate that once stimulated, increased numbers avail themselves of the services.

A thorough study of the functioning of state and local employment services from the viewpoint of increasing their effectiveness in equating the labor market would, I am certain, uncover much that could be done. A few of the more evident possibilities gleaned from my hasty exploration of operating procedure, along with the suggestions made by Bishop on information needed for aiding the potential migrant to arrive at a decision, are: (1) establishment of more offices in rural areas, (2) better paid professionally trained personnel, (3) more complete information of the type needed to help local potential migrants arrive at sound decisions, and (4) greater freedom from local influences in the conduct of an educational program as to employment opportunities. If the objective is primarily to draw off enough of the labor resource to improve significantly the supply-demand balance in agriculture as rapidly as possible, maximum progress is most likely to be made if the added offices are confined to the more productive agricultural areas. If the objective is primarily to solve the low-income problem of many rural areas and the added offices are situated in such areas, it is highly questionable if the total agricultural production will be reduced. Instead some actual increase may result through more effective farming by those who remain.

Chapter 12

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The Potential in Rural Industrialization and Local Economic Development*

THIS discussion of the potential of rural industrialization and local economic development will be focused upon the following three questions:

1. What are the implications of local urban-industrial development for farm family incomes in the low-income agricultural areas?
2. What is the potential for local urban-industrial development in the low-income agricultural areas?
3. What are the implications of this analysis for the Federal-State Rural Development Program?

The boundaries of this discussion can be further identified, first, by pointing out that local economic development refers to development at the city or county level in contrast to area or regional development. Second, primary emphasis will be placed on the prospects for expansion in local industrial employment and relatively little attention will be given to the prospects for employment expansion in trade, service, and the other "tertiary" industries.

Finally, by centering this discussion around the implications of local urban industrial development on agriculture's low-income problems, any discussion of the implications of local urban-industrial development for the problems of price and/or income stability in American agriculture is being deliberately by-passed. I would argue that the specific location pattern of nonfarm economic growth has little or no bearing on those problems which have occupied the center of the stage in farm policy discussion during the last three decades — that is the problem of price and income instability[1] — although space limitations prevent discussion in this paper.

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There can be little doubt, however, that the level of farm family

*This paper is based on work conducted under Purdue Agricultural Experiment Station Project No. 893 and under TVA Project Authorization Serial No. 840.

[1]This point was made by Willard Cochrane in "Appraisal of recent changes in agricultural programs in the United States," paper presented at the AFEA Winter Meeting, Cleveland, Ohio, Dec. 28, 1956, pp. 17-18.

income is closely related to the extent of local urban-industrial development.[2] When the median incomes of rural farm families are plotted on one axis and the proportion of the total population that is nonfarm on the other axis of a chart, the result for most areas is a very clear positive relationship (Table 12.1). On a national basis, only the seven Northern Great Plains States appear to stand definitely outside of this relationship.

Welfare levels in agriculture, as measured by the median incomes of farm families, are generally higher in those areas where urban-industrial development has advanced the furthest. Even so, this does not "prove" that (1) the higher income levels are "caused" by local urban-industrial development or that (2) further development would necessarily result in higher incomes for farm families located in close proximity to such developing urban centers.

In order for local urban-industrial development to have any differential impact at all on the income levels of nearby farm families, the local nonfarm economy must channel its impact through at least one of four markets:

1. The labor market — through which labor is allocated among agricultural enterprises and between the agricultural and non-agricultural sections of the economy.
2. The capital market — through which purchases of capital assets and working capital are financed.
3. The product market — the markets for the products produced by agriculture.
4. The current input market — the market(s) for current inputs consumed in the process of agricultural production.

T. W. Schultz has stressed the importance of the labor and capital markets in transmitting the impact of urban-industrial development to the agricultural sector.[3] E. C. Young has placed important emphasis on the contribution of urban-industrial development to the creation of an efficient farm supply market.[4]

My work on the impact of urban-industrial development on agriculture in the Tennessee Valley region indicated, in that area at least, that the major income effects of local urban-industrial development are transmitted to the agricultural sector of the local economy through the

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[2]See Ruttan, Vernon W., "The impact of urban-industrial development on agriculture in the Tennessee Valley and the Southeast," Jour. Farm Econ., Vol. 37, Feb., 1955, pp. 38-58; Sinclair, Lewis W., "Urbanization and incomes of farm and nonfarm families in the South," Jour. Farm Econ., Vol. 34, May, 1957, pp. 510-16; Anderson, R., and Collier, J., "Metropolitan dominance and the rural hinterland," Rural Soc., 21:2 June, 1956, pp. 152-57; Glasgow, Robert B., "Farm family income, its distribution and relation to nonfarm income," USDA, ARS 43-34, Washington, Dec., July, 1956.

[3]Schultz, T. W., "Factor markets and economic development," The Economic Organization of Agriculture, McGraw Hill, New York, 1953, pp. 283-312. See also Wilcox, Walter, "Effects of farm price changes in efficiency in farming," Jour. Farm Econ., Vol. 33, Feb., 1951, pp. 55-65; and Bishop, C. E., "Under-employment of labor in southeastern farms," Jour. Farm Econ., Vol. 36, May, 1954, pp. 264-68.

[4]Young, E. C., "The interaction between technical changes on the farm and technical changes in marketing and distribution," Proc. Internat. Conf. Agr. Econ., Tenth Conference, 1956.

Table 12.1. Relationship Between the Median Income of Farm Families and Unrelated Individuals in 1949 and the Percent of the Total Population Nonfarm in 1950 for Selected Areas

Area	The regression in equation[c]	Arithmetic mean		Standard deviation		Standard error of estimate	Coefficient of		F ratio[d]	
		$\bar{I}$	$\bar{X}$	Sy	Sx		Correlation	Determination	Computed	Critical
U. S. (48 states)[a]	I=289.86 /28.72X	2029.79	80.77	615.63	11.68	527.22	.53	.282	19.43	4.068
U. S. (41 states)[a,e]	I=-1749.41/44.64X	1939.02	82.63	620.34	11.29	371.06	.81	.650	75.37	4.889
Southeast (104 state[a] economic areas)	I=342.13 /11.73X	1100.67	64.67	342.12	16.24	286.98	.55	.303	45.83	3.944
Tennessee Valley Region[a] (201 counties)	I=515.55 /10.87X	1028.76	47.22	284.39	17.87	208.80	.68	.463	173.66	3.92
Central and Eastern Uplands (VII) [b]	I=561.84 /13.70X	1281.89	52.55	397.56	18.72	307.36	.638	.407	58.00	3.95
Southeast Central Plain (VIII)[b]	I=479.00 /9.62X	974.36	51.51	357.51	17.02	321.80	.451	.203	21.36	3.95
Atlantic Flatwoods and Gulf Coast (IX)[b]	I=583.83 /11.02X	1387.90	72.93	450.00	17.31	421.92	.387	.150	6.10	4.20
South Central and Southwest Plains (X) [b]	I=396.16 /17.91X	1416.18	56.94	719.24	16.66	667.92	.395	.156	10.04	4.07

[a] From Ruttan, Vernon W., "The impact of urban industrial development on agriculture in the Tennessee Valley and the Southeast," Jour. Farm Econ., Vol. 37, Feb., 1955, pp. 38-56.

[b] From Sinclair, Lewis W., "Urbanization and incomes of farm and nonfarm families in the South," Jour. Farm Econ., Vol. 39, May, 1957, pp. 510-16. The regional groupings in Sinclair's article are based on Bogue, Donald J., "An outline of the complete system of economic areas," Amer. Jour. Soc., Vol. 60, Sept., 1954, pp. 136-39.

[c] I=Median income of farm families in 1949; X=percent of total population nonfarm 1950. Basic data compiled from U. S. Census of Population, 1950, Vol. 2, Characteristics of the Population.

[d] Critical values of F are at the .05 level of significance and indicate that the hypothesis that there is no relationship between the two variables should be rejected.

[e] Excludes Idaho, Montana, Wyoming, North and South Dakota, Nebraska, and Iowa.

labor market — through the direct increase in the incomes resulting from nonfarm employment of farm family members. Secondary effects were exerted through the capital market. And distinctly minor effects were exerted through the product and current input markets.[5]

Christian's work in Mississippi also points to a relatively minor impact through the product market.[6] There is a substantial basis for believing that the product market effects may even run in the opposite direction — that is, that farm income may exert a greater effect on local nonfarm incomes through the product and current input markets than is exerted in the opposite direction.[7]

II

The fact that local urban-industrial development exerts its primary impact through the labor market should not lead to a discounting of the important role which local development must play if we are to achieve a rapid solution to the low-income problem in many areas.

Typical replacement ratios for rural farm males in the 20-64 age group are expected to run slightly above 200 during the 1950-60 decade in the South and about 135 in the rest of the country (Table 12.2). Therefore, in the major low-income areas of the South, young men are still entering the labor force at a rate more than double the number required to replace existing farm operators and hired farm workers as they retire. Thus, over half of the young men from such areas must find off-farm employment simply to prevent an increase in farm employment during 1950-60 — to maintain the number of male farm operators and hired workers at existing levels.

In addition, a further decline in farm employment averaging about 50 percent of the 1950 level for the 11 Southeastern states will be acquired if farm incomes in the Southeast are to be brought in line with farm incomes generally by 1975 (Table 12.3).

In areas such as the Northeast and North Central regions, where farm employment runs about 5 to 15 percent of total employment, the absorption of the required number of farm youth and farm workers into the local nonfarm labor force is relatively easy, even in the absence of exceptional rates of growth in nonfarm employment.

In the low-income areas of the Southeast, where farm employment runs about 40-60 percent of total employment, only exceptionally rapid

[5]Ruttan, op. cit., pp. 43-55.

[6]Christian, W. E., "Impact of industrialization on the marketing outlets for locally produced farm products," paper presented at annual meeting of the Southern Economics Association, Biloxi, Miss., Nov., 1954. See also Dickins, Dorothy, Welch, L. D., Ferguson, Virginia, and Christian, W. E., "Industrialization and market for food products in the Laurel trade area," Miss. Agr. Exp. Sta. Bul. 540, Mar., 1956.

[7]See Olson, Philip, "Arizona cotton town — an explanatory inquiry," Arizona Business and Economic Review, Bureau of Business Research, University of Arizona, Tucson, Oct., 1956, pp. 1-5, for an examination of the impact of farm income instability on a rural service center.

rates of growth in nonfarm employment will permit absorption of the surplus farm labor force locally. In the absence of an adequate rate of growth in local nonfarm employment, long distance migration presents the only solution to the surplus labor problem. And spontaneous long distance migration has rarely reduced the surplus labor force sufficiently to narrow substantially the earning differentials between the surplus and deficit labor (and population) areas.[8]

The logical implication seems clear: In those areas where local expansion in nonfarm employment is not sufficiently rapid to absorb a

Table 12.2. Replacement Ratios for Rural-Farm Males for Selected Areas*

Region	Ages 20-64		Ages 25-69	
	1940-50	1950-60	1940-50	1950-60
South Atlantic	219	223	192	169
Delaware	140	125	131	106
Maryland	157	155	146	134
Virginia	198	188	172	147
West Virginia	217	214	186	153
North Carolina	239	243	217	192
South Carolina	246	267	215	197
Georgia	221	236	189	170
Florida	186	178	156	129
East South Central	219	215	190	159
Kentucky	220	198	190	152
Tennessee	210	198	187	152
Alabama	235	241	203	172
Mississippi	211	227	181	160
West South Central	176	204	184	134
Arkansas	207	192	187	142
Louisiana	214	219	195	157
Oklahoma	209	172	184	131
Texas	196	154	178	124
South	214	206	189	155
Northeast	-	134	-	117
North Central	-	137	-	117
West	137	135	-	116
United States	179	168	167	135

*Source: Bowles, Gladys K., and Taeuber, Conrad, Rural-farm males entering and leaving working ages, 1940-50 and 1950-60. Series Census-AMS, P-27, No. 22, Aug., 1956. Tables 1 and 8.

[8]For further discussion of the interrelationships between local development and migration, see Johnson, D. Gale, "Some problems of measuring the economic effects of area resource development," University of Chicago office of Agricultural Economics, Research Paper No. 5307, May 29, 1953, and "Mobility as a field of economic research," Southern Econ. Jour., Vol. 15, Oct., 1948, pp. 152-61. See also, Galbraith, J. K., "Inequality in agriculture — problem and program," First J. J. Morrison Memorial Lecture, Ontario Agricultural College, Guelph, Canada, Nov. 16, 1956, especially p. 6.

Table 12.3. Changes in Farm Output, Employment and Productivity Required To Equate Farm Incomes in Selected Southeastern States With the Projected U.S. Average Farm Income in 1975 *

Area	Average net income per farm worker 1950	Est. no. of farm workers 1950 (thousands)	Projected indexes for 1975 (1950=100) Net farm output	Output per worker Low	Output per worker High	Number of workers Low	Number of workers High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
United States	$2,091	7,507	160	198	240	67	81
Non Southeast (37 states)	2,361	4,850	159	175	213	75	91
Southeast (11 states)	1,375	2,657	164	307	373	44	53
Alabama	1,038	264	114	398	483	23	29
Arkansas	1,639	227	142	252	306	46	56
Florida	2,615	130	205	158	192	107	129
Georgia	1,183	279	131	349	424	31	38
Kentucky	1,221	258	153	338	411	37	45
Louisiana	1,516	159	190	273	331	57	70
Mississippi	1,072	318	162	385	468	35	42
North Carolina	1,492	378	208	276	336	62	75
South Carolina	932	207	175	443	538	32	40
Tennessee	1,120	267	153	369	448	34	42
Virginia	1,722	176	143	240	291	49	60

*Source:

Column (1) For methodology employed in making these estimates see Comparative Data on Farm Income and Employment, 1929-51, TVA, Knoxville, May, 1953.

(2) Estimated from Annual Report on the Labor Force, U.S. Dept. of Commerce, Bureau of the Census, by distributing the national total to states on the basis of farm employment data in 1950 Census of Population.

(3) For national estimates see, Ruttan, Vernon W., "The Contribution of Technological Change to Farm Output: 1950-75," Rev. Econ. and Stat., Vol. 38, Feb., 1956, pp. 61-69. State estimates are based on 1929-52 trends in state output in relation to national farm output.

(4) National estimates are based on the assumption that output per farm worker will continue to increase at the 1910-50 rate of 3.9 percent per year. State estimates reflect the increase required if output per farm worker in each state is to reach the national average by 1975.

(5) National estimates are based on the assumption that output per farm worker will continue to increase at the 1929-50 rate of 5.6 percent per year. State estimates reflect the increase required if output per farm worker in each state is to reach the national average by 1975.

(6) This is the number of farm workers required to produce the farm output estimated in column (3) if output per farm worker increases at the rate indicated in column (5).

(7) This is the number of farm workers required to produce the farm output estimated in column (3) if output per farm worker increases at the rate indicated in column (4).

major share of (a) the young men and women entering the labor force for the first time (from both urban and rural areas) plus (b) the surplus farm population resulting from advancing technology in agriculture, farm families will continue to receive incomes below the levels in those agricultural areas situated more favorably relative to urban-industrial development.

III

The importance of local urban-industrial development to the solution of agriculture's low-income problem is widely recognized. We are now engaged in a rural development program which stresses expansion of local nonfarm employment alternatives as a solution to the low-income problem. This means that we can hardly avoid facing up to a second question: What is the potential for local urban-industrial development in the low-income agricultural areas? The answer to this question will depend to a major degree on the locational advantages of the low-income areas.

Factors affecting location decisions can be divided into three broad classes.[9]

1. Cost factors — including raw material, labor, site, and transportation costs.
2. Market or demand factors — including the size, structure, and location of the market for the products of the farm or industry.
3. Personal factors — mainly environmental preferences.

Location theorists have traditionally devoted a good deal more attention to the cost factors of location than to the market factors. The influence of personal factors has largely been ignored.

More recently, inquiry into the spatial interdependence of economic activity, especially under conditions of imperfect competition, has tended to emphasize the importance of the demand factors involved in industrial location decisions.[10]

The declining relative importance of raw material costs in manufacturing;[11] the external scale economies resulting from the agglomeration

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[9]Greenhut, Melvin L., Plant Location in Theory and Practice, University of North Carolina, Chapel Hill, 1956, pp. 279-81. Other authors frequently give separate emphasis to the two major cost factors — raw material and labor costs. See, for example, McLaughlin, Glenn, E., and Robock, Stefan, "Why industry moves South," National Planning Association, Washington, D. C., 1949.

[10]Greenhut, op. cit., pp. 23-83.

[11]Dewhurst, J. F., and associates, America's Needs and Resources, A New Survey, Twentieth Century Fund, New York, 1955, p. 755. See also Greenhut, op. cit., pp. 113-17, and Isard, Walter, "Some locational factors in the iron and steel industry since the early nineteenth century," Jour. Polit. Econ., Vol. 56, 1948, pp. 203-17.

of industrial activity in urban centers;[12] plus the growing recognition of the market as a locational factor[13] all seem to favor the continued expansion of industrial activity in urban centers of at least standard metropolitan size or their nearby industrial satellites.

We might hypothesize that the smaller cities and towns characteristic of the low-income areas are likely to experience substantial expansion in industrial employment only under four conditions:

1. When labor costs are an important consideration in location decisions.
2. When local raw materials represent an important locational factor.
3. When defense strategy considerations dictate location at a substantial distance from important urban centers.
4. When personal preferences of managerial personnel for small town or rural locations are sufficiently strong to override strict profit maximization considerations.

If the above hypothesis is correct, local urban-industrial development would be expected to present an effective alternative to geographic labor mobility in only a relatively few of the nation's low-income agricultural areas during the next two decades. Those low-income rural areas which do experience substantial urban-industrial development will by and large be located where they can serve as effective satellites to existing urban-industrial centers.[14]

How does this hypothesis stand up when examined in light of the actual experience of industrial expansion during the recent years?

First of all, there is little doubt that the long-term trend toward location of a larger share of the nation's industrial employment in the less industrialized regions is continuing (Table 12.4).[15] The share of the nation's total industrial employment located in the New England, Middle Atlantic, and the East North Central regions has declined. The other regions have increased their share of manufacturing employment, with the most dramatic increases occurring in the Pacific and West South Central regions.

[12]Greenhut, op. cit., pp. 37-41, 257-72. See also Schultz, op. cit., p. 147; Vining, Rutledge, "A description of certain spatial aspects of an economic system," Economic Development and Cultural Change, Jan., 1955, pp. 147-95; Friedman, John R. P., The Spatial Structure of Economic Development in the Tennessee Valley, University of Chicago, 1955, pp. 21-45; One might also refer to Allyn A. Young's presidential address to the Royal Economic Society in 1928, "Increasing returns and economic progress," Econ. Jour., Vol. 38, Dec., 1928. Although written in terms of general economic development, Young's article presents an especially interesting discussion regarding the basis for the agglomeration of economic activities.

[13]Greenhut, op. cit., pp. 23-83.

[14]For further discussion of the type of spatial structure which can be expected to develop in such areas, see Friedman, J. R. P., "Locational aspects of economic development," Land Econ., Vol. 31, Aug., 1956, pp. 213-27.

[15]"Comparative rates of manufacturing growth by region: 1899-1954," U. S. Dept. of Commerce, Office of Area Development, Staff Paper 3, Nov., 1956. See also Dickson, Paul W., Decentralization in Industry, Studies in Business Policy No. 30, National Industrial Conference Board, New York, 1954.

Table 12.4. Total Manufacturing Employment of the United States, Distributed by Geographic Region: 1899-1954*

Year	Total U.S. manufacturing employment[a] (millions)	Manufacturing employment of geographic regions, as percent of U.S. total								
		New England	Middle Atlantic	East No. Central	West No. Central	South Atlantic	East So. Central	West So. Central	Mountain	Pacific
1899	4.9	17.6	34.1	23.2	5.8	9.5	3.7	2.4	1.0	2.7
1909	7.0	16.0	33.8	23.3	5.9	9.7	3.9	3.0	1.1	3.3
1919	9.8	14.6	31.9	27.0	5.7	8.5	3.5	3.1	1.1	4.6
1929	9.7	12.3	29.8	29.1	5.6	10.1	4.1	3.3	1.1	4.6
1939	9.5	11.8	28.9	28.3	5.2	11.6	4.3	3.5	0.9	5.5
1947	14.3	10.3	27.6	30.2	5.5	10.7	4.4	3.9	1.0	6.4
1950	14.5	9.8	27.0	29.9	5.6	11.1	4.4	4.1	1.1	7.0
1951	15.3	9.6	26.5	29.9	5.8	10.9	4.4	4.2	1.1	7.7
1952	15.7	9.4	26.5	29.4	6.0	11.0	4.4	4.2	1.1	8.0
1953	16.7	9.4	26.2	30.0	5.8	10.7	4.4	4.3	1.1	8.1
1954	15.7	9.1	26.3	28.5	6.0	11.1	4.6	4.6	1.2	8.6

*Source: 1954 Census of Manufactures, Preliminary Report, Series MC-G2; 1953 Annual Survey of Manufactures; and 1947 Census of Manufactures. Supplied by the Office of Area Development, U. S. Department of Commerce.

[a]Includes employment, both production workers and non-production personnel, at operating manufacturing plants only; excludes employees of manufacturing firms at separately reported central administrative offices, sales offices, auxiliary units, and other non-manufacturing activities.

Second, it seems equally clear that the recent dispersion of industrial employment to the less industrialized regions has not been accompanied by any substantial increase in the proportion of total manufacturing employment located in the smaller cities and towns of the nation (Table 12.5). For the United States as a whole, the percentage of manufacturing employment located outside of the standard metropolitan areas was almost exactly the same in 1954 as in 1947. However, the smaller metropolitan centers — those with less than 40,000 industrial employees in 1947 — did experience a more rapid rate of increase in industrial employment than the larger industrial centers.

Location patterns among the several regions differ in some important respects. The contrast between the five states of the East North Central region and the 11 states of the Southeast is especially interesting. In the East North Central region, with approximately two-thirds of total industrial employment located in the very large industrial centers, the most rapid (percentage) increase in industrial employment during the 1947-54 period occurred outside of the standard metropolitan areas. In the Southeast, with three-fifths of industrial employment located outside of the standard metropolitan areas, the most rapid (percentage) increase in industrial employment occurred in larger cities. It is also interesting to note that the absolute, as well as the percentage, increase in industrial employment in the Southeast was substantially greater than in the East North Central region between 1947 and 1954.

The large share of the nation's small town or rural industrial employment that is presently located in the Southeast is perhaps even more striking. With only 14 percent of the nation's total manufacturing employment, the Southeast has one-third of all manufacturing employment in the nation that is located outside of the standard metropolitan areas.

The importance of small town and rural industrial employment in the Southeast can be traced in large measure to the importance of lumber and textiles in the region's economy. With a major proportion of total national employment in these industries already located within the Southeast,[16] it seems reasonable to anticipate that future industrial expansion in the Southeast will tend to bring the industrial location pattern of the region more nearly in line with the national pattern.[17]

The data examined do not seem to offer any reason for altering our earlier hypothesis — that local urban industrial development will present an effective alternative to geographic labor mobility in only a few of the nation's low-income agricultural areas during the next two decades.

In the Southeast, the nation's major low-income agricultural area, there is even some basis for expecting that industrial growth outside of

[16]In 1947 the Southeast accounted for 48 percent of the nation's manufacturing employment in textile mill products and 45 percent of the nation's manufacturing employment in lumber and wood products. These two industries alone accounted for 47 percent of total industrial employment in the Southeast. In the United States, they accounted for only 10 percent.

[17]On the basis of a detailed analysis of the location patterns in the Tennessee Valley region, Friedman presents the following data and projections:

the standard metropolitan area size may be more difficult to achieve in the future than in the recent past.

IV

What are the implications of these conclusions for the conduct of development programs in low-income agricultural areas — more specifically for the Federal-State Rural Development Program?

1. Only a limited number of small cities and towns possess location characteristics sufficiently attractive to serve as the basis for substantial urban-industrial development — say an amount sufficient to bring the area into the standard metropolitan area classification by 1975.
2. Programs which focus their efforts on these potential urban-industrial centers will be more successful than programs in areas which are selected on the basis of other criteria — say the current level of income or the magnitude of rural underemployment.
3. The rural areas peripheral to the potential centers of urban-industrial development have more to gain from a successful development effort centered on the potential development centers than on unsuccessful or even partially successful efforts centered in areas of only minor potential development.
4. A single area development organization with programs centered around the potential urban-industrial center in its area will be more effective than a series of county programs each attempting to obtain part of the areas potential employment gains.

Locational Orientation of Manufacturing Workers in the Tennessee Valley Region

	Market	Raw Material (including power)	Labor	Miscellaneous	Total
Percentage distribution in: 1929	31	32	35	3	100
1950	32	26	39	3	100
Percentage distribution of increase, 1929-1950	32	20	45	3	100
Estimated percentage distribution of increase, 1929-1975	45	15	35	5	100

Friedman, J. R. P., "Locational aspects of economic development," op. cit., p. 222, and "The spatial structure of economic development in the Tennessee Valley," op. cit., Chap. 7, pp. 102-25.

Table 12.5. The Location of Manufacturing Employment in the United States and Selected Sub-Regions, 1947 and 1954*

	Manufacturing employment (in thousands of workers)									
	Metropolitan areas[a]						Non-metropolitan areas		State Total	
	Large[b]		Medium[c]		Total					
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
United States										
1947	8,698	61	1,933	13	10,632	74	3,671	26	14,303	100
1954	9,372	60	2,215	14	11,587	74	4,096	26	15,683	100
Distribution of change 1947-54	674	49	282	20	955	69	425	31	1,380	100
Southeast (11 states)[d]										
1947	214	11	563	29	776	40	1,173	60	1,949	100
1954	262	12	633	28	895	40	1,358	60	2,253	100
Distribution of change 1947-54	48	15	71	23	119	39	185	61	304	100
East North Central (5 states)[e]										
1947	2,839	66	491	11	3,330	77	993	23	4,323	100
1954	2,899	65	496	11	3,396	76	1,075	24	4,472	100
Distribution of change 1947-54	60	40	6	4	66	44	83	56	148	100

*Source: 1954 Census of Manufactures, Series MC-S1 to S49 and MC-C-2.

[a]A standard metropolitan area is a county or a group of contiguous counties which contains at least one central city of 50,000 inhabitants or more. Contiguous counties are included in a standard metropolitan area if they are essentially metropolitan in character and are sufficiently integrated with the central city.

[b]Metropolitan areas with over 40,000 industrial employees. These include metropolitan areas roughly equivalent to Peoria, Illinois, Columbus, Ohio, and Flint, Michigan, and larger.

[c]Metropolitan areas with less than 40,000 industrial employees.

[d]Includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia.

[e]Includes Ohio, Indiana, Michigan, Illinois, and Wisconsin.

In addition to the policy implications, two lines of research are strongly suggested:

1. Regional economics — including: (a) identification of geographic sub-regions which represent meaningful units for the purpose of local economic development; and (b) careful assessment of the specific locational advantages and disadvantages[18] possessed by each sub-region. (Let me emphasize that these are research problems and not problems which can be settled by appointing a committee of senior staff people who "know the area.")

2. Factor mobility — especially labor mobility. During the last two decades we have learned a good deal about population and labor mobility patterns. We still do not know enough about the selectivity of migration, either among areas or among individuals, to formulate meaningful generalizations. And we are apparently not yet ready to design programs which can transfer population and workers from the areas of greatest underemployment to the areas where employment is expanding most rapidly without encountering excessively high social costs.

Neither of these research areas can be studied independently of other research currently being conducted. They are both complementary to strong research programs in farm management, production economics, and marketing.

[18]The importance of identifying the locational disadvantages correctly is as important as identifying the advantages. Location errors which are later corrected by plant closings may leave an area in worse condition than failure to attract new industry in the first place. See, for example, Kolker, B. L., and Levin, M. R., "Facts and illusions in resource development," Iowa Business Digest, July, 1956, pp. 1-7.

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*Discussion**

RUTTAN'S paper submits good evidence that:

1. Urban-industrial developments are associated with some increase in the incomes of farm families and that this increase flows primarily through the labor market.

2. There is grave doubt that urban-industrial developments will solve the low-income problem in the major areas of low farm income because: (a) the natural population increase is building up the farm labor force faster than movement into nonfarm employment is reducing it, and (b) many of these areas of low farm incomes have relatively little to offer to new industries in terms of advantageous location. Ruttan limits the projection of implications to the next 20 years.

The practical alternative, as he points out, is increased "geographic labor mobility."

Within the framework of hypotheses, supporting evidence, and general conclusions drawn, Ruttan is to be commended for his excellent analysis. Any addition to what he has said will be made appropriately by using his presentation as a springboard for developing further hypotheses and supporting evidence to chart the course for research and action in a complex situation.

Perhaps the first hypothesis, which actually needs little supporting evidence, is that we are dealing with a complex situation both geographically and culturally.

In terms of geography the 1955 report of the Secretary of Agriculture on "Development of Agriculture's Human Resources," identified nine "Generalized Problem Areas": (1) Appalachian Mountains, Valleys, and Plateaus; (2) Southern Piedmont and Coastal Plains; (3) Southeastern Hilly Area; (4) Mississippi Delta; (5) Southwestern Sandy Coastal Plain; (6) Ozark-Quanchita Mountains and Border; (7) Northern Lake States; (8) Northwestern New Mexico; and (9) Cascade and Northern Rocky Mountains. The majority of these areas are in the Southern and Southeastern part of the United States. While these geographic areas

*Much of the material and ideas for this discussion have been developed from research carried on by Professor H. R. Moore and Dr. William A. Wayt in Ohio.

indicate concentrations of low farm income, it should be added that all agricultural areas contain some low income farm families.

Low income is the one common denominator with which we are dealing. This problem might be regarded as the result of unsatisfactory balance between people and the use of resources by which they make their living.

It is a reasonable hypothesis that each of the nine generalized problem areas has characteristics which make it different from the others: (1) Location with respect to metropolitan areas and to the larger urban regions into which metropolitan areas are merging in the more industrialized sections of the United States; (2) soil resources upon which to build a satisfactory agriculture; (3) mineral resources available for future exploitation; (4) resources of climate, scenery, etc. which lend themselves to the development of a recreational area for our vast urban population; (5) resources of water, location, and raw materials coming into future demand (for instance, renewable forest resources are gaining new importance in a broad band from Texas to the Carolinas); (6) human resources — the qualifications of the people either to join the industrial labor force or to find their place in their home communities or elsewhere.

The above six possible (and probable) differences among areas should be taken into account when studying the problem of low income and the place of various remedial measures in its solution.

As an illustration of how some low-income areas may change considerably for the better in the next few years, I wish to cite some developments in Ohio which are being duplicated in other states at least to some extent.

The growth of part-time farming is relieving the low-income situation in some areas. This improvement is possible because of automobiles, good roads, and growing industrial opportunities. Agriculturally, we still have the same low-income farms but not necessarily low-income families.

The Secretary's report delineating problem areas, referred to above, included four economic areas of Southern Ohio. Two areas were in the "moderate" and two in the "substantial" problem categories. Regional industrial development now taking place in the Ohio River Valley should considerably relieve the population pressure on the agricultural resources of this area.

Recent research in Ohio indicated that the growth of part-time farming was more closely identified with availability of nonfarm employment opportunities than with the quality of the agricultural resources. (The pull toward employment seems to be more effective than the push of poor resources).

Ohio research indicates that part-time farmers are willing to drive 25 to 30 miles, and that some are actually driving as much as 75 miles one way to work. With such a broad radius we need to take another look at the geographical limits of our so-called expanding metropolitan areas and their zone of influence on the occupational pattern of the people.

Circles with a 40-mile radius around new industrial developments in the Southern Ohio area place most of this area in commuting distance to industrial plants. Research is now being undertaken to discover what changes in farm organization and land use take place when full-time farmers take a nonfarm job and become part-time farmers.

The critical resources in the selection of these new Ohio industrial sites were apparently power, water, and raw materials. Chemical brine, one of the raw materials, is a resource that has become increasingly important in recent years. As little as 25 years ago this would probably not have been an important item in an inventory of the resources of that area.

Water, both for transportation and direct uses, seems destined to become a critical resource and more important in determining location of industry. Changes in the supply, cost, and use of water could foster a movement to locate new industry away from metropolitan areas.

Before people can take advantage of industrial opportunity at home or by outmigration they must want the employment and must be qualified for the work. An approach to this problem is underway in some eastern Ohio counties faced with new industrial developments. An inventory of human resources is being taken to determine how many people are available and want work, their educational training, their age, skills and aptitudes, their attitude toward remaining where they are or moving close to the job if and when such is available.

Another hypothesis is that low farm income is only one manifestation of a basic cultural problem. As mentioned previously, a rapid outmigration from some areas is not relieving the pressure on the land because of the rapid rate of natural population increase. Also, at the other end of the line are manifestations that the migrants have taken some problems with them.

A current issue of Time magazine comments on the social problems arising from the influx into Chicago (at the rate of more than 1,000 a week) of people from the submarginal farming areas — problems arising from the poor preparation of these people to fit well into an urban community. Here is a problem of education, of cultural development, of health, of orientation which is needed by people, migrants or not, before they can comfortably fit into the pattern of living and working in the modern urban-industrial community.

This leads us to ask the questions: (1) is our prime motive or policy to relieve the low-income farm problem, or (2) is the motive and policy to help people to become the best possible citizens wherever they may be?

Ruttan's paper points to the all-important fact that industrialization is a link in the chain of events which removes the pressure of population on our agricultural land. It also supports the view that industrialization is not a universal panacea for the ills of the low-income farmer.

On the other hand, the changing pattern of industry — decentralization, plants built to utilize automation and often requiring much ground floor space, new products using new sources of materials — is of sufficient importance that any area and community may have an unrealized potential. This points to the need for forward planning for all communities. The economic geography of industrial developments centers in several urban regions composed of widely merging metropolitan areas. But this does not rule out the possibility or the probability that some new industries will continue to find it advantageous to locate beyond the urban periphery.

PART V

Public Programs

Chapter 13

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Technological Research in Relation to Adjustments

MY task is to discuss the problem of reallocating resources for technological research in agriculture. The assignment further divides this general problem into two subproblems: (1) On what basis is technological research in agriculture justified, and (2) in which agricultural innovations should society invest? Implicit in this statement of the problem are the assumptions that: (1) society should invest in some innovations, (2) technological research in agriculture is justified on some basis, and (3) we do not have an optimum allocation of resources for technological research in agriculture.

To begin a study of technological research in agriculture with these assumptions appears untenable, because these assumptions suggest that we already know the goals or ends of society, that we already know the consequences of technological research, and that these consequences are in some degree consistent with the attainment of these ends but could be made more consistent by a reallocation of resources. I am not convinced at the outset that we have all this knowledge. Unless the consequences of technological research can be predicted and unless the ends society upholds are clearly known, suggestions on how to allocate resources for this research in agriculture are less than satisfying as a basis for taking action.

Since goals and values related to agricultural adjustments are evaluated elsewhere in this conference, I shall address myself primarily to predicting the consequences of choices in resource allocation for technological research in agriculture. However, since my assignment calls for a discussion of the basis upon which technological research is justified, I shall deal briefly with this aspect first. To the extent that "bases" are synonomous with goals and values, a discussion of bases for technological research also relates concepts of what ought to be to technological research. Discussing bases for justifying technological research prior to predicting consequences of alternative resource allocations for such research separates normative preconceptions of what ought to be from propositions postulated for prediction. This separation reduces the risk of propositions postulated for prediction being rejected on the

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basis of normative preconceptions, even though these propositions yield predictions which experience later confirms. Thus, if certain propositions or models later postulated logically do predict particular techniques as having high output-increasing probabilities, the acceptance or rejection of these propositions should rest eventually on whether they indeed do predict as expected rather than on whether the consequence is considered desirable or undesirable.

POSSIBLE BASES FOR PUBLIC SUPPORT FOR TECHNOLOGICAL RESEARCH IN AGRICULTURE

State acts in Michigan (1857), Iowa (1858), and Minnesota (1859), and the Morrill Act of 1862 invited science to aid agriculture. Through succeeding acts, such as Hatch, Purnell, Research and Marketing, society has come to assume the major role for furthering technological research in agriculture and for extending the results. In 1951, federal and state expenditures for agricultural research alone totaled almost 109 million dollars.[1]

Early motives and needs for public support of technological research in agriculture might be discussed at this point. However, at this juncture tracing some of the major consequences of such research is more useful because, if for example, the consequences have failed to contribute to the attainment of society's goal, no rational basis exists on which to justify this research.

Economic progress can be defined as a change "which enables man to obtain a given quantity of ends with a smaller quantity of means or what is the same thing, to obtain a larger quantity of ends with a given quantity of means."[2] On the basis of this definition few would deny that technological research in agriculture has contributed in a major way to economic progress. Aggregate farm output in the 1952-56 period was 51 percent greater than in the 1925-29 period while population, the consumption base, was only 37 percent greater in 1952-56 than in 1925-29. This larger output was attained with only a slight increase in inputs. According to one source, in terms of 1946-48 input prices, only 14 percent more inputs were used in 1950 than in 1910, while output increased 75 percent during the same period.[3] Another source states that during the period from the close of World War I to 1948, total production inputs in agriculture, valued in constant dollars, increased about 15 percent, while volume of farm output increased by 50 percent.[4]

Technological change in agriculture has thus enabled us to attain a considerably larger quantity of ends with only a slight increase in means.

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[1]Central Project Office, Agricultural Research Administration, U. S. Department of Agriculture.

[2]Boulding, K., Economic Analysis, 1948, p. 647.

[3]Schultz, T. W., The Economic Organization of Agriculture, 1953, pp. 108-9.

[4]Barton, G. T., "Effects of technological changes on cost reduction in agriculture: recent and prospective changes," Jour. Farm Econ., Vol. 21, Proceedings Issue, p. 442.

This statement takes on significance when we point out that between 1910 and 1955 total farm employment decreased from 13.6 million to 8.2 million and that the persons supported per farm worker increased from 4.5 in 1860 to 20 in 1956. Moreover, these persons were supported at levels far above subsistence. Technological change in agriculture has permitted a large diversion of manpower into secondary and tertiary industries and in consequence our welfare potential has increased greatly. As food production has required relatively fewer and fewer of our total resources, more resources have become available for the production of nonsubsistence or luxury goods and services. Hence, as consumers, our opportunities for exploiting the utility from these nonsubsistence goods and services have increased. Whether our total welfare has increased because of these opportunities must be decided in the fields of philosophy, ethics, or religion.

Boulding has pointed out, "The goal must be the right ends" to which he adds "plus the power to achieve them."[5] Certainly the consequences of technological research in agriculture have increased our power to attain ends, i.e., they have increased our welfare potential.[6] If to increase our welfare potential is one of society's goals, then the power to attain greater quantities of nonsubsistence goods and services as a result of technological change in agriculture becomes an important basis for public support of technological research in agriculture. Moreover, this power to attain can be extended beyond greater quantities of nonsubsistence goods and services for ourselves. A consequence of technological research in agriculture is the ability to produce food and fiber over and above our own needs. This surplus can be used to alleviate hunger abroad and thereby contribute to peace and individual freedom in the world community. If peace and freedom are among our goals, these then furnish another basis for public support of technological research in agriculture.

Some might say that this power to attain greater quantities of nonsubsistence goods and services for ourselves might be achieved by ways other than through technological research in agriculture, e.g., by territorial acquisition. However, if peace and freedom for peoples are among our goals, we cannot use this means and at the same time be consistent with our ends.

Others might say that public support of technological research in agriculture has indeed increased our welfare potential through larger quantities of nonsubsistence goods and services and through greater opportunities to advance world peace and freedom, but that these consequences serve only as bases for technological research in agriculture and not as bases for <u>public support</u> of such research. We can only

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[5]The significance he attaches to "the power" is seen through this statement: "impotence may protect us from the worst results of wrong desires, but it can never yield us the satisfaction of right desires." See Boulding, K., Economic Analysis, 1948, p. 648.

[6]This statement might be questioned on the basis that as means increase relative to ends, more ends can be attained. Thus, means add to ends, which in turn stimulate the desire for more ends which require more means. Hence, a mad race develops between means and ends.

speculate on the technological changes that might have been wrought from the hands of entrepreneurs of agricultural firms had we relied solely on them. At this date, however, we can observe that the agricultural firm has remained small scale. Consequently, individual farmers do not possess the funds necessary for undertaking research on a scope to insure a high probability of invention or discovery.

PREDICTING THE CONSEQUENCES OF RESOURCES ALLOCATED TO TECHNOLOGICAL RESEARCH IN VARIOUS ALTERNATIVES IN AGRICULTURE

Economic theory contributes little to our understanding of the economic effects of technological change. The reason is that in traditional theory the state of the arts is given. Yet, technology is one of the most dynamic forces in our economy. An understanding of the process of technological change in order to predict its consequences is among the most challenging tasks facing the social sciences. Such knowledge would be particularly useful to administrators of resources for technological research in agriculture as a guide for efficient allocation of such resources.[7] The task here then is a consideration of models for predicting the consequences of resources allocated to technological research in agriculture, particularly those models which are structured to include the accumulative effects through time. One possible model is to predict outcomes for the agricultural industry on the basis of past consequences of resources allocated for technological research.

Model Based on Past Consequences of Resources Allocated for Technological Research

In constructing such a model we might wish to determine the relationship between technological change on the one hand and output, costs, and revenue for the industry on the other. One way of approaching this relationship is to relate changes in output over time to changes in revenue and costs.[8] Changes in output over time of course reflect not only the effects of technological change but also the effects of weather, government programs, and management. Considering output at the industry level and recording it in the form of five-year moving averages is likely to remove most of the weather effects on output. The effect of government programs on the aggregative output may very well be negligible since resources have been mostly free to shift among products.[9]

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[7]Resource efficiency is defined to mean allocation of resources to attain the goals in question or to come as close as possible to attaining these goals.

[8]"Inferring this relationship" is perhaps more appropriate terminology than "approaching this relation" since change in technology for this model is known only by inference. The model includes no direct measure of technological change to which output, costs, and revenue can be related.

[9]Reference here is particularly to the acreage adjustment aspects of the program.

Moreover, output in the form of five-year moving averages gives these resources time to shift. Removal of the effects of management would be undesirable since management decides on adoption of innovations. Revenue and expenditures can be made to reflect changes in physical quantities by measuring them in constant dollars.

Changes in output, gross revenue, cash expenses, and net cash revenue for agriculture as a whole are outlined in Table 13.1. These data have been adjusted by the procedures just mentioned to reflect the output, revenue, and cost effects of technological change. During the first decade, technology appears to have been total output, total revenue, and total cost increasing. Net revenue also increased since total revenue increased by more than total costs. During the next decade, technology generally held total output and total revenue constant but decreased total cost. Hence it was net revenue increasing. During the 1932-36 period and since, technology has been total output, total revenue, and total cost increasing. On the whole, net revenue also increased as total revenue increased by more than total costs. During this latter period, particularly, increases in population and employment levels and upward shifts in consumer incomes have more than offset a price elasticity of demand of less than 1.0 for agricultural commodities, resulting in increasing total revenue for the period.[10] A price elasticity of less than unity operating without offsetting influences would cause a declining total revenue curve as an innovation increased output from one point in time to another (illustrated from Points A to B on Revenue Curve R_4 in Figure 13.1). However, when the demand schedule shifts upward and to the right, the total revenue curve shifts in a similar direction (R_1 to R_2, etc., in Figure 13.1). Such shifts can more than offset demand inelasticities to force increases in total revenue (Table 13.1 and Figure 13.1). Unit costs of production have decreased in the manner shown by Points S to V on TC_3 and TC_4 in Figure 13.1. Except for uncertainty considerations, innovations that fail to reduce unit costs would not be adopted, which explains the shift to the right of the total cost curves (TC_1, TC_2, etc., in Figure 13.1).

These data suggest that technological innovations in agriculture have for the most part been net revenue-increasing to the industry. Hence, if society's goal has been to increase total welfare potential and total income to agriculture, then past allocation of resources for technological research appears to have contributed to the attainment of this goal.

The efficiency of the above model for predicting the consequences of resources allocated for technological research in agriculture is likely to be low. It is a static type of model and likely to be more proficient in explaining ex post facto than in directing ex ante predictions.

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[10]Price supports and government payments have in effect increased the price elasticity of demand for agricultural commodities. However, since the proportion of total output moving into government hands in any one year is relatively small, an inelastic demand for agricultural commodities is considered to prevail.

Table 13.1. Total Marketings, Cash Receipts, Current Operating Expenses and Net Cash Receipts for U. S. Agriculture in Five-Year Moving Averages 1920-1955. (Total farm marketings are in terms of an index of output marketed with 1947-49 = 100, and receipts and expenditures are in terms of 1947-49 dollars.)

Period	Farm marketings (index)	Cash receipts-farm marketings and gov't. payments (millions)	Current farm operating expenses (millions)	Net cash receipts (millions)
20 - 24	62	$17,837	$ 7,583	$10,254
21 - 25	64	18,406	7,692	10,714
22 - 26	66	18,813	7,835	10,978
23 - 27	67	19,368	7,971	11,397
24 - 28	68	19,694	8,099	11,595
25 - 29	69	19,949	8,106	11,843
26 - 30	69	20,086	8,084	12,002
27 - 31	69	20,163	7,843	12,320
28 - 32	68	19,992	7,456	12,546
29 - 33	68	20,198	7,048	13,150
30 - 34	67	20,207	6,648	13,559
31 - 35	66	20,117	6,362	13,755
32 - 36	65	20,256	6,394	13,862
33 - 37	66	20,389	6,622	13,767
34 - 38	67	20,725	6,917	13,808
35 - 39	69	21,536	7,329	14,207
36 - 40	72	22,611	7,897	14,714
37 - 41	75	23,550	8,429	15,121
38 - 42	78	24,958	9,194	15,764
39 - 43	82	26,128	10,072	16,056
40 - 44	87	27,033	10,903	16,130
41 - 45	91	28,007	11,704	16,303
42 - 46	95	28,812	12,431	16,381
43 - 47	97	29,193	12,896	16,297
44 - 48	98	29,241	13,196	16,045
45 - 49	99	29,500	13,396	16,204
46 - 50	99	29,644	13,488	16,156
47 - 51	100	29,700	13,655	15,035
48 - 52	101	30,013	13,750	16,263
49 - 53	104	30,863	13,880	16,983
50 - 54	105	31,281	14,081	17,200
51 - 55	108	32,021	14,251	17,770

Source: FIS-159, U.S.D.A., July 17, 1956, and "Agricultural prices," Supplement No. 1, Crop Reporting Board, AMS, U.S.D.A., May, 1956.

We can predict successfully from it only if similar conditions prevail in the future as in the past and only if we have knowledge of these conditions — i.e., the major forces operating in the national economy, together with their effects, resource availabilities and allocations, people's expenditure patterns — and of the manner in which resources have been allocated for technological research and the extension of its results in agriculture. Lack of knowledge of these phenomena and of how they are related through time precludes action to cause their future recurrence for similar consequences. Moreover, since various types

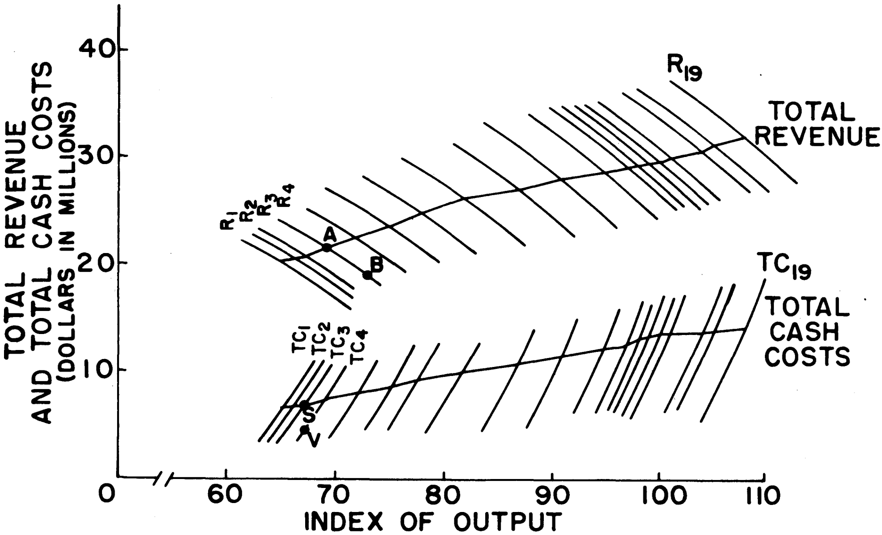

Fig. 13.1 - Output in relation to total revenue and total cash costs, U. S. agriculture, 1932-55 (source, Table 13.1).

of innovations may differ in their consequences, we may want a more specific type of prediction model.

Prediction Models for Various Types of Innovations Assuming Various Price Elasticities of Demand for Agricultural Commodities

Heady's models for predicting the consequences of different types of innovations are helpful in filling a void in economic theory.[11] Heady's models are geared to the industry level. The components of the models are a total revenue curve and two total cost schedules — one for the old technique and one for the new technique; these cost and revenue curves are then constructed with total output on the horizontal axis and dollars in revenue or costs on the vertical. The total revenue curve has an inclining portion to reflect revenue from the sale of commodities with price elasticities of demand greater than 1.0 and a declining portion to indicate revenue from sale of commodities with price elasticities of demand less than 1.0. Both cost schedules rise upward to the right, and the cost schedule for the new technique lies to the right of the schedule for the old, since with the exception of uncertainty consideration, all adopted innovations reduce unit costs. Heady classifies innovations in terms of their physical characteristics, their effects on output and on

[11]Reference here is to "Basic economic and welfare aspects of farm technological advance," Jour. Farm Econ., Vol. 31, May, 1949, and "Technological change and economic progress," Economics of Agricultural Production and Resource Use, Chap. 27.

costs. Thus, innovations are biological, mechanical, or biological-mechanical. They increase total output or hold total output constant. They are total cost-increasing or total cost-decreasing. Heady then sets up six situations which are constructed from varying demand conditions in combination with innovations which have different output and cost effects. From each of these situations, net revenue can then be predicted. Briefly the situations, the physical characteristics of the innovations, and the predicted effects on net revenues are as follows:

Situation	Physical characteristics	Predicted effect on net revenues
Demand elastic; total output and total cost-increasing innovation	Biological	Net revenue may or may not increase
Demand inelastic; total output and total cost-increasing innovation	Biological	Net revenue will decrease
Demand elastic; total output constant and total cost-decreasing innovation	Mechanical	Net revenue will increase
Demand inelastic; total output constant and total cost-decreasing innovation	Mechanical	Net revenue will increase
Demand elastic; total output-increasing and total cost-decreasing innovation	Biological-mechanical	Net revenue will increase
Demand inelastic; total output increasing and total cost-decreasing innovation	Biological-mechanical	Net revenue may or may not increase

Heady concludes that: (1) these various types of innovations have taken place side by side, but that available evidence indicates that aggregate farm technological advance has been of an output-increasing and likely of a total cost-increasing type; (2) this type of innovation, in combination with an aggregate elasticity of demand for farm products far less than 1.0, points to decreases in net revenue unless other forces increase demand and income; and (3) under any given demand situation, this type of innovation is likely to bring a lower net revenue than other types of innovations outlined.

Let us now examine these models to determine their efficiency in predicting the consequences of resources allocated to technological research among various alternatives in agriculture. If they are efficient, a research director should be able to say, for example, that if he allocates resources for research on biological innovations for commodities whose price elasticity of demand is less than 1.0, he can predict with considerable certainty that these innovations will be total output and total cost increasing but net revenue decreasing in the aggregate. We have already noted how forces such as increases in population and upward shifts in incomes can more than offset an inelastic demand and thereby reduce the likelihood of the prediction being correct — unless, of course, correct expectations were formulated about the ex ante effects of these forces. Moreover, these static models yield no information on when to expect changes in output, costs, and revenue. The rate of change in these variables is also vital in determining optimum resource allocation for technological research.

The success of our predicting the rate of change in these variables depends on knowledge of the whole technological process, i.e., knowledge of basic inquiry, invention, innovation, and imitation. Allocation of resources for research, say, in output-increasing techniques carries no assurance that output will increase in the aggregate. Perhaps knowledge in the basic sciences has not advanced sufficiently. Perhaps the inventor or applied scientist or experimentalist is out of touch with the concepts posited in the basic sciences. On the other hand, even if invention or discovery does take place, maybe innovation fails to materialize, or if innovation does take place, perhaps imitation does not. To predict the consequences of resources allocated over time for technological research requires knowledge of the whole technological process, of the steps in the process, and of the rate of change in the variables comprising the process. Let us, therefore, identify some of the major variables in each step of the process and see how these variables can be fashioned into a model.

Model Based on the Whole Technological Process

The foundation of technological change is basic inquiry. Fundamentally, research is undertaken to increase our understanding of our environment — both physical and social. Thus, basic inquiry is exploration of old or new phenomena because they are incompletely understood. Consequently, basic inquiry is theoretical and seeks knowledge for its own sake. The major variables contributing to the output (including its rate of accumulation) from basic inquiry are:

1. The amount of accumulated knowledge about fundamental relationships or processes among phenomena.
2. The number and quality of scientists who are positing basic concepts.[12] Imagination, together with intense devotion to their work, appear among the most important qualities.

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[12]Man is an important variable in this and the succeeding step in the technological process. Actually, one might entertain the position that research resources should be allocated to men rather than to projects. It has been pointed out that the tendency is to do exactly the reverse and that this procedure stems from a belief in centralized control and planning — that we must have a coordinated research plan and avoid duplication. Yet, duplication is exactly what needs to be emphasized because new ideas are likely to develop only as a number of people with different viewpoints, insights, and interests investigate the same area. On this basis, an administrator of resources for technological research would allocate resources to the men where he expects highest marginal productivity. (The point as developed here follows M. Friedman's in Amer. Econ. Rev., Vol. 43, May, 1953, p. 447).

3. The environment in which scientists work. Elements in this environment which contribute to the productivity of scientists are relief from routine tasks, sufficient funds, and a spirit of freedom which fosters basic inquiry.

Although research is undertaken primarily to increase our understanding or knowledge, we are likely to draw upon this knowledge in finding operative solutions to our problems. Thus, a second step in the technological process is characterized by the experimentalist, the inventor or discoverer, the engineer, the applied scientist. The men working in this area translate the theory from basic inquiry into invention or discovery for practical use.

The major variables contributing to output in the form of invention or discovery are:

1. The extent of communication with the men and the work in basic inquiry, e.g., the extent of communication between the researcher in animal nutrition and the chemist or between the researcher in plant or animal breeding and the geneticist.

2. The amount of funds.

3. The number and quality of applied scientists. Qualities essential to high productivity are inventiveness, an appreciation of basic inquiry, a desire to make knowledge operative in solution of problems, and a knowledge of practical problems.

4. The stock of accumulated knowledge in basic inquiry.

Innovation is the stage in the technological process wherein the changes in technological possibilities, which have been fashioned by the inventors or discovers, are put into use or adopted by one or more entrepreneurs.[13] These entrepreneurs are thus technological leaders.

Variables which determine innovation are:

1. The stock of inventions or discoveries from which to draw.

2. The level of technological leadership. A high level of technological leadership may be characterized by those entrepreneurs who: (a) have a strong desire for improvements in production and therefore exert special effort to learn about new inventions and discoveries, (b) attain greater utility from possible gains as a result of being first in adopting new technology than disutility of possible losses from adoption, (c) are young to middle-aged, and (d) have aggressiveness and/or ability to formulate expectations in line with realizations.

3. The degree of risk or uncertainty in committing capital to specialized forms.

4. The resource requirements of the innovation. Some innovations can be adopted with small increases in current operating expenses, while others require sizable capital outlays. Moreover, some innovations require not only the initial capital outlay but lead to other capital expenditures, i.e., to major modifications in the plant; illustrations are

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[13] Available data point to a sizable group of innovators in the farm population. According to the Interstate Managerial Study, 36 percent of the farm operators questioned were willing to be first in trying out an innovation.

substitution of mechanical for horsepower or adoption of soil conserving practices.

5. The expected flow of returns from the innovation, i.e., how profitable it is expected to be and the time flow of these returns. Some innovations may return the investment and more within the year, while others return the investment only over a period of years, and the present value of future returns becomes important in measuring profitability.

6. The existing resource patterns and resource availabilities. The amount of capital sunk in old techniques may deter innovation. On the other hand, a growing supply of capital is likely to encourage innovation.

7. The nature of the industry. In a declining industry, a new technique is likely to be adopted only if the average total cost of it is less than the average variable cost of operating with present techniques. On the other hand, in a growing industry, a new technique is likely to be adopted whenever the average total cost of it is less than the average total cost of operating with new equipment of the old type.[14] The degree of competition in the industry can also encourage or deter innovation. Some argue that the competitive structure of agriculture encourages innovation. The argument is that competition forces farmers to adopt new techniques since failure to adopt places them at a disadvantage relative to other farmers. Imperfectly competitive industry, on the other hand, may postpone innovation in order to maintain the capital value of an obsolete investment.[15] This argument may be more applicable to imitation than innovation. Competition may foster or encourage rather than force innovation. In industries with price elasticity of demand of less than unity, innovators may be aware of the likelihood of abnormal profits from new techniques until imitation proceeds to the point where increased output returns less revenue.

8. The level of economic activity and population status. A growing population along with an increasing level of national income and employment is likely to be more conducive to innovation than a constant or declining population coupled with deflationary pressures which make holding money more attractive than investing in capital.

9. The tax system. Taxes may deter or encourage innovation depending on whether capital write-offs are in line with obsolescence.

10. The extent and intensity of organized effort expended in bringing information about inventions and discoveries to innovating entrepreneurs. In agriculture, for example, the Extension Service is an organization which can perform this function.

Imitation in the technological process is the step when others follow the innovators. Imitation is diffusion in the application of new technology by entrepreneurs.[16] The extent of imitation determines whether there will be any substantial effects through time from resources allocated to basic inquiry, invention, and innovation.

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[14]See Brozen, V., "Invention, innovation and imitation," Amer. Econ. Rev., Vol. 41, May, 1951, p. 246.

[15]See Schultz, T. W., The Economic Organization of Agriculture, Ch. 7, p. 112.

[16]According to data from the Interstate Managerial Study, 50 percent of the farmers questioned are in the category of imitators.

The major variables determining innovation appear equally relevant as determinants of imitation. However, we might expand upon the discussion of some of these variables and add a few more. Resource availabilities and resource requirements of new technology are of particular importance to imitation because of the wide variation in resource availability among agricultural entrepreneurs. This wide variation in resource availability can force entrepreneurs to operate on different iso-product contours. For instance, in Figure 13.2, some managers, because of resource availability, Oa of labor and Or of capital, may be forced to operate on iso-product contour I_1 at the point where it is intersected by Ray 1 (R_1). These entrepreneurs may be forced to operate at this point even though factor price ratios indicate greater profits by operating where R_2 intersects I, or where R_3 intersects I_2. Other managers may find operating where R_2 or R_3 intersect I_2 as most economical because of more ample resource supplies. Innovations giving rise to rays between R_2 and R_3, will not be imitated by capital-short managers. However, innovations giving rise to rays lying between R_1 and R_2 (R_4 for example) can have strong likelihood of being imitated since a small increase in capital availability (rv) makes

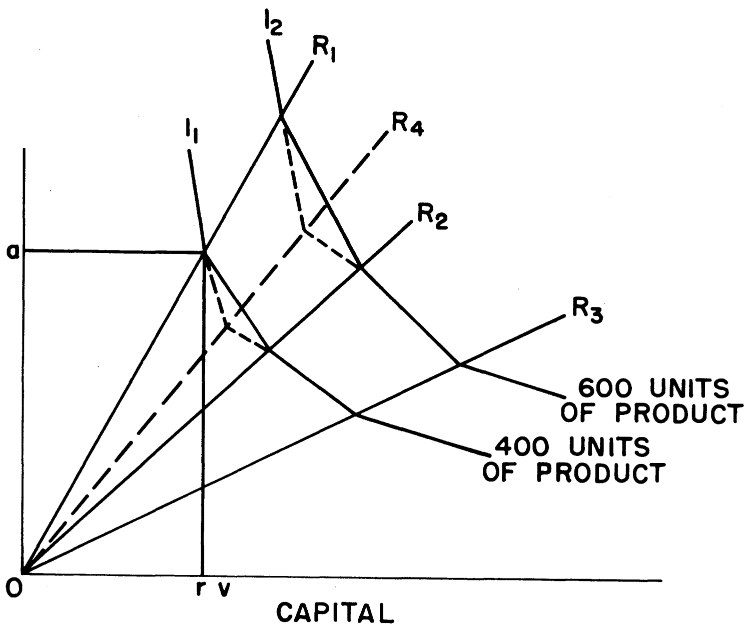

Fig. 13.2 - A graphic illustration of how differences in resource availabilities may influence choice of production techniques and amount produced. (R_1, R_2, and R_4 are rays representing different production techniques available at a given point in time. I_1 and I_2 are iso-product contours. R_4 represents a new production technique, which shifts the old iso-product contours to the new positions shown.)

imitation possible. The large increase in mechanization in the Southeast after World War II illustrates how an innovation failed to be imitated in a large segment of the country until capital supplies increased.

Other variables, aside from those already mentioned, which are determinants of imitation are:

1. Knowledge of credit capital sources. Lack of such knowledge may deter imitation.

2. Levels of managerial training or ability. High management levels are expected to encourage imitation.

3. Marginal utility for gains or marginal disutility for losses. Imitators are expected to have a lower marginal utility for gains or a higher marginal disutility for losses than innovators.

4. Communication. Factors, such as social and economic class divisions or low educational levels, act as barriers in communication.

5. Differences in goals or ends. Amish settlements, for instance, have resisted imitation in technology for a considerable span of years.

We have outlined a number of variables as major determinants of the whole technological process. The answer to the question of whether they are indeed the major determinants awaits fuller knowledge than we now possess. The same can be said for the manner in which the variables are related through time in the whole technological process. But until we do have fuller knowledge of the whole process, we are hardly in a position to predict accurately the consequences of allocating resources to technological research and to the extension of research output. We can only speculate and say that perhaps more funds should be allocated to basic inquiry and less to invention or discovery; or perhaps less should be spent on imitation and more on innovation. Perhaps a lag in imitation is necessary so innovators can realize abnormal profits as a return for taking innovating risks; or perhaps society should assume these risks and innovators would then receive the abnormal profits without risk costs; society could then redistribute these gains through the tax system. Again, perhaps, capital accumulation by entrepreneurs is more important in the technological process than any organized effort to inform entrepreneurs of new inventions or discoveries.

We should prefer more than conjecture in these matters. We should like to be able to predict, with some assurance of being correct, the consequences of allocating resources to technological research. A prediction model, which includes all the steps in the technological process, might be formulated somewhat as follows:

$$Y = f(X_1, X_2, X_3, X_4) \text{ where}$$
$$Y = \text{the technological outcome}$$
$$X_1 = \text{basic inquiry}$$
$$X_2 = \text{invention}$$
$$X_3 = \text{innovation}$$
$$X_4 = \text{imitation}$$

Each of the independent variables would contribute in varying amounts to the accumulated outcome in Y and these amounts can be designated by constants, a, b, c, and d for X_1, X_2, X_3, and X_4, respectively. Since technological change in one time period is influenced by changes in the independent variables in the preceding time period, time can be introduced by considering a differential equation. Thus, change in Y in time period, t_1, can be expressed as follows:

$$\frac{dY}{dt_1} = a' \frac{dX_1}{dt_0} + b' \frac{dX_2}{dt_0} + c' \frac{dX_3}{dt_0} + d' \frac{dX_4}{dt_0}$$

The change in each independent variable in t_0 is a function of the parameters previously outlined along with changes in the preceding step in the technological process. Thus, the change in X_4 (imitation) in t_0 can be written as a function of the following parameters:

$\frac{dX_4}{dt_0} =$ f(stock of inventions, level of technological leadership, degree of risk or uncertainty in innovating, - - - - - - - - - $\frac{dX_3}{dt_0}$)

Similarly, the changes in the other independent variables in t_0 can be expressed as functions:

$\frac{dX_3}{dt_0} =$ f(expected level of economic activity, expected population status, expected flow of returns from the innovation, - - $\frac{dX_2}{dt_0}$)

$\frac{dX_2}{dt_0} =$ f(extent of communication with work in basic inquiry, amount of funds, - - - - - - - $\frac{dX_1}{dt_0}$)

$\frac{dX_1}{dt_0} =$ f(amount of accumulated knowledge, number and quality of scientists, - - - - -)

Change in Y in time period, t_2, can then be expressed as follows:

$$\frac{dY}{dt_2} = a'' \frac{dX_1}{dt_1} + b'' \frac{dX_2}{dt_1} + c'' \frac{dX_3}{dt_1} + d'' \frac{dX_4}{dt_1}$$

The change in each independent variable in t_1 is then determined in the following manner:

$\frac{dX_1}{dt_1} =$ f(amount of accumulated knowledge in t_1, number and quality of scientists in t_1, - - - - - - - - -, $\frac{dX_1}{dt_0}$)

$\frac{dX_2}{dt_1} =$ f(extent of communication with work in basic inquiry in t_1, amount of funds in t_1, - - - - - - -, $\frac{dX_1}{dt_0}$, $\frac{dX_1}{dt_1}$, $\frac{dX_2}{dt_0}$)

$\frac{dX_3}{dt_1} =$ f(expected level of economic activity, expected population status, expected flow of returns from the innovation, - - - -, $\frac{dX_2}{dt_0}$, $\frac{dX_2}{dt_1}$, $\frac{dX_3}{dt_0}$)

$\frac{dX_4}{dt_1} =$ f(stock of inventions in t_1, level of technological leadership in t_1, degree of risk in imitating, - - - - -, $\frac{dX_3}{dt_0}$, $\frac{dX_3}{dt_1}$, $\frac{dX_4}{dt_0}$)

In order to predict the consequences of allocating resources to technological research, an understanding of the manner in which the model relates the variables through time is essential.

The above model recognizes that all new technology is not only dependent upon old technologies, but also that there may be a logical development pattern for technological change. The model with empirical parameters seeks to predict the accumulated effects of technological change from knowledge of this pattern.

Because of the difficulties involved in establishing the necessary parameters, the prediction model just outlined may be of considerable concern to the applied scientist. But I am quite sure also that we will all admit that technological change is a complex process and that, therefore, constructing a model to predict this change with an acceptable degree of accuracy is far from simple. Since considerable time would be required to test such a model, we might turn to another model which may give us some current insights on how to allocate resources for technological research.[17]

Model Based on No Further Technological Research

The assumptions or conditions underlying this model are:

1. Technology in agriculture is held constant, i.e., no new techniques are introduced, but choices remain among known techniques.
2. Continued increase in population.
3. Present trade restrictions.

With these assumptions we might then postulate the immediate and long-run effects. In the immediate future, output in agriculture will continue to increase. This increase stems from further diffusion of knowledge about techniques currently known to researchers and/or innovators. The proportional increases in agricultural output will depend in part on the relative stocks of inventions and discoveries which now exist for different products.

In the long run, the following conditions can be expected to materialize:

1. Population begins to press against the food supply as population increases with a diminishing food supply.
2. Food prices will increase.[18]
3. Labor resources will move into agriculture along with capital for the purchase of land and other resources.
4. Production functions in agriculture will drop to lower levels as

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[17]This proposal is made not with the idea of abandoning the model based on the whole technological process. The suggestion is made only for the purpose of considering another model which may offer some guidance in the short run. In spite of the complexity of the technological process model, certainly some resources "should" be allocated now to a study of the process itself. To date, sociologists have taken the leading role in studying the process.

[18]If consumer incomes are changing, both price and income elasticities of demand will need to be considered in determining the relative price changes for different foods.

ravages from insect pests and diseases increase. Cost per unit of output in agriculture will increase, but the increased value productivity of resources will probably more than offset this increase in costs.

5. The marginal physical productivity of resources in industry will increase but the marginal value productivity will decrease.

6. Farms will become smaller and more capital and labor will be needed to produce a smaller, or the same, output as before.

7. Less resources will be available for secondary and tertiary production. Hence, living levels will decline. Diets will gradually deteriorate as population exerts greater and greater pressure on food. As more and more people fail to satisfy their food needs through meats, fruits, and vegetables, demand will shift in the direction of food grains, potatoes, and lentils.[19] If, at this point, funds were again allocated to technological research, the emphasis in this research would be on output-increasing techniques for these products.

These conditions may suggest in a general way how resources for technological research need to be reallocated. Certainly we are far from the point where additional resources for technological research are needed for output-increasing techniques for food grains, potatoes, and dry lentils. On the contrary, consumer demand and surpluses suggest fewer resources for technological research in production of food grains, dry lentils, and potatoes, together with sugar and cotton. Since, under our assumed conditions, the pinch would come first for fruits, vegetables, and livestock products, and since consumers, through the market, indicate a relatively high order of preference for these products, additional resources for technological research are suggested for these and complementary primary products, such as feed grains and forages. Output-increasing techniques should be emphasized for these products — for livestock not in the sense of increasing output per unit of time but per unit of feed.

CONCLUSIONS

The economics of technological change remains as one of the least developed areas in economics — both in theory and application. Yet, because technological change is one of the most dynamic forces in our economy, its impact on socio-economic processes is tremendous. Hence, lack of knowledge of the technological process and its consequences is one of the most significant problems in economics, particularly, and in social science, generally. For this reason, the temptation is great for us to work on a problem of this magnitude and complexity. Perhaps, we should seriously consider resisting this temptation because as Friedman has pointed out: "Economics can be and remain a cumulative science only if little bits and pieces can be done right so

[19]Diets including meats, fruits, and vegetables are generally regarded as superior in quality although less efficient in use of resources for producing calories.

that these can serve as firm bricks on which to rest the structure."[20] In a study of the economics of technological change there appears to be a need to shape numerous little bits and pieces into firm bricks before we can build a structure which can give us the power to predict the consequences of allocating resources to technological research in agriculture.

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[20] Friedman, M., From a discussion paper in Amer. Econ. Rev., Vol. 43, May, 1953, p. 445. von Neumann and Morgenstern have advanced a similar idea by saying: "the great progress in every science came when, in the study of problems which were modest as compared with ultimate aims, methods were developed which could be extended further and further." (see Amer. Econ. Rev., Vol. 43, May, 1953, p. 428.

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Discussion

AS Harold Jensen effectively points out, we as researchers seek to discover and formulate basic relationships in order that we may improve our capacity to project, predict. In this discussion we seek to determine the probable consequences of making or not making certain biological, mechanical, and related changes. As an essential part of our analysis, we need to predict probable rates of adoption of the technological innovations which we evaluate.

No single mechanical, biological, or other technological development can be analyzed as a separate entity. New technological developments tend to come to us in chunks — not in integrated production, processing, or distribution systems. A part of the genius of successful management is the assimilation, integration, and synthesis of separate building blocks into processes not previously in existence.

One of the objectives of this conference is to produce some fairly specific research proposals. To this end the following are suggested.

To help us improve our predictive capacity, to provide greater opportunity for creative research in technological innovation, some of us feel that the farm counterpart of industry's pilot plant is needed in agriculture. This pilot plant probably should:

1. Become a laboratory for integration of modern technology into new systems of farm organization and operation — a vehicle for creating and testing whole new systems of production (and perhaps of marketing).
2. Be a research, not a demonstration unit.
3. Be under private, not public, ownership.
4. Be operated by superior, not average, management.
5. Be financed (perhaps by a foundation) with a guaranteed income to the private owner who would also share in the profits.[1]

Details remain to be worked out by thoughtful, creative minds. The potential could be substantial. If a research step of this size cannot be undertaken, maybe we should substitute careful case studies of individual innovators. Maybe we should do both. To the individual firm the capital requirements and learning costs of applying new technological developments are high. Perhaps the pilot plant idea can: (1) improve

[1]This admittedly creates an artificial situation whereby many risk and uncertainty considerations are removed.

the efficiency of the development and integration process and (b) give us coefficients for budgeting and programming in order that the research educator, innovator, and imitator can more accurately predict the consequences of alternative courses of action.

Now let us turn to a related research area.

Technological developments do not stop with production. In fact, we might reason thus:

1. Technological research tends to produce means whereby man gains greater control over environmental forces. Some of the non-price risks and uncertainties are removed. The physical product likely to result from following a given production process and practice can be predicted with greater certainty. Broiler production is cited as a case in point. Time, form, quality of output from given feed, labor, housing, management, and related inputs are accurately predictable.

2. When production of large quantities of highly standardized food products becomes economically possible, (either from individually small or large production firms) mass distribution agencies become interested.

3. If farm producers are unwilling to meet mass distribution requirements — time, form, place, quantity, quality, package — assembly or distribution agencies may stand ready to enter the production field. This may be direct (as with production of some fruits and vegetables for processing) or indirect (as in contractual arrangements). A key point of entry seems to be through provision of capital.

This brings us to the need for research in the financing of technological innovations in agriculture. What are the alternative methods for channeling needed capital into agricultural production? What are the probable consequences _if_ capital for innovation flows into farm production through:

1. Machinery dealers or manufacturers (leasing, not selling machines).

2. Public utilities, corporate or cooperative (providing producers with materials-handling equipment, appliances, along with the electrical energy).

3. Lending institutions (public or private) by assigning to real estate a _permanent_ debt load.

4. Service corporations or cooperatives which erect farm structures, construct irrigation installations and other improvements, and lease them to farmers.

5. Increased absentee ownership, resulting in tenant operation of a larger percentage of our farms.

6. Vertically integrated farm supply, food processing, or food distribution firms.

In the years ahead the route through which the capital flows into farm production may be:

1. A key to rate of adoption of technological developments, change, and resulting adjustments.

2. A determinant of the bargaining power of the farm producer in the market place.

3. An indicator of the nature of the future structure of the farm firm itself.

Yes, research in this broad area involves foresight. Historical analysis will not suffice. We may be forced to "make more of our own data" through pilot plant operation or sheer deduction. This, however, is legitimate, desirable activity for agricultural economists.

Chapter 14

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Extension Education for Guiding Adjustments

THE growing interest in economic growth as a subject of emphasis is quite encouraging. This conference should be a landmark in the progress toward a better understanding of how economic forces can be harnessed for more rapid economic growth. Perhaps now more emphasis will be placed on ideas and less on mechanics and the vernacular. Those of us charged with taking technical education to farm families deeply appreciate an effort to crystallize some guiding principles and suggest some hypotheses which may later be the essence of active educational programs.

The selection of this topic by the conference committee implies that extension education can materially affect the adjustment process. As the major education arm of the United States Department of Agriculture and as one education arm of the colleges of agriculture and experiment stations of the land-grant colleges and universities, it holds a unique position. It is supplied the discoveries of the laboratory, the test plot, and the researcher's analysis for interpretation to farm families. It is recognized as one of the most important forces for attaining orderly adjustments on farms. Through its leadership agricultural progress is guided by technical science. It also serves as a stabilizer by regulating the extent of adjustments.

I

The format for this conference indicates the problem for this paper: Given the assumption that, over the next several decades, economic growth as reflected by the gross national product will be unusually great, how can extension education most effectively help farm families adjust resource use so that agriculture is most advantageously geared to the prospective economic growth? The problem may be stated another way: If the gross national product increases over the next 20 years two to three hundred billion dollars, what kind of an educational program should be conducted by extension to help maximize the position and contribution of agriculture? This indeed is a question of tremendous magnitude and perhaps one of the most important problems facing agricultural educators today. To my knowledge no one has been bold enough to establish positive educational programs based on such a long-run projection.

From the agenda for this conference and the instructions to participants, three important assumptions are obvious:

1. That agriculture, at this particular time, is not attuned with the rest of the economy. I presume this will be explained by the other conference participants.

2. The adjustments that must be made by agriculture in the future are expected to be tremendous in scope. Such an assumption is clearly logical in view of the events that have occurred over the past several years and the anticipated events of the future.

3. Economic growth in agriculture will come from intensified efforts for a more efficient agriculture rather than from the usual concept of increasing the total capital investment. The emphasis of this conference on concentrating existing capital into fewer hands and transferring resources to other products and out of agriculture, is in sharp contrast with the approach that would attempt to attract more capital to agriculture. This implied assumption is of significant interest and is probably one of the most important of the conference.

All three assumptions are of significant importance to anyone concerned with agriculture.

II

A projection to 1975 by evaluating trends and setting up acceptable assumptions establishes the framework within which agriculture must operate. The most salient projections to 1975 include:

1. An increase in gross national product of 50 to 75 percent.
2. An increase in total population by approximately 25 percent.
3. A decrease in farm population, perhaps as much as 10 percent.
4. An increase in farm income resulting from a 25-30 percent increase in farm output.
5. An increase in production per farm worker because farm population is estimated to decline and the total population is estimated to increase. This may amount to as much as 40 percent increase per worker by 1975.

The needed adjustments in agriculture may be classified into three main categories:

1. Increased production per worker in agriculture. This can occur through: (a) increasing the span of control over resources, and (b) increasing the productivity per unit of production.

2. Shifts in agricultural resource use between agricultural products and between agricultural and nonagricultural uses. As demand changes and new production patterns emerge, these shifts will be necessary.

3. Cost-decreasing actions on the part of individual farmers. Cost reduction will continue to be important, in fact necessary, if efficiency of farming is to keep pace with other expected adjustments.

Extension, in fulfilling the role as the leader of thought among farmers, would have no particular problem in designing educational programs if those concerned with over-all future policy direction in agriculture could reach general agreement. Disagreement regarding the future direction, or unwillingness to estimate future probabilities, or lack of confidence in predicted future events, have been obstacles to the development of such educational programs.

Given a statement as presented by Rex F. Daly in Agricultural Economics Research in July, 1956, entitled "The Long Run Demand for Farm Products," extension has a concrete set of expectations for use as a guide in the design and execution of an educational program. I believe it would be a fair statement that even the most renowned agriculturists fear that the plateau of farm prices for the past several years may be only a repeat of the similar period from 1926 to 1929, and everyone knows what followed after that. With this fear, coupled with the knowledge of man's inability to include all of the forces in his predictions, very few experienced agricultural directors would lead their extension workers very far from a known base. They would prefer, and logically so, to follow a set of basic principles which will keep their programs essentially in the areas of current importance. Perhaps we have enough confidence in our expectations now to develop a more concrete educational program.

III

The consequences of some areas of circumstance, as well as accepted procedure or philosophies, need reviewing. Such a task is as much the responsibility of the researcher and the professor as it is that of extension. In fact, the best results will probably come from their joint efforts.

1. For the last four decades at least, except for the war years and a short period afterwards, agricultural processes have been restrained by the gloom of overproduction. The continual pressure to depress prices has forced extension to face its task from a defensive position. Only during the war years were farmers encouraged to release the check-rein on production and actually use the whip to increase production. During World War I and II the resulting response was phenomenal. Both periods of unrestrained production-increasing effort were of relatively short duration. We have no record to show what agriculture could produce if production needs were great enough over a long enough period to encourage a significant inflow of capital to the total agricultural plant. To emphasize the point, consider that the present emphasis is on reduction of cost without corresponding increase in output. Such an environment restrains the forces of production. While such efforts are beneficial for society, the educational process is more difficult. In spite of this situation the demand for extension services in most counties greatly exceeds the supply. Current agricultural programs aimed at conserving today's production potential for tomorrow suggests that this situation will continue for some time. This means extension education programs must be more finite and selective in the points of emphasis.

2. Planning is generally done on a short-run basis in the absence of expectations, projected far enough to be called long run. Also farmer interest is mostly in short-run considerations as reflected by attendance at meetings, participation in program activities, and discussions of issues. Under such conditions the exogenous factors of production receive very little attention in the formulation of economic guidelines. Held constant are such important factors as values, tastes, social, cultural, and political forces, as well as the interdependence between agriculture and industry. In addition to the exogenous group, the endogenous items classed as fixed costs are minimized. With our agricultural leadership willing to make and accept long-run projections, greater consideration can be given in education programs to long-time objectives. This is certainly a desirable objective. Under short-run considerations, it is difficult to convince producers that increasing output of those products with a price elasticity of less than 1.0 can decrease income.

A typical rural community, in which the problem is to maximize the individual farm family's satisfaction, is composed of the social institutions and the mores, all of which have an important influence on values held by the family. An economic study of communities would show a minimum number of families to justify different institutions such as churches, schools, stores, health services, and the like. In areas where the population greatly exceeds the resource potential, poor institutions and poor services persist; the answer in the long run is usually an inflow of capital to provide employment or an outflow of labor to other markets. On the other hand, large-scale units with few people present the problem of high costs per family for acceptable institutions. Such considerations as these are of importance when the economist considers resource use. Furthermore, the economist can utilize his economic tools to assist with some of the problems of this sort.

The idea of an educational program designed to include more endogenous long-run factors for agriculture and also the exogenous factors is an exciting one.

3. Economic analyses and theoretical constructions for the farmer begin with the assumption that the entrepreneur in the farm firm is guided by economic motives of production. Perhaps it has to be this way, but the fact remains that the home (consumption unit) is an integral part of the production-economic unit. The fact that the house, its surroundings, and other esthetic factors are capitalized in farm value indicates the "one-ness" of the unit. Coupled with the integrated capital unit is an interdependent decision-making unit in which the consumption unit considerations are interlaced in production unit decisions. In addition to the economic considerations of production and consumption, are social considerations. Therefore, a complete and unified extension program deals with both economic and social considerations. This is the way a farm family must face its problems. If decision-making, as viewed by extension, began with a balance sheet that recognized allocation of total income to the home as well as to the farm, our educational

program concerning adjustments would be more realistic. Farm and home development as devoted to particular families has brought this need clearly to the fore.

4. Traditionally, farm management researchers have viewed the agricultural problem as if they were standing in the farmer's shoes and looking out of his eyes. From an economic growth point of view, i.e., where the total economy is growing and developing, this means that they take the pieces and fit them together, cutting and fitting as they go, to get the total picture. I would like to propose as a thesis that there is equal, and perhaps in some instances, more merit to the method of first visualizing the total picture and then determining the adjustment process needed to obtain the pieces to make the total picture. This may be the best way to achieve major adjustments such as reclamation of land over a broad area, developing a valley plan, building up run-down areas, or settling the dust in Oklahoma.

IV

We are dealing with the problems of an extension education program that will facilitate adjustments in agriculture under conditions of rapid economic growth. Extension does not ask for assistance in method or approaches. However, it is in need of the subject matter ideas possessed by you. Not only is the subject matter needed but also an interpretation of its value in particular uses. The thought running through my mind is, "If we in extension could convince you that the extension program is in reality your program and through it your conclusions can be converted into accomplishment, perhaps you would join us in putting all this information into a workable program."

Up to this point I have tried to show the strong interrelationships between extension education programs and your concepts. If you agree, let us get to the business of developing education programs jointly.

Extension programs are not designed with the objective of forcing the inefficient out of farming in order to achieve scale economies. Extension is interested, however, in programs which will guide farm families to higher planes of living even if it means significant changes in who controls the resources.

At present, four major program activities of extension demonstrate its concerted effort to meet the problems of rural people in a rapidly changing world. One of these is Program Projection. This is a program development procedure whereby local committees under the leadership and guidance of specialists, county extension workers, and local leaders study the possibilities for agricultural development in their county within an assumed framework as set forth in Rex Daly's article. Such information is interpreted in the light of their own county situations, and the most important problems for the development of the county's resources are recognized and specific goals established. Out of this process develops a program of action conducted mostly by local people in fitting their county into a growing and changing society.

Another activity is Farm and Home Development, wherein the farm family inventories its total resources, ascertains the productivity of these resources, approximates the expected progress, and develops a plan of action. All of this is done under the guidance of trained personnel with facts provided by the researcher.

A third activity is the Rural Development Program. All of the agricultural agencies, in cooperation with other interested groups and organizations, are making an effort to persuade agriculture, industry, education, and the social community to join their resources and capabilities to make possible sufficient opportunity for a respectable per capita income either in or outside the community. The greatest need in the Rural Development Program is a set of principles pertaining to economic development. This conference can, and I hope will, provide significant assistance for this program.

The fourth of the activities is the policy education meetings held in cooperation with the general farm organizations to bring to farm people the very important realization that they are now a minority group and that their future depends on intelligent action, beginning with the idea that agriculture, as such, is an integral part of the total economy.

These four major activities (and there are many others) indicate that a respectable framework for extension education already exists. The problem confronting extension administration is to obtain the needed substance for successful action.

V

Agricultural economists can provide brilliant yeoman service to our rural friends. I am sure the Cooperative Extension Service stands ready to receive its assistance.

In pursuing the task of developing an extension education program, one of the greatest obstacles is the inability of colleagues, other professional workers, and local leaders to comprehend the basic relationships which undergird the whole area of economic use of resources.

The need is clear. Economists need somehow to provide agricultural workers and local leaders with an understanding of the basic ideas of economics. If this were established as an objective of this group, I know that success would come within a few years. We hurt "deep down" when we know of the valuable and basic information held by agricultural economists and yet see that it does not get into the operational framework of more minds. Perhaps excessive time is devoted to the mechanization of economic techniques and glamorization of selected principles.

As a proposal for your consideration, suppose emphasis were placed on explaining the basic ideas of resource use to a group of local leaders. High priority should be given to diminishing returns, evaluation of alternative choices, principles of substitution, elasticity, risk and uncertainty, and other concepts.

General farm organizations have expressed a sincere interest in leadership development. Consider the preparation of a basic economic education series that would assist local leaders and even 4-H youngsters, to speak intelligently for agriculture. Basic subjects might include: farm policy, foreign policy, rural-industrial relationships, community structure and its institutions, consumer influence, management principles, problem solving, and others. Getting such information to local leaders would be no problem, as the farm organization leaders would be quick to support it.

As a final suggestion for strengthening the extension educational program for teaching sound approaches in resource adjustment, I would like to urge more departments of agricultural economics to develop study programs that produce extension specialists.

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Discussion

DIRECTOR NESIUS' paper has stimulated us to think in terms of a 1975 model of the Agricultural Extension Service with particular reference to extension education in production and in agricultural economics.

Rather than consider individual points of emphasis and perhaps of differences, we have tried some elementary projection concerning the future role of extension education. These projections are obviously colored by and extended from the analysis made in the discussion of technological research (see discussion of Harald Jensen paper). The comments here are in a large measure a synthesis of the thoughts of Purdue colleagues and particular recognition is given to contributions of Professor J. C. Bottum, J. B. Kohlmeyer, N. S. Hadley, and J. E. Losey. The discussion, likewise, draws upon ideas concerning the diffusion process as analyzed by George M. Beal and Joe M. Bohlen, Iowa State College.[1]

These comments are presented more as hypotheses to stimulate discussion than as proven propositions.

First, considerable evidence seems to exist that the innovators or early adopters may be by-passing traditional extension educators for their information on technological research. Many of them apparently are going directly to the researchers themselves, to technical publications, and to the technical people employed by the firms that supply production factors. These innovators appear willing to incur considerable learning costs to obtain wanted information directly from the primary source.

Second, it may well be that the share of time which farm people devote to learning about production is declining relative to the costs they incur to obtain greater understanding of group, social, and institutional problems. Many avenues exist for learning about production techniques, innovations. In these farmers probably have considerable confidence. Reference is made to the suppliers of production factors ranging from the irrigation equipment engineer to the feed company's animal nutritionist. On the other hand, there may be relatively fewer sources in which the farmer has confidence for learning about group,

[1]North Central Regional Publication No. 1, "How farm people accept new ideas." Special Report No. 15, Iowa Agr. Ext. Serv., Nov. 1955.

social, and institutional problems. Therefore, our farm people may be turning increasingly to agricultural agencies and especially the land-grant college for assistance in understanding group, social, and institutional problems as contrasted with production problems.

Third, in the area of production, leading farmers seem to be placing their emphasis more on acquisition of managerial skills than on the acquisition of technical production skills. As we shift more and more functions from farm to city and factory, the successful farm producer becomes more of a manager and less of a production artisan or husbandryman. Once the use of many production skills becomes widespread producers do not have to be retaught each generation by professional educators. Dad may do the job.

We may further note that if substantial amounts of capital flow into farm production from nonfarm sources even through partial integration vertically, with this capital is likely to flow some of the production management.

If the above are at least in part true, what is the impact on extension education as we have known it?

If more of agriculture follows the pattern of fruit and vegetable production and the poultry enterprise and becomes in part vertically integrated, perhaps the integrating firms rather than the land-grant colleges will assume most of the responsibility for educating producers. Educators, fieldmen, and line or staff managers with the integrating firms are likely to go directly to the researchers for their technological information, thus by-passing the public extension worker in production. Or we may develop more joint extension-research specialists to service the managers employed by integrating firms.

If more capital is concentrated into each farm and if an increasing share of total agricultural production is in the hands of the innovators, these people, too, are likely to by-pass the traditional extension worker in their quest for production knowledge. Administratively and financially it seems improbable that we can train and make available in each county a farm and home development agent qualified to do a top job of management with our innovators.

Probably a substantial number of farm producers will remain in the lower end of the spectrum as late adopters. If we accept the Beal and Bohlen analysis, the diffusion process reaches these late adopters by way of their neighbors who are the innovators and community adoption leaders. Apparently these late adopters are not directly touched by the extension service as such, perhaps not even by the unit farm planning agents. (If the Beal and Bohlen analysis is correct, it is interesting to speculate on the long-run consequences of expanded farm and home development work. With whom are we really expecting the farm and home development agents to work — with the innovators, the late adopters, or with the group somewhere in between?)

Clearly we are likely to have developments in all the above directions. But these hypotheses might be advanced:

1. The need for extension specialists in production may decline.

Certainly, social values attached to the small farms plus service work to the "non-commercial" producers will keep extension active in this area for many years to come. Were probable accomplishment to be measured according to an efficiency yardstick, however, we would probably say, "Place your scarce research and education dollars on the technological researchers to whom the innovators come in their quest for knowledge." This gives major educational emphasis to serving the innovators and community adoption leaders. Here there may be relatively less room for the traditional extension person between the researcher and the farm or other producer. We may bring the innovators to special conferences at the university or district level, recognize them, and cater to them as a special group to lessen the work load of individual conferences.

2. The extension economist's role may become more nearly that of a broad social scientist working with the total problems of people. This suggests less emphasis on production skills. It increases the need for training people to integrate knowledge and improve understanding. Clearly, farmers' problems are greatly broadened in this generation. As Nesius has pointed out, farm people probably need to learn more about the social, production, and consumption adjustments which are taking place and are likely to take place in the future in the highly integrated economy in which we live.

3. To serve the needs of our real farm leaders, extension may offer advanced courses in economics, management, and social sciences. Instead of emphasizing technical education, we may shift to a broader educational base. Instead of offering a community one or two meetings a year in a particular area, we may well offer advanced courses in adult education on a weekly or more frequent basis. These courses may well be taught at a college or at a graduate credit level. And these rural leaders may well take these courses for college credit. Understanding of the inner workings of our dynamic economic system is not easily acquired in an occasional meeting. Orderly, consecutive, progressive adult education programs that build sequentially may well be in the picture. If so, this calls for a meeting of minds in educational institutions concerning the role of the Agricultural Extension Service and Adult or Continuing Education divisions. Certainly our extension specialists can well do much of the advanced educational work outlined here.

This analysis suggests that in extension education we have frequently attempted to serve the masses with a more or less standardized educational package. We have often presented the same freshman level work year after year. Since we have seldom built our offerings sequentially so that once the freshman work was mastered sophomore and junior level courses were offered, some farmers have gone directly to the research and to other information sources for the more advanced work. With improvement in transportation, communication, and farmer appreciation of his ability to use the telephone or seek out his own information from the source, the trend toward going to the source of the information probably will not be reversed.

On the other hand, most professions and socio-economic groups in this country appear to have an increasing awareness of, and interest in, adult education. The integration and synthesis of new and developing technology into new systems of production offers a challenging educational job to the production economist. Even here, however, this role may be more effectively accomplished if we give the manager of the farm unit more basic training in analytical processes so that he may determine for himself, in his situation, the consequences of alternative courses of action. This probably calls for junior, senior, and graduate school levels of instruction. And to this same group, the more advanced instruction in analysis of how our social and economic system works and how it changes has substantial appeal. This implies relative reduction of extension education resources in teaching production skills and facts, and suggests relative increase in advanced, broad-based extension educational work. As we think of what we are attempting to accomplish in such important activities as program projection, rural development, and agricultural policy, the contribution of broad-based education in the fundamentals of the economics and the social sciences could be of major proportions. Herein may lie extension's most powerful tool for guiding adjustment.

Chapter 15

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Current Programs in Relation to Needed Adjustments

"THE farm problem" has been impressed upon the consciousness of the American public for more than a generation. The farm problem of the early 1920's was due in part to the sharp postwar decline of the general price level when farm debts were high, and in part to the need for adjusting agriculture to changes in markets, particularly in postwar foreign markets. In the latter 1920's, cost-price relationships were less distorted than in the early 1920's, but power mechanization was increasing rapidly, and the farm income situation became more distinctly an adjustment problem.

The need for adjustments of various kinds continued to grow during the 1930's, but the overwhelming reason for the farm income problem of that decade was general economic depression. Even though the major pieces of farm legislation during the 1930's were called agricultural adjustment acts, the first need in this period was to increase the income of farmers and others in depressed sectors so that economic activity could be revived. The farm programs of that time were directed toward this end.

During World War II and for about two years thereafter, the farm problem ceased to haunt us. But it began to reappear in 1948 and 1949, and it has come strongly to the fore since the Korean inflation leveled off about five years ago. In its postwar form, the income problem of farmers is rooted almost entirely in the need for adjustment. Certainly, neither domestic nor export demand could be expected to be much better in a peacetime situation. Farm production has been too large in total and has not consisted of the right balance of individual commodities in recent years, and in the absence of government programs farm income would have been considerably lower than it was.

To many people, saying that the current farm income problem is essentially an adjustment problem somehow implies that the income consequences either are readily avoidable or cannot be very severe. But since the adjustments include a reduction in labor force, consolidation of uneconomic units, shifts to more extensive uses of land, and the like, they are in fact very difficult to achieve; and falling income

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hurts regardless of the reason for it. The main force behind the demand for farm programs in the past has been the desire to protect incomes, which is just as true today when the farm problem is almost entirely an adjustment phenomenon. The insistence on support is a reflection of the magnitude of the adjustments currently needed in farming. Moreover, inputs and market demands in agriculture are such that maintenance of perfect adjustment cannot reasonably be expected even under the best of circumstances. Certainly it would be unrealistic to assume that government programs can concentrate upon needed adjustments to the exclusion of income problems.

On the other hand, government programs must take needed adjustments into consideration even if the motivation for the programs is almost entirely income support. Economic forces in markets for farm products tend, in general, to force the methods and configuration of production and the pattern of consumption in the directions dictated by economic efficiency. The "invisible hand" of Adam Smith may be slow and clumsy, and it may have a paralyzed finger or two, but its sweep and power are nonetheless enormous. Economic forces in the market will work against farm programs that attempt to support income by insulating farmers from price stimuli. This does not mean that income support is an inferior objective, of course, but it does mean that successful administration of the programs may become very difficult. As evidence, we need only observe the enormous stocks that CCC controls, the necessity of absorbing large losses on agricultural exports, or the persistent tendency to use other inputs to offset the effects of reduced acreage on crop production.

EFFECTS OF RECENT PRICE SUPPORTS, ALLOTMENTS, AND QUOTAS

I shall approach the task of appraising the effects of current programs on agricultural adjustment by reviewing our experience, particularly during the past four years, with acreage controls and price supports. Conclusions as to what this experience seems to portend for agricultural adjustment will be summarized after a brief discussion of the Soil Bank program. Such comments as I have about credit, crop insurance, and other non-price programs will be included at the end of the chapter, where suggestions for promoting needed adjustments are made.

Location of Production

Acreage allotments and marketing quotas, computed on a historical basis, necessarily tend to freeze the interregional and interfarm pattern of production. Though provision may be made for past trends and new producers, such corrections are typically small, and allotments and quotas check trends that otherwise would develop. Cotton is an example of a commodity for which important shifts in the interregional pattern of production have been needed (in an efficiency sense) during the past 25 years of intermittent production controls. Acreage data show that allotments and quotas have maintained production in the Southeast at a higher level relative to the Delta and West than otherwise would have been the case. Tobacco production also has tended to be geographically immobilized by acreage controls, and shifts of types among areas have been restricted.[1] Similar, but usually less important, instances of this tendency can be noted among other basic commodities.

Allotments and quotas undoubtedly have prevented many shifts of production among farms that normally occur with the family cycle, change in ownership, variations in attractiveness of alternative enterprises, and the trend toward larger size of business. Also on occasion some farmers have obviously stepped up production of an uncontrolled crop in the expectation that quotas would soon be put into effect. If all the necessary data were available, they would perhaps show a significant loss of efficiency in production of cotton because of the freezing of the production pattern, but the loss for all of American agriculture probably would not be large. Acreage controls have been in effect for most basics for only a short time, after a long period of comparative freedom from them. Use of controls over an extended period would be another matter.

Inputs Used in Agriculture

Total inputs used in farm production in 1956 probably were a little larger than they would have been without government programs during the period 1953-56. Price supports created a stronger incentive to intensify production than otherwise would have existed, and the more favorable level of income enabled farmers to maintain a high level of investment.

Use of fertilizer and lime probably has been influenced by government programs. A strong price incentive for their use has existed, though not so strong as in the best postwar years. Support of prices has given farmers: (1) greater confidence that they would recover their investment in fertilizer and lime and (2) more money with which to make such investments. Equally important, perhaps, has been the effect of acreage restrictions independently of price relationships. Some farmers may have tried to maintain the same volume on less land, and others may have felt only challenged to undo the effects of acreage controls. ACP payments for lime and fertilizer have had yield-increasing effects despite the attempt to emphasize conservation rather than greater output. The USDA diverted-acres study showed

[1]Benedict, Murray R., and Stine, Oscar C., The Agricultural Commodity Programs, The Twentieth Century Fund, 1956, p. 85.

that in some instances increased use of fertilizer was attributable to acreage controls, while in other instances it was not. However, farmers almost certainly were influenced considerably by the level of prices. Hence, price supports plus acreage controls probably have contributed importantly to the heavy use of fertilizer and lime in recent years.

Farmers' investment in equipment and machinery probably was bolstered by price and income support during 1953-56. The Federal Reserve index of production of farm machinery reflects changes in gross farm income fairly accurately. This index has declined each year, with one exception, since 1951. In the absence of farm programs, both the price incentive and the means for buying machinery and equipment would have been lower than they were, and the index would have declined more than it did.

The effects of the programs on size of farm labor force are not clear. Conflicting assertions are made: that small tobacco and cotton allotments have kept men in full- or part-time farming who otherwise would have given it up; that the impossibility of enlarging a small allotment has caused some men to quit farming; or that price support programs have led some farmers to be overly optimistic and to postpone movement into industry. Each is undoubtedly true in individual cases, but the relative frequencies are not known. According to the recent USDA diverted-acres study, the reduction (attributed by farmers mainly to cotton allotments) in the number of cropper and share-tenant families on cotton farms in the Delta and Southeast between 1953 and 1955 ranged from 17 to 34 percent.[2] But probably all influences of the programs have been minor compared with the powerful pull on the farm labor force exerted by high employment at very attractive wages in industry. The net change in population from farm to nonfarm locations averaged 848,000 persons annually between 1950 and 1956,[3] and probably farm programs have had little influence on the movement.

Acreage controls have resulted in a little idle cropland, especially on Southeastern cotton farms and in a very small shift from crops to pasture. On the other hand, price supports may have tended to hold some land in crops that otherwise would have been idle or used for pasture. The total cropland used for crops in 1955 was practically identical with the 1945-49 and the 1952-53 averages, and the slight decrease in cropland harvested was attributable mostly to an increase in crop failure.[4] The Soil Bank reduced the acreage harvested in 1956 by a small amount, but mostly by removal of acreas on which production would have been low because of drought. In the short period during which acreage controls have been in use since the war, the effect

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[2] "Effects of acreage-allotment programs, 1954 and 1955: a summary report," Production Research Report No. 3, ARS, USDA, June, 1956, p. 13.

[3] "Farm population estimates for 1956," AMS-80, USDA, Aug., 1956, p. 5.

[4] "Major uses of land in the United States: summary for 1954," Agr. Inf. Bul. No. 168, ARS, USDA, Jan., 1957, pp. 11-12.

on total cropland, both absolutely and in comparison with what might have been the situation in their absence, has been negligible.

Size of Enterprise, Consolidation of Farms

Acreage controls adjust the size of enterprise downward, and unless substitute crops utilize equipment and labor already available on the farm, efficiency may be reduced significantly. If a little room is made for new producers and if minimum quotas are used, the effect is intensified. Census data for 1949 and 1954 reflect the reduction in size of enterprise. The increase in per-farm acreage of vegetables harvested for sale, a class of farm products not affected by allotments, was 25 percent; the increase in number of dairy cows per farm (1950-54), also unaffected by controls, was 18 percent; and the increase in per-farm acreage of corn, for which allotments in 1954 were not generally effective, was 12 percent. The figures indicate that a desirable adjustment was taking place in widely different kinds of farm production in the absence of controls. But for cotton and winter wheat, which were under quotas in 1950 and 1954, the acreage per farm decreased 9 and 19 percent respectively; and for tobacco, which was under quotas during the entire period, the per-farm allotment in 1954 was 4 percent less than in 1949.[5]

The effects of programs on farm consolidation and enlargement are as unclear as the effects on the size of the farm labor force, and the two are related. The increase in the number of tobacco allotments between 1949 and 1954, when Census data show a large decline in the number of small farms, may be a shred of evidence that allotments tend to retard farm consolidation. On the whole, however, the effects of the programs in this respect appear to have been small.

Kinds of Commodities Produced and Total Output

Both aggregate statistics for the United States and the USDA diverted-acres study show that land withdrawn from basic commodities under the production controls of 1954 and later years was almost all shifted to other crops, particularly to sorghum grains, barley, oats, and soybeans. A little of the diverted land was used for hay and practically none for pasture.

Table 15.1 summarizes changes in U. S. acreage, production, and yields per acre for the six basic commodities between 1953 and 1956.

The foregoing acreage and yield comparisons are somewhat influenced by weather and by use of the Soil Bank in 1956 as a form of crop insurance. Nevertheless, the tendency for higher yields per acre to offset reduced acreage is striking. Experience in the 1930's was

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[5] "Annual report of tobacco statistics," 1953 and 1955, USDA Stat. Bul. 138 and 169, p. 22.

Table 15.1. Changes in U. S. Acreage, Production, and Yields Per Acre for Six Basic Commodities Between 1953 and 1956

Crop	Percent change		
	Harvested acreage	Yield per harvested acre	Production
Cotton[a]	-36	+26	-19
Wheat[a]	-27	+16	-15
Rice[b]	-28	+24	-10
Tobacco[c]	-16	+25	+ 4
Peanuts[c]	- 8	+ 8	0
Corn[d]	- 6	+14	+ 8

[a] Marketing quotas in effect 1954-56.
[b] Marketing quotas in effect 1955 and 1956.
[c] Marketing quotas in effect prior to 1953 and during 1953-56.
[d] Compliance with acreage allotments a requirement for price support during 1954-56.

similar. Some of the increase in yield occurred because the acres diverted from production of basic commodities were often the least productive, and some of the increase was due to practices that would have been adopted in the absence of programs. As is argued elsewhere, however, the combined effect of the programs in force during 1954-56 probably was one of greater intensification of crop production than otherwise would have occurred. All things considered, it seems likely that total crop production, as measured by a price-weighted index, was not reduced.

Harvested acreage of the four feed grains as a group was about 10 percent higher in 1954 and 1955 than in 1953 as a result of acreage diversion from basic commodities. Drought, coupled with the Soil Bank, reduced the total feed grain acreage in 1956 to the 1953 level, but tonnage produced was 10 percent higher than in 1953. Price support and disposal operation diverted substantial quantities of feed grains into storage and export, however, and the feeding of wheat to livestock, which has appeared to be an increasingly desirable adjustment, was almost entirely prevented. A rough computation suggests that the amount of concentrates fed to livestock during the crop years 1953-55 was perhaps 6 percent less than would have been the case in the absence of programs. Probably the programs somewhat restricted the production of livestock and livestock products, but by diversion of grains rather than by means of allotments. Apparently any over-all restricting effect of the programs on total farm output was small.

Support Prices and Adjustment

Price support has been used to sustain farmers' incomes; it has been extended only to a restricted list of products rather than to all; and, as is appropriate to the income objective, some commodities to which it has been extended were in particularly weak market positions. Since the supply and demand situations that made for these weak markets were, in general, not temporary, the resulting price relationships have been inappropriate guides for adjustment of farm production. Several instances of this have already been mentioned.

Somewhat apart from this difficulty, price supports in recent years have had a perverse effect on agricultural adjustment because of their relation to the certainty of farmers' expectations. Supports have increased short-run certainty. Farmers have known before planting a particular crop that price support would be available at not less than an announced level. This knowledge has increased their willingness to invest in inputs having prompt effects on production — fertilizer, better and more expensive seeds, insecticides, weed killers, etc. The extra inputs have produced commodities that merely added to the CCC's stocks or to its losses on disposal programs.

The most important adjustments that agriculture faces, however, are long-run adjustments, those that change the entire farm organization, require investment in new kinds of fixed capital, and usually take years to accomplish. Most farmers need to be thoroughly convinced that such adjustments are highly desirable — or, in fact, essential — before they will undertake them. Supports have prevented market prices from indicating to farmers what long-run adjustments were needed. Equally important, the programs have operated on a year-to-year basis amid nation-wide political duststorms; farmers have had every reason to be confused about long-run outlook for their type of farming and what they ought to do about it. The USDA diverted-acres study showed that two years of drastic acreage controls on cotton and wheat had little effect on forage production or on livestock numbers. Two years is not much time in which to make such adjustments, but there was little evidence that farmers had even started. Why should they, when to do so might mean loss of base acreage, large outlays of capital, and assumption of the risk that, by some program, cotton and wheat would be made highly profitable crops in the future? Price supports as they actually have operated in recent years — not, perhaps, as anyone hoped they would operate — have befuddled farmers and have retarded needed long-run adjustments.

THE SOIL BANK, ASSOCIATED PROGRAMS, AND ADJUSTMENT

The Soil Bank has been added to the price support, acreage control, and export disposal program. It is an attempt to solve the diverted-acres problem, to reduce both basic commodity production and total farm output. There seems to be rather wide agreement that its immediate purpose is to prevent additions to CCC stocks while the Corporation's disposal programs reduce the present huge inventory down to "normal" levels. What is to happen afterward is not so clear. One hope seems to be that if present surpluses are eliminated, free farm prices will reach and remain at a level where income support programs will no longer be required. But agriculture at present is far out of adjustment, and it will long have a strong propensity for expanding output because of the high birth rate on farms, adoption of presently known technology, and development of new technology. I doubt, therefore, that the elimination of current stocks can in large degree solve the income problem by creating a favorable level of prices.

A Soil Bank program must continue indefinitely if it is to be a means of dealing with the income objective, and the Soil Bank will have to be accompanied by other programs. Export subsidies will be necessary if we are to maintain a reasonable volume of foreign sales while holding domestic prices at levels satisfactory to producers. Marketing quotas will be needed to keep production of basic commodities within bounds. The present program, somewhat modified, seems likely to be continued if the Soil Bank is used as a means of solving the farm problem. It is appropriate, then, to bring together conclusions about the probable effects of acreage controls and price supports when used over a long period of time and when modified by the special effects of the Soil Bank.

First of all, total inputs used in agriculture are not likely to be reduced, although the composition of inputs may be changed. Withdrawing a little land on each farm from production will save some seed, tractor fuel, labor etc. Except on the larger farms, the saved labor will not have much monetary value to the farmer. Total expenditures on fertilizer may even increase as farmers seek to intensify production on land still in cultivation.

The question of whether heavier application of fertilizer and other yield-increasing inputs is desirable or not is a tricky one. Very often, the practice has been to use fewer inputs of this type than would be economically desirable if existing prices reflected the marginal value of output. So long as prices are kept at recent levels, by whatever means, added inputs are profitable to the individual farmer. But if prices are held there by acreage controls and costly disposal programs, the added inputs are undesirable from the social viewpoint expressed in the programs. Farmers' self-interest and the program methods are clearly at cross purposes in this situation.

But if agriculture ever becomes sufficiently adjusted to permit free market prices to be near recent levels, then the heavier application of fertilizer and of similar inputs not only will be profitable to the farmer but also will be socially desirable. We are in a situation in which too much land and labor stand ready to produce crops, but in which too little fertilizer (and similar inputs) typically is used. An ideal adjustment calls for reducing the first two and increasing the last. By and large, the "substitution" of fertilizer for land that has taken place so far will not be reversed even if controls on land are relaxed. Supports and controls are merely pushing fertilization and similar practices along faster than is consistent with the slow rate of other adjustments. The high potential for more production through the use of fertilizer, irrigation, etc., in corn, cotton, and several other crops is a threat to the Soil Bank program.

The program will impede adjustments in the location of production.

The tendency of acreage controls to freeze the interregional and interfarm pattern of production has already been mentioned. The Soil Bank must take millions of acres of our best land out of production if it is to be successful, and success will tend to hold in crop production land better suited to pasture or forest. Preventing the law of comparative advantage from working is likely to result in increasing inequities of allotments and inefficiencies.

If operated on a sufficient scale, the Soil Bank can reduce production of basic commodities without increasing feed grain production. Limiting feed grain production will limit livestock marketings. Hog production is usually integrated with corn production, and the limitation of feed supplies will be practically painless to hog producers. But the dairy industry is already overextended in relation to its market, and a successful Soil Bank program may raise feed costs. Dairying is notoriously slow to adjust, and it may be squeezed long and fairly hard by the program. Poultrymen adjust more promptly but can scarcely be expected to be enthusiastic about the Soil Bank. On the whole, the adjustment of both total farm output and its composition will be in the right direction, but it can be maintained only by continuation of the Soil Bank. An adjustment that shifts marginal cropland to grass, achieves needed changes in farm organization, and retires some land from agriculture would be a permanent sort of adjustment. One that suspends land of all grades from production on hundreds of thousands of farms will retard, rather than encourage, changes in type of farming. The land, its fertility increased, will be returned into production of the original crops whenever controls are relaxed.

If industry is prosperous and continues to expand, the present set of programs probably will not have an important effect on the rate at which labor leaves agriculture for nonfarm work. Sharecroppers and tenants may be forced out a little faster by the Soil Bank than otherwise would be the case, but some operators of inadequate units may continue to farm in the hope that a marketing quota will eventually raise their income to a satisfactory level. Much the same conclusions apply to the number of inadequate farm units. The rates of decline in the farm labor force and in the number of too-small farms in recent years suggest that substantial adjustment between the agricultural and industrial sectors takes place when the general economy is prosperous. Some of the adjustment takes place when young men, having seen their fathers work hard at low wages for several years, refuse to go into farming themselves; the effects are cumulative and may be particularly important in the next few years.

SUGGESTIONS FOR MORE EFFECTIVE PROGRAMS

We are not likely to develop an effective and realistic farm program until a large majority of the policy makers in agriculture recognize that the need for adjustment is at the root of the farm income problem and greatly limits what can be done about it. Many people want to create a price situation in which the "small farmer" — a man depending largely on 10 dairy cows, 10 acres of cotton, or 100 acres of wheat — can live as well as a steel worker in Pittsburgh or a farmer on an adequate family farm. Many people also want to prevent any further decline of the farm population or in the number of farms. But labor efficiency in agriculture has risen to the point that drastic controls and extreme sacrifices of efficiency would be necessary to achieve such prices. These objectives, widely held as they may be, are not going to be achieved.[6] To be practical, consideration should be given to non-price programs for farm people who do not have an opportunity to use their labor productively and to possible alternatives open to commercial agriculture. Ideally, programs should increase agriculture's ability to adjust and at the same time provide income protection for farmers.

Modifications of the Present Program

The Soil Bank is just getting under way, and the first thing to consider is its possibilities. As earlier comments indicated, the program is likely to be a Soil-Bank, price-support, marketing-quota, export-subsidy combination. The program must really cut production, not just go through motions. The Soil Bank must make idle many millions of acres of productive land — not mostly drought-stricken acres or low-yielding tracts. Either "Soft evasions" in connection with the Soil Bank and marketing quotas must be eliminated or more money must be used to offset their effect. Per-acre payments must be high, especially when the Soil Bank is achieving its price objectives. Many of the old rules and formulas for computing allotments and quotas are now merely obstacles to effective operation of the complete program (witness the difficulty with corn), and they should be eliminated.

Flexible price supports plus full use of modernized parity will help to establish price relationships that contribute to desired adjustments within agriculture. This process will be slow and uncertain, however, for much more price freedom than will actually occur is required to make the new parity formula work well. Subsidies for lime and fertilizer, that directly or indirectly increase yields of field crops, are inconsistent with the production control objectives of the Soil Bank, and the list of approved ACP practices should be further revised to avoid payments having this effect.

The Soil Bank and associated programs are aimed more at income support than at agricultural adjustment. Pressures on the Soil Bank, some traceable to the need for adjustment, may cause it to gravitate toward the grassland program suggested by Dunbar and Bottum.[7] If

[6]Unless a serious depression puts industrial workers on relief and drives some of them back to the country, a solution nobody wants.

[7]Dunbar, John O., and Bottum, J. Carroll, "Adjusting farm production through grass and livestock," Economic and Marketing Information for Indiana Farmers, Purdue University, June, 1954.

this shift is made, payments would be made in such a way as to provide the greatest incentive for shifting from basic commodities to grass in areas and on farms where the change is most consistent with best land use. Grazing on diverted land would be permitted, and payments on existing grassland would compensate beef and dairy producers for the increased competition for their products. Though the details and possible difficulties of such a program cannot be discussed here, the plan would at least promote better use of resources than the Soil Bank as currently conceived.

A Major Change: Direct Payments

The strategic advantages of having the price system work for a farm program rather than against it are obvious. The great objective against free prices at present, of course, is that farm income would be very unfavorable during several years of difficult adjustment. One way to retain most of the allocative function of price without pulling the rug from under farmers is to use direct payments for supporting income. Ordinary compensatory payments, however, may present farmers with as misleading a set of incentives as supported prices. To get around this difficulty, farmers would be given sales (not acreage) allotments equal to perhaps three-fourths of their marketings during the past three or four years. Farmers would sell their total production but would receive compensatory payments only on allotment quantities. The per-unit payment would be the difference between the market price and an "intended price" based on modernized parity — say, 85 or 90 percent of parity. As a result, market prices would reflect the marginal value of output, and farmers' decisions to expand or reduce production, or to shift from one product to another, would be guided largely by market prices.

In order to permit desirable adjustments and to avoid inequities, allotments would be shifted slowly among producers according to their marketings in the most recent three or four year period. (The total national allotment for each product would remain fixed, however.) This provision means that "intended prices" would have some influence on farmers' long-run adjustments. But with the modernized parity formula in use, relationships among "intended prices" would be fairly satisfactory guides to production.[8] A farmer producing a chronically surplus product would receive a low price for marginal output currently and would be aware that eventually the "intended price" for that product would fall relative to others. He would have no unwarranted incentive

[8]The modernized formula does not change the average level of all parity prices as a group, but it adjusts parities for some individual commodities upward and others downward, so that relationships among parity prices depend upon market prices in the most recent ten-year period. A product in chronic surplus gradually receives a lower parity price if market prices are permitted to reflect the oversupply; a product which has a persistently strong market price gradually receives a higher parity price.

to intensify current production, and he would be stimulated to adjust his type of farming if alternatives exist. As he shifted from one product to another, he would build up an allotment for the latter. Such adjustments would gradually eliminate the surplus of the particular product. While the need for adjustment was being registered and while adjustment was getting underway, direct payments would provide considerable income support for producers of overproduced commodities. A flow of payments would not necessarily go to producers of any single commodity indefinitely, but agriculture as a whole would be assured of income support.

I have assumed that modernized parity prices can be reasonably good long-run guides to production if market prices are allowed to change freely. I think most of us would agree that relationships among modernized parity prices at the present time would go a long way toward indicating needed adjustments to farmers if they took the relationships seriously. The parity prices are, of course, backward looking — at the most recent decade — but, if we are frank about it, so are most economic forecasts. The principal exception is when something unusual like a war occurs. Farm policy operates in too political an environment to permit the use of any forward-looking prices based on judgment. The modernized parity formula is the best alternative we have, and it is not a bad one.[9]

Time does not permit examination of the details and difficulties, but some of these have been discussed elsewhere.[10]

Non-price Programs

Some of the adjustments needed in commercial agriculture involve changes in equipment, livestock, or size of farm, and capital requirements will be large. If a price policy is adopted that provides the necessary incentives, a government program to assist farmers in making adjustments will be desirable. The general approach might be (a) determine where adjustments are most badly needed and what they are, (b) make government credit available at very favorable terms to finance approved adjustments, and (c) coordinate Extension, Soil Conservation, Agricultural Conservation, and similar activities to achieve a consistent, across-the-board adjustment program.

If a modified compensatory payment plan similar to the one I have described is used, the government might offer to give farmers sales allotments for livestock and livestock products in exchange for sales allotments for wheat and cotton.[11] If appropriate exchange rates were

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[9]The revised parity recently recommended by USDA is equally acceptable.

[10]Brandow, G. E., "A modified compensatory price program for agriculture," Jour. Farm Econ., Vol. 37, No. 4, Nov., 1955, pp. 716-30.

[11]The new allotments for livestock would be added to the national livestock allotments; the allotments received for wheat and cotton would be subtracted from the national allotments for them. Farmers could always accumulate an allotment in another commodity, but a prompt and favorable exchange would be an added incentive for needed adjustments.

established, farmers would select themselves for participation in the program in much the same way that low-income families would select themselves under the Aiken Food Allotment proposal. In general, the most needed shifts would occur.

Another problem that we are particularly aware of now is the weather risk to which agriculture is subject. Two kinds of programs seem to be required, though each is very difficult to carry out effectively. One applies to the highest-risk wheat area just west of the 100th meridian. If we ever reach the point where prices are reasonably favorable without tight production controls, this area is very likely to increase crop production during a succession of high-rainfall years. When a dry interval follows, the area will be in serious distress. Some sort of program is needed to keep land in the area predominantly in range even when grain production temporarily seems highly attractive.

Many agricultural economists are better qualified than I to discuss what such a program might be. I feel certain, however, that it must be something different, a departure from methods so far tried. Crop insurance does not seem to be the answer. We need some new ideas, and we need them soon, for the people in the high-risk area and in the country as a whole are now as ready to do something about this problem as they ever are likely to be.

The other weather problem is the danger of drought, freezes, and similar hazards outside of the high-risk area. We may hope that some form of crop insurance can be developed that will deal effectively with it. Experience has not been especially promising, but the experimental crop insurance program has been too cautious to be a thorough test of the possibilities. Area and weather insurance approaches apparently have not been adequately tried.

CONCLUSION

The principal reason for the current farm income problem is the need for agricultural adjustment. The current "Soil-Bank, marketing-quota, price-support, export-subsidy" program may be able to achieve satisfactory incomes for producers of basic commodities if it is somewhat modified, heavily financed, and applied unremittingly to agriculture. It will encounter serious administrative difficulties, attributable largely to the fact that the program thwarts needed adjustments or encourages undesirable ones. A major handicap is that the price system works against the program rather than for it.

A successful long-run government program must provide income protection for farmers while promoting adjustment in agriculture. The program should create a desire to adjust where adjustment is required and it should assist farmers with the reorganization and financial problems involved. A program that permits prices to reflect supply and demand conditions in markets, that uses direct payments on a part of production for income support, and that marshals credit facilities, research, extension, and conservation services into a coordinated adjustment effort may accomplish the job as well as can be expected.

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Discussion

PROFESSOR BRANDOW has presented quite orthodox comments on the role of governmental farm programs in a dynamic economy. Small inefficiencies and minor obstacles to adjustment appear to be the rule, although it was stated at one point that agriculture is far out of adjustment with respect to total resources used.

I am not so sure that this maladjustment in total resource use is so great, despite apparent unanimous agreement on this point at this conference. When only a small fraction of the labor force is producing few goods, or goods of relatively low utility, it may be difficult to convince many people that the maladjustment is severe. Professor Galbraith's comments on the possible low utility of alternative uses of excess agricultural labor has never been seriously challenged to my knowledge.[1]

However, whether the situation is serious or only troublesome, it is perennial. It is part of the price of economic growth and progress. If policy makers continue to expect an early end to farm product surpluses, we can expect nothing better than we have had, namely, programs hopefully initiated but reluctantly reformed. I believe that what we have had is about what the American public wants today. But even if the voters are unaware of the extent of production inefficiency, or are convinced that this inefficiency is negligible, we, as economists, still are not freed from our job of exploring the possibilities for speeding up production adjustments. We have been hired by a society wise enough to see that even though it has chosen its ends (alternatively, we may take them as given), information is needed not only for achieving these ends but also for deciding whether to change them.

I can see nothing in Professor Brandow's proposal for "modified compensatory payments" to suggest that it can move us more boldly toward production adjustment than do current programs. If old rules and formulas for distributing allotments cannot be discarded now, why should we expect to discard them by using direct payments? If the goal of equity now prevents enough flexibility in prices to encourage production adjustment, what reason is there to expect that the surplus fraction

[1]Galbraith, J.K., "Economic preconceptions and the farm policy," Amer. Econ. Rev., Vol. 64, 1954, p. 48.

of a crop under direct payments would be permitted to sell at prices needed to encourage adjustment? Given our estimates of supply response to lower prices, downward adjustments appear unlikely even if Congress would permit lower prices or price expectations.

Professor Brandow is right in saying that farmers in the Great Plains will produce a massive wheat and sorghum crop if it ever rains. There are two major possibilities for dealing with this unstable area. First, the nation may recognize the area as giving rise to a perennial problem, which needs to be reduced or eliminated. Power exists, I believe, to impose a major zoning, reseeding, and perhaps a land-purchase program in the area. Such a program would involve serious questions of community and personal adjustment, of local versus centralized control. However, the experience of land acquisition for reservoir construction is available for answering these types of questions.

The second possibility is continuing the status quo — alternately bailing out the unproductive Great Plains and then our wheat program because of Great Plains productivity.

The first alternative is not likely to be considered seriously although the time is more appropriate than ever. Farmers are willing to try new remedies, as Dr. Parks states in Chapter 17. But non-farmers are likely to make the crucial decision to zone and reseed the Great Plains. In my opinion, the problem simply does not yet seem serious enough for the general public to use a new approach. John Locke, in 1690 when speaking of democratic society in general, foresaw the impasse on Great Plains adjustment and of the farm economy in general. "Such revolutions," he said, "happen not upon every little mismanagement in public affairs. Great mistakes will be borne without mutiny or murmur."[2]

No apology is needed for failing to propose revolution in the Great Plains or in any other part of the farm economy. These are not yet revolutionary times. Perhaps a generation from now, if the farm labor force shrinks to the sometimes predicted 2.5 to 3 percent of the labor force, the time will be more appropriate for talk about agricultural monopoly or other extreme departures, as suggested for the Plains.

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[2]Locke, John, Second Treatise on Civil Government, Everyman's Library, No. 751, 1924.

PART VI

Goals and Values

Chapter 16

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Instrumental Goals and Economic Growth

GROWTH is by definition a dynamic phenomenon. For most questions of social relevance economic growth can be identified simply as a condition in which per capita output of goods and services is increasing when measured in real terms. This definition implies measurement of change. A level of real output has little factual meaning.

I infer it to be my function in this conference to review what we can, as economists, assume to be the goals held by society in relation to economic growth. We shall then attempt to identify what appear to be the goals of individual farmers which serve as proximate sources of their motivation, i.e., instrumental goals. Finally, we shall attempt an appraisal of these goals in terms of their consistency with social goals in economic growth.

SOCIAL GOALS IN A GROWING ECONOMY

With a stable or increasing human population, economic growth can be brought about only by two means: (1) increasing efficiency in the use of given resources and the distribution of aggregate output; or (2) increasing the quantity or improving the quality[1] of the resources themselves. To the first we orient that body of theory we know as welfare economics; to the second, the less developed theory of economic change, including resource development and organizational advance.

These means are distinct in an analytical sense and will be reviewed separately. Yet in a problem sense they can hardly be separated. We shall attempt to develop the basis for hypotheses which cut across both areas of theory when so indicated by problems at hand.

[1]A change in resource quality is perhaps most conveniently defined as such a change in the properties of a resource as would result, without change in resource identity, in a change of production coefficient in any of its uses, given the quantity and quality of other resources used in the relevant production process. An improvement would be implied if the production coefficient were increased in the change.

Goals in Allocative Efficiency

Modern welfare economics centers on the notion of equilibrium. Criteria which fix the equilibria relate to consumption, production, and marketing. They are derived from the single condition that the value of net output from given resources is a maximum, where net output is valued in terms of utility among a given population of consumers with particular sets of preferences. Technology, tastes, and aggregate capital are assumed constant during adjustments to attain these equilibria. Thus the "efficiency" with which this theory is concerned is of an allocative character. The existing distribution of resource ownership is taken as a "point of departure." Adjustments to attain equilibria may and can, within our frame of reference, occasion a redistribution of resource ownership. As a consequence, a redistribution may also occur among resource owners in their respective claims on the aggregate output.

The results are well known[2] and can be summarized briefly here. To maximize utility from a given sum of disposable income, the consumer so allocates this sum among known alternatives as to equate ratios of their marginal utilities with, respectively, ratios of their prices. A behavioral assumption is required to give this result. The consumer is assumed to order his preferences in some systematic and consistent manner. In this paper we need not be overly concerned with the host of problems raised by psychologists and by would-be psychologists from our own group. The remarkable thing is that the assumption holds as nearly as it does.

Between consumers, produced goods and services are optimally distributed when the marginal rates at which they substitute in the preferences of any one consumer equal, respectively, the marginal rates of substitution in the preferences of any other consumer.[3] In both this and the preceding condition, optima are assured, given other assumptions already stated, if the alternatives are made available to consumers in terms of prices which are constants with respect to quantities taken by the consumers.

Given markets for both resources and products, producers must meet three conditions to be consistent with a welfare-maximizing use of resources. In producing a given commodity, the producer is required to select, from techniques available to him, that particular technique or combination of techniques which will give for each quantity of resources employed a maximum output. Also, for a given quantity

[2]For an excellent summary of the welfare conditions and their proofs, see Reder, M. W., Studies in the Theory of Welfare Economics, Columbia University Press, 1947. See especially Chap. 3.

[3]This condition leaves an indeterminacy in the distribution of goods and services between consumers. But the indeterminacy can be resolved by recourse to action which, while improving the welfare position of one consumer, need not impair the welfare of the other consumer (s). For an elaboration of this point, see, Scitovsky, Tibor, Welfare and Competition, Irwin, Inc., 1951, Chap. 4.

of product, resources must be so combined as to equate ratios of their marginal physical products with respective ratios of their prices.

A third condition to be met by the producer is somewhat more subtle. Some of his resources are committed in total quantity for a specified period of time; some are variable in quantities depending on output. The welfare-maximizing use of resources is concerned only with those which are variable in amount. Among these, some are specialized in their functions, thus specific to a particular product; others can be shifted between products. We calculate a marginal cost of output from the use of resources specific to a given product. Subtracting this from the marginal revenue of output from the same product, we obtain what might be termed a net marginal revenue of output for the product. Our welfare-maximizing condition requires that variable resources with alternative product uses be so allocated that marginal rates at which products are thus substitutable are equal (inversely) with respective ratios of their net marginal revenues. For products sold into purely competitive markets, the marginal revenues of output become prices of output. In these cases net marginal revenues are prices net of the marginal cost of output from use of resources specific to the relevant products.

Between producers, each with given purchasing power, resources are optimally distributed when for given products the marginal rates at which resources substitute for any one producer are equal to their marginal rates of substitution for any other producer. This condition is met when the resources are made available at prices which are constants with respect to quantities purchased. As with consumers (they in terms of utility), this condition in no way specifies (or rules out) an optimum in equity between producers and their consequent claim to income. It merely takes the initial claim of producers to the aggregate resources as given.

Between producers in the aggregate and consumers in the aggregate, a market functions optimally, i.e., in a welfare-maximizing manner, if, the preceding conditions having been met, the marginal rate at which any one product substitutes for any other product in production is equal, respectively, to the marginal rate at which the same products substitute in consumption.

Failure to meet one or another of these conditions is presumed to offer particular individuals an opportunity to increase their utility in consumption or returns above variable cost in production (including performance of marketing functions). They would also thereby increase the aggregate of utility for society as a whole. Thus, divergence of actual from equilibrium conditions creates opportunities for increasing real output per capita and hence, by definition, economic growth. The welfare conditions constitute one set of social goals in the sense that they imply limits attainable in economic growth from improvements in allocative efficiency.

Goals in Economic Change

Added sources of economic growth are found in assumptions used to specify the welfare economics model. These include changes in: (1) population (more specifically, labor resources), (2) technology, (3) capital resources, and (4) tastes. Since Malthus, economists have paid little serious attention to problems in population size. We lack consensus even on terms in which to conceive of an optimum in population size. It has seemed sensible to treat it as an autonomous variable, the effects of which are to be reckoned with, not explained. Thus, considerable attention is given to change in structure: age, sex, occupation, spatial distribution, etc., as well as to predictions in size. But goals related to population size are hardly even visualized in any concrete sense.

By technology we mean the array of production techniques by which resources can be combined in production and marketing. A change in technology creates the opportunity to shift a production function, i.e., to innovate. As a society, we imply a tangible goal in innovation: that it proceed so long as: (1) the value of added output exceeds the cost of innovation or (2) if applicable, costs reduced by innovation exceed the value of reduced output. Yet we have given little serious attention to goals relating to technological change itself. Instead, we allocate research resources, for the most part, according to: (1) the interests of owners of such resources, (2) the likelihood of success in new research ventures, and (3) the consequences, for owners of research resources, of success in research. The most important (partial) exception relates to research in agricultural technology, where a fairly large part of the research is publicly financed.

When private sources are used to finance research, motivating goals are readily conceived. They hardly differ from any other activity in which the firm participates. When research is financed with public funds, however, the goals are far more difficult to conceive. Without such goals, innovators are placed at a distinct disadvantage. Unless they have some means for controlling the allocation of research resources, they are subject to sudden changes in technology in which they are powerless to act in any way other than through competitive innovation. Yet aggregate returns are reduced if the price elasticity of demand for their product is less than unity over the relevant range of quantities. This does not mean that society's welfare is necessarily reduced. Other individuals may well benefit from the change. Yet serious question is raised concerning the total welfare position, in general, and the welfare position of innovators, in particular.

The early innovator in pure competition gains if: (1) the technology yields an increased rate of output with respect to variable inputs and (2) the cost of resources with which to innovate is exceeded by either (a) an increase in total receipt of (b) a reduction in cost of resources already used in the production process. Buyers from the competitive industry benefit in any event because of a shifted supply. The relative benefit shared between producers and the various levels of subsequent buyers, here considered an aggregate, depends on the relative price elasticities of demand and supply. The lower the price elasticity of demand (supply) relative to supply (demand), the greater the share of benefit to sellers (buyers). Regardless, however, of relative benefits, society generally benefits because no one yet has been harmed.

Those who fail to adopt a technology successful in these terms are disadvantaged in a welfare sense. The damage comes from either or both of two sources: a reduction in price of product, resulting from shifted supply, or a reduction in value of resources fixed in use, because of either lower imputed returns or from obsolescence incident to innovation. In any event, income to non-innovators is reduced and a problem is created. It might seem that if the total value of the changed output exceeds the total value of output prior to change by more than the total cost of added resources, aggregate welfare has been increased. Yet this cannot be said without qualification unless we are willing to assume that utility changes can be compared between different persons in the economic reorganization. In that case we could calculate the amount of increase in utility required for beneficiaries to offset a loss in utility for losers without yielding a total reduction in welfare.

Reluctance to do this has made the modern economist conservative. Before judging a reorganization to be welfare-increasing he insists that those harmed by reorganization must be compensated. Without compensation, final appraisal, on economic grounds, is withheld. This does not preclude the use of economics in analysis of alternatives. Yet limitations which prevent the economist from concluding whether economic welfare has been increased or decreased certainly restrict his usefulness in the problem. Can this restriction be lifted?

Farmers harmed by innovation can be grouped into those who migrate from farming instead of innovating and those who do not migrate. The non-migrants, in turn, include those who innovate late and those who do not innovate at all. It might be argued that for many migrants, technological change often crystallized the consequences of alternatives long vaguely conceived. If resources in the nonfarm economy are essentially fully employed, migration improves individual welfare often enough that society might be justified in ignoring this particular problem. Migration occurs, after all, from expectation of a better alternative. Over time, therefore, migrants may well benefit from technological change. The action called for here is education plus, possibly, financial aid for moving and re-training.

Returning now to non-migrant farmers harmed by innovation, the situation is more doubtful. Among those who innovate late, the extent of damage is a matter of degree, depending on the length of lag and the effect of innovation on aggregate supply. To those electing to remain in agriculture without innovating, damage clearly has been done. We could argue that such action reflects a low supply price for the relevant resources in the first place. But this overlooks the possibility of specialized resources without ready nonfarm alternatives. The small-scale dairy farmer, faced with a milk supply shifted with bulk-line milk handling, capital inadequate to finance innovation, yet too old to develop new skills, may have little choice than to accept his reduced welfare position. Society may well be obligated to redress such an operator whose income position has been worsened by publicly-financed technological changes. The real problem would be to accomplish this action without holding, in agriculture, those who can move productively into alternative employment.

During the past decade several economists[4] have explored the area of economic growth through investigation of conditions which determine optima in rates of quantity change in resources, i.e., in capital formation and growth in labor resources. The major problem has centered on attainment of a rate of capital formation to satisfy certain growth requirements without jeopardizing cyclical stability in the employment of capital and labor resources.

Since 1920 the rate of capital formation seems to have exceeded the rate of growth in labor resources. Despite this fact and the theoretical expectation of diminishing returns to capital owners, the average (and hence marginal) productivity of capital appears also to have increased — still more, in fact, than for capital.

As pointed out by Professor Fellner,[5] these trends provide conditions necessary (but not sufficient) for increased returns to owners of both capital and labor resources. Yet further innovations may create serious problems. Should they save capital relative to labor, returns to capital owners could diminish to levels which would discourage new investment. The result might be unemployed resources in a cyclical sense, if not a slowed rate of growth, even while average productivity of capital increases.

On the other hand, should new innovations save labor relative to capital, returns to labor could diminish. The resulting effect on aggregate demand could again create conditions leading to unemployed resources. Real wages have increased relative to returns to capital owners. Yet we can hardly infer from this that important changes have taken place in relative productivity of capital and labor. In this same period, the organization of labor may have reduced the spread between marginal value product of labor and realized wage rates.

Agricultural economists have by now reached near-unanimity on the need for net migration of people from farms. The reasons are to: (1) raise the marginal value product of labor and (2) reduce the number of claimants to aggregate farm income. In large measure society has acquiesced. Social goals in economic growth are promoted by a supply

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[4]E.g., Harrod, R. F., Towards a Dynamic Economics, Macmillan, 1948; Domar, E. D., "Expansion and employment," Amer. Econ. Rev., Mar., 1947; Hamberg, D., "Income growth in secular stagnation and inflation," Econ. Jour., Sept., 1953; et al.

[5]Fellner, William J., "Discussion of papers by Moses Abramovitz and Paul T. Homan," Amer. Econ. Rev., Vol. 46, No. 2, May, 1956.

of added labor from farms. Not only are the numbers important, but also the terms by which the labor is made available. With a low marginal value product in agriculture, the labor is supplied to the nonfarm sector at relatively low prices. Allocative efficiency is thus improved and, perhaps just as important, likely leads to better balance in growth between capital and labor. In fact, labor from large-scale immigration, drastically reduced some three decades ago, has been supplanted only by migration from farms and increased numbers of women in the labor force.

The attractiveness of this solution is not hard to see. In 1953, 5.5 million farm families received a total net income, before income taxes, of 19 billion dollars, an average of $3,459 per family. In contrast, 35.6 million nonfarm families received 227.8 billion dollars, an average of $6,393 per family.[6] These aggregates, distributed as shown in Table 16.1, include income from all sources. Thus, the figures for farm families include off-farm income; those for nonfarm families, income from farm sources.

Compare now the percent of all families (columns 3 and 7) with the percent of all income (columns 5 and 9). For each group, we can determine with these comparisons, the level of income above which families received more than an equally proportioned income distribution and below which, less.[7] The break for farm families comes at the $3,000-$3,999 level; for nonfarm families, at $6,000-7,499. The 57 percent of farm families below the "break point" received 27 percent of personal income in agriculture. The 61 percent of nonfarm families below the "break point" received 38 percent of personal income in the nonfarm sector. The apparent difference in distribution characteristics is doubtless offset in part by the greater relative importance of noncash income in the lower income groups in agriculture.

We are concerned particularly with families below these "break points." To improve the income position of (remaining) farm families would require migration especially from this group of farm families. Yet, there is little reason to suppose these families, after migration, would rise in the nonfarm income scale beyond the "break point" there. A movement of all 3,121,000 such families in 1953 would have left only 2,361,000 on farms. On farms, the migrant families received 5.1 billion dollars, an average of $1,641 per family. If the remaining farmers could absorb the vacated farms without reducing output, income per remaining family would increase from a pre-migration average of $5,861 to $8,031, less the added cost from larger operations. If even as much as two-thirds of the added income were offset by added cost, the income per remaining farm family would increase to the average level of nonfarm families.

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[6]Goldsmith, Selma, "Income distribution in the United States, 1950-53," Supplement to Survey of Current Business, Mar., 1955.

[7]This in no way implies a criterion for income distribution. It serves merely as a convenient point at which to separate high from low income recipients in each sector.

Table 16.1. Family Personal Income Before Income Taxes for U. S. Farm and Nonfarm Families, by Size Classes, 1953[a]

Family personal income before income taxes	Farm operator families				Nonfarm families				Total personal income to families[b]	
	Number		Income		Number		Income			
	Thousands	Percent of total	Dollars	Percent of total	Thousands	Percent of total	Dollars	Percent of total	Farm	Nonfarm
$15,000 and over	69	1.3	$25,545	9.4	1,374	3.9	$28,321	17.1	$ 1,777	$ 38,916
10,000-14,999	120	2.2	11,903	7.6	2,089	5.9	12,111	11.1	1,431	25,302
7,500- 9,999	198	3.6	8,539	8.9	4,506	12.7	8,520	16.8	1,693	38,392
6,000- 7,499	267	4.9	6,660	9.4	5,763	16.2	6,700	16.9	1,776	38,613
5,000- 5,999	349	6.3	5,462	10.0	5,570	15.6	5,471	13.4	1,907	30,471
4,000- 4,999	556	10.1	4,462	13.1	5,950	16.7	4,494	11.7	2,479	26,737
3,000- 3,999	802	14.6	3,460	14.6	5,143	14.4	3,536	8.0	2,776	18,186
2,000- 2,999	1,096	20.0	2,481	14.3	3,287	9.2	2,543	3.7	2,719	8,358
1,000- 1,999	1,342	24.5	1,497	10.6	1,724	4.8	1,556	1.2	2,009	2,684
Less than $1,000	683	12.5	577	2.1	222	0.6	481	0.1	394	107
Total	5,482	100.0	$ 3,459	100.0	35,628	100.0	$ 6,393	100.0	18,961	$227,766

[a]Source: Goldsmith, Selma, "Income distribution in the United States, 1950-53," Survey of Current Business, U.S. Department of Commerce, 1955, p. 15.

[b]In millions of dollars.

Table 16.2. Family Personal Income for Families Migrating from Low-Income Farms, Based on 1953 Data

Family personal income before income taxes	Number (thousands)	Percent of migrant families	Average income
$5,000-5,999	796	25.5	$5,471
4,000-4,999	849	27.2	4,494
3,000-3,999	734	23.5	3,536
2,000-2,999	468	15.0	2,543
1,000-1,999	243	7.8	1,556
Less than 1,000	31	1.0	481
Total	3,121	100.0	$3,956

The big question relates to the outcome for migrant families. If we assume they are absorbed into the nonfarm sector with incomes distributed as found in the nonfarm sector below the "break point," the results would be as shown in Table 16.2. Aggregate income would increase from 5.1 billion dollars to 12.4 billion dollars; average income, from $1,641 to $3,956 per family.

Finally, such an increase in total income would have a small, though not negligible, effect on demand for farm products and, hence, upon incomes of remaining farm families. The increase would generate from two sources: (1) cash purchases substituted for home-produced products and (2) added income. Assuming an income elasticity of 0.3 for food expenditure, half of which would go to the farm sector,[8] aggregate farm income would be increased by $168,534,000, about $70 per remaining farm family, due to the second factor alone. Though unmeasured, the first factor might easily have twice the effect.

So viewed, few programs would appear as attractive as one which would induce off-farm migration from low-income farms. Large-scale migration from farms has taken place and is continuing, of course. But available evidence suggests that a considerable part of the migration comes from higher-income farm families.[9] Granted that our assumptions here have been crude, the results in terms of income for remaining farm families and for migrants are impressive. We have not taken account of moving costs for migrants or the effect of migration on the pricing of nonfarm labor. Presumably, the marginal value product of nonfarm labor would be reduced while the marginal value product of capital resources would be increased. We have assumed throughout, it will be recalled, full employment of resources.

Faced with these results and the nearly complete consensus among agricultural economists, we feel that surely the problem is not this simple. Otherwise we would have found, by this time, the means for

[8]See summaries of such estimates in Schultz, T. W., The Economic Organization of Agriculture, McGraw-Hill, New York, 1953, pp. 45ff.; and Daly, Rex E., "The long-run demand for farm products," Agr. Econ. Res., Vol. 8, No. 3, July, 1956.

[9]E. g., see Bachmura, Frank T., "Migration and factor adjustment in Lower Mississippi Valley agriculture: 1940-50," Jour. Farm Econ., Vol. 38, No. 4, Nov., 1956.

implementing such a program. Are there alternatives less onerous, which would yield the equivalent results in terms of welfare for farm families? Before turning to this question which will remain basically unanswered in this paper, we need to investigate goals of individuals per se, apart from goals evidenced by groups to which they belong.

INSTRUMENTAL GOALS OF INDIVIDUALS

The individual has two sets of instrumental goals which are essentially economic. The first relates to income; the second, to equity in asset holdings — to wealth, to use an old-fashioned word. The individual's income goals center on three properties of income: (1) level, (2) time distribution, and (3) variation. His interest in wealth centers on four properties of wealth: (1) total equity in owned assets, (2) structure of the equity, (3) rate of equity accumulation, and (4) fluctuation in asset values.

Society is interested primarily in income (or output), the flow of product from the capital aggregate. The capital aggregate itself has little social relevance in a financial sense. Social interest lies almost entirely in opportunities for increasing the flow of output, or contrariwise, the danger of diminution should the capital aggregate be reduced. Thus we engage in publicly supported research to add to our stock of real capital, as well as to better use the existing stock. Society is interested also in protecting certain assets from lasting impairment. Yet the effects of such action on the value of the capital aggregate have little social relevance. There are no gains from transactions available to "society" comparable with opportunities available to individuals within a society.

Income Goals

Of the three properties of income, agricultural economists have been most concerned with income levels. We customarily assume that an individual selects among alternatives to maximize the expected level of some net income. Ordinarily a time span also is specified (assumed), for purposes of classifying expenses into categories of fixed and variable with respect to output. The latter only are relevant in defining the net income to be maximized. In producing a given product, the costs of various levels of output are minimized when resources are combined to equate increments to costs from each resource (or resource aggregate). Returns above variable costs are then maximized, when, with a given outlay, resources are allocated among products to equate increments from each value of output above its respective marginal cost. So far these solutions for optima within the firm coincide neatly with goals of society in allocative efficiency and thus in economic growth.

Analytical complications arise immediately when income goals are extended beyond the simple one of income level in a given time period.

The passage of time entails, first of all, a distribution of income among time periods. An optimum distribution requires that a given aggregate of income be so allocated between time periods as to equate returns for each time period in terms of marginal utility. The notion of time preference is used to reflect differential values placed on units of income which differ only in time availability. Theoretically, the notion is clear enough. Empirically, the concept is difficult to use. Time preference is an individually conceived valuing system hardly subject to coherent estimate by an individual, much less capable of tangible measurement and aggregation over a range of individuals.

A second complication originates in the income consequences from uncertain expectations in: (1) quantities of resource use, (2) quantities of products available for sale, (3) prices of resources for which commitments are implied though not contracted, and (4) prices of products to be sold. From society's viewpoint this problem might be ignored were it not that the degree of uncertainty differs, for the farmer, among the different resources and products. Because of this difference, individual producers adopt production techniques and patterns of resource use which, while reflecting individual response to uncertainty, are not necessarily consistent with society's goals in resource use and in economic growth.

Agricultural economists have conceived of income variation usually in terms of variance — or at least of some symmetrical[10] measure of dispersion. Assuming the farmer does likewise, we conjecture that: (1) he prefers a smaller variance in income to a larger one, (2) he has a scale of preference which determines his indifference to selected combinations of level and variance in income, and (3) the rate at which he substitutes (with indifference) level of income for variance of income increases with increases in variance.[11]

Clearly we need to know far more than we do about the way in which individuals conceive of uncertainty before we can be even reasonably sure of our postulates on goals which relate to the passage of time. Moreover, we need to know more about the manner in which society can be said to be concerned with uncertainty. Society itself (or its chosen agencies) can err in expectation. Considering the consequences of such errors, there may be real benefits from allowing a large number of individuals to form expectations and make individual decisions. Through diversity, a measure of flexibility may thus be yielded which society might well afford to pay for, if necessary, with a sub-optimum resource organization when compared with one based on "certain" expectations.

Goals in Asset Equity

The legal, sociological, and economic structure of the firm in agriculture renders it peculiarly dependent on proprietorship equity as a

[10]An interesting attempt to introduce skewness is found in Heady, E. O., Economics of Agricultural Production and Resource Use, Prentice-Hall, 1952. See especially Chap. 15, pp. 439-64.

[11]Lange, O., Price Flexibility and Employment, Principia Press, Inc., 1944. See especially Chap. 6, pp. 29-34.

source of finance. Farming has long been known as the occupation in which the proprietor can lose money for 30 years and then retire on his accumulated capital! Certainly growth of equity stands high on the list of factors which motivate the farmer and serve as criteria for decision-making.

To measure equity the accountant uses net worth of the firm. If the firm is owned by a single proprietor, this net worth represents the value of the proprietor's residual claim on assets of the firm. Because the firm must be liquidated to allow him to exercise this claim, net worth must be regarded as one of the more remote factors which motivate the proprietor. Yet this is the final indicator of his total success in accumulating capital.

However, equity can be structured, managed, and hence used to promote as well as to measure success in management. Normally, the individual values proximate claims more highly than remote ones based on liquidation. These lead him to favor more rather than less liquid assets. Yet the larger the total equity in a given circumstance, the lower is the proportionate requirement for liquidity purposes. With a larger total equity the individual increases his access to loan funds and hence lowers his liquidity requirements.

Uncertain expectations condition the individual in equity management as well as in production and marketing management. They lead to conservatism in incurring debt even though the loan funds are expected to result ultimately in increased total equity. Uncertain expectations lead him also to so diversify his asset holdings as to reduce his reliance on a single (or few) asset(s). Opportunities for diversification increase with the size of total equity.

In connection with growth in asset equity, we are once more reduced nearly to conjecture on goals of individuals. Growth in equity results from an increase in prices used for valuing owned assets, a diversion of income to the purchase of new assets, or reduction of indebtedness. The diversion or debt reduction alternatives entail an opportunity cost which consists of utility from spending the diverted income on consumer goods and services. To benefit from appreciation in the price of assets requires the willingness to assume the risk that asset values might go down.

INDIVIDUAL GOALS AND SOCIAL GOALS

An individual contributes to growth if he: (1) responds to a situation of disequilibrium in such way as to restore equilibrium or (2) creates by his activity the basis for an increase in quantity or an improvement in quality of resources available to society. The first type of contribution comes simply from alertness to existing opportunities. Were an individual to conform to economic goals of society already outlined under "allocative efficiency," his economic success would be limited only by his ability to: (1) predict accurately the relevant ex ante production and consumption coefficients and prices and (2) manage the consequences of failure in these predictions. A society comprised of such individuals would, in the absence of economic change, allocate resources and products ultimately in accordance with the welfare conditions already outlined.

The second type of contribution may be the more difficult to make. One of the difficulties in relating goals of individuals to goals of society lies in the difference in values placed on income and on stocks of resources. For society a stock of resources is important only as a source of output. For an individual the stock of resources is important not only for this purpose, but also because his stock of resources creates the basis for a possible capital gain. In the latter purpose the individual alone participates. Capital gain is a phenomenon of market transactions — or market opportunities which exist among individuals within a society. Participation of a whole society in capital gains from stocks of resources is of nominal significance. Aside from some problems in distribution it would matter little to society in the aggregate if the value of all assets were to be reduced by half or doubled.

To improve allocative efficiency, we have shown that a further, even accelerated, shift of labor from farm to nonfarm employment would be beneficial. Yet, there is another type of adjustment which, were it possible of attainment, would have comparable results for agriculture. One reason for a lower marginal value product for labor (and other "personal" resources) in agriculture is found in the economic structure of the farm firm. Since, typically, the firm here is essentially a pure competitor in the sale of product, the marginal value product of its resources is simply the product of marginal physical product and price. The same resource(s) in nonfarm employment might well be used to produce a commodity sold by a noncompetitive firm. This reason alone might account for a difference in marginal value products from the resource(s) in question. If so, are social goals in economic growth served by an adjustment which equates marginal value products in these circumstances? Might they be equally well served by such institutional changes as would be required to change the relevant revenue function of the farm firm from a horizontal price line to a negatively sloped marginal revenue function? Let me make it clear that I do not necessarily recommend this type of adjustment. Yet it would have the same net effect in allocative efficiency.

We have as yet said nothing of social goals relating to tastes. This nebulous area may contain the real solution for several important problems of growth. Professor Homan has gone so far as to state, "If they are to participate very much in rising income, without specific public support, farm people will have to find other uses for their time than merely producing more for the market."[12] Yet, since farmers sell products as pure competitors, their individual incomes depend on quantity of sales. They do not — indeed cannot, as individuals — sense

[12]Homan, Paul T., "The social goals of economic growth in the United States," Amer. Econ. Rev., Vol. 46, No. 2, May, 1956, pp. 24-34.

the alternative of increasing leisure, hence reducing output and income. The alternative simply does not exist for the individual farmer apart from the whole group.[13]

Outside of agriculture, many people favor reducing the already shortened work week. Perhaps we need to investigate the circumstances under which the economic position of farmers would be better served were they to respond to technological change with increased leisure instead of increased output. To be sure, the results would be ineffective until some better means is found to relate the goals and actions of individual farmers when both are affected by group behavior. And this requires that we know far more than we do about group behavior and the determinants of group behavior. Yet failure to recognize this alternative may have serious consequences in terms of goals both for society in the aggregate and for individuals.

CONCLUSION

Technology is made available to farmers by agencies outside agriculture at a rate determined largely by factors external to agriculture. Within agriculture farmers innovate competitively. Innovation generates change — a healthy result for society in the aggregate, but uncomfortable for the individual farmer.

At present we allow the individual to benefit from rewards which accrue from increase in the value of fixed assets. To participate in this form of benefit, the individual must be willing to accept the uncertainty which might yield reductions in asset values. Clearly, society has no direct interest in this sort of individual income. Yet it may be the most effective means available to promote a continued rapid rate of innovation. Are there better alternatives? I think we must confess to considerable ignorance on this question. It may be one of the more important questions which exist in this troublesome area of goals and growth and consistency between these two phenomena.

Finally, we return to the question of the feasibility of developing a means for diverting unpaid labor from highly competitive application at extreme rates into varying forms of leisure. Do we need to move people from agriculture to a position from which they can regard leisure as a respectable alternative?

[13]Farmers are not alone in these circumstances. Most professional persons face a similar problem. However, geographically limited markets, product differentiation, and smaller groups have permitted most other groups to exercise, as groups, some control over output.

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Discussion

IN discussing Professor Baker's paper I should like to delineate three classes of questions. These are: (1) What questions are assumed to be answered in the paper? (2) What questions are answered by the paper? (3) What questions are left unanswered? To indicate all of the questions under each class would be too lengthy. However, I shall attempt to indicate at least one question under each class with an appropriate illustration from the paper.

QUESTIONS THAT ARE ASSUMED ANSWERED

One question that Professor Baker assumes answered is, "Can there be a moral science?"

The answer assumed by Baker is yes. In fact, if I may infer from what he says, Baker believes that, once a scale for measuring and predicting a human process is discovered, the same scale can be used for valuing the process, i.e., distinguishing between good and bad, right and wrong. If this is what Baker means when he says, "Even the terms appropriate for measuring growth may have consensus on criteria for valuing growth,"[1] then welfare economics is in a position to value utility. In spite of the well-known results of welfare economics, such a valuation has not been conducted. The recently developed tools[2] of measuring relative utility, which may be useful in predicting human behavior, are inapplicable to the situations of welfare economics where an absolute scale is implied.

[1]This quotation is from a first draft of the paper. A later revision reads, "Even the terms appropriate for measuring growth may have to await consensus on criteria for valuing growth." The conclusion that a valuing scale must be derived before a measuring scale can be discovered is the converse of the one implied by the original quotation. Since my comments apply to the possibility of a value scale in science, the comments are still relevant to Baker's revised statement. The second formulation is probably less acceptable than the original, because no generalizations of science up to the present have been dependent upon a valuing scale. This does not deny that a valuing scale in social science may be necessary before it can make comparable predictions to those of physical science, e.g., those of astronomy. It merely means that all the evidence to the present leads to the conclusion that only a measuring scale is necessary for description and prediction and not a valuing scale.

[2]Von Neumann, J., and Morgenstern, O., Theory of Games and Economic Behavior, Princeton University Press, 1947.

Really, value never has been described or defined, in spite of all the doctrines of desire, pleasure, etc., or the biological survival theories. Morals has no efficient basic concepts similar to such concepts as "differentials" in other sciences. It rests upon the first products of analysis, abstractions which are obvious, and, as these have not transcended common sense, the whole structure totters on a mythical stage. This stage is similar to the one which described the obvious abstractions of hot and cold, soft and hard in physics before the seventeenth century.

To assume that indicating social goals of allocative efficiency can be indicated by filling the gap between the actual situation and the equilibrium conditions is analagous to assuming a static universe in physics. Economists, not having borrowed any words from the recent developments in space-time physics, as they once borrowed from the mechanistic physicist, have been left with a static vocabulary, unable to cope with the process of change that appears on the surface of human endeavors. Unfortunately we must set out to solve a great moral problem without the words of description.

QUESTIONS ANSWERED BY THE PAPER

To state a question that has been answered by Baker's paper is the most difficult part of my assignment. Although it may be the result of having read a first draft of the paper, the central objective of the paper remains obscure. The words and constructions of the paper invite misinterpretation of the meaning; hence an effort to argue points can be futile.

With your understanding of my position, I shall state the following question and Baker's answer: What are two important instrumental goals in agriculture and how are they related? The two goals if I may state them somewhat naively are: (1) more leisure and (2) more income. (The question as to what these two goals are instrumental to is unanswered and properly belongs under the next section.) The relation between these two goals is an illusive, but, nevertheless, a subtle one. The "unemployment" problem which is supposed to exist in commercial agriculture (whatever it is) is the main impediment to the attainment of either goal. The unemployment problem can be solved, according to Baker, by: (1) movement of the excess competitors to the city, thus increasing income per capita in commercial agriculture, or (2) changing the preference functions of the unemployed to include more leisure without increasing their per capita income.[3]

Herein lies the relationship: You cannot have one (leisure) without the other (income). Although the unemployment problem is solved, it remains for the rest of us to ascertain the means of simultaneous accomplishment of the two instrumental goals: (1) more leisure and (2) more income.

[3]This solution to the unemployment problem is more aptly called a <u>deus ex machina</u>.

QUESTIONS LEFT UNANSWERED

In the paper, the list of unanswered questions concerning instrumental goals in agriculture is extensive. However, I would be the first to admit that the task assigned to Professor Baker is difficult, though nevertheless, an important one. The place of instrumental goals in agriculture, as well as in explaining any other human activity depends upon the initial adoption of some conception concerning the nature of man. Do we realize that we are asking for a 30 minute explanation of the essence of man? How can we understand the complexities of a society without first understanding the nature of the individual? Ascribing the same teleological nature to society as is imputed to man does not answer the question. Baker becomes involved in an analytical error when he says society has goals and places values on income and stocks of resources different from those of individuals. He thus ascribes the same nature to society as he does to the individual. Obviously there is no analytical reason for making this ascription which can only lead to discovery of conflicts and paradoxes when the presupposed goals are compared.

When will we recognize that progress in understanding of the great moral problems can come only with a comprehension of the nature of man? As long as we continue to slice life and nature into vertical strips, i.e., economics, sociology, etc., we will continue in our abstracting of man away from the situation in which he is found making moral judgments. Perhaps the abstraction in the case of human behavior should be to isolate the process within which the particular behavior takes place. Then we can view the particular behavior situations as a differential of the total process in question. The process must contain all the characteristics of the whole man.

In recognition of the "would-be psychologists," when will we permit an alien idea to enter our well-trained habits of economic thought? I believe that all human disciplines need to be directed toward morality, and I doubt that the topic of this conference falls outside this category. How long can we continue to tamper with a man's morals without having more basis than Bentham's and Adam Smith's word for a glorified Utopia?

Chapter 17

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Historical Goals and Political Behavior in Agriculture

IMMEDIATELY upon considering an assignment such as "historic goals relating to agricultural structure and income," the mind is crowded with a plethora of goals which farmers are commonly supposed to hold: farm ownership, family size farms, income stability and income equity, parity living conditions with urban people, educational opportunities, free enterprise, freedom, democracy, and so on.

At the same time, the orderly mind, when confronted with such a confusion of goals, seeks to tidy up this litter by attempting to establish some sort of a pattern or system for categorizing and arranging these goals. At once, the student is confronted with the problem of level of goals. He faces the task of sorting, weighing, and classifying a variety of farmer wants into goals, sub-goals, and instruments, which are merely means to goals.

He becomes entangled in such questions as: When does a means for achieving a goal become sufficiently institutionalized so that it, in itself, becomes a goal independent of the further goods or services it may create? For example, is family farm ownership an ultimate goal, or is it a sub-goal of the farmer's larger goals of economic security and political democracy? Or should family farm ownership be regarded merely as a means — an instrument which has been effective under a peculiar combination of historical circumstances in helping to achieve economic security? From this viewpoint, does the family farm have any greater significance than parity income payments or price supports? Are there, indeed, any ultimate worldly goals other than the one of "maximizing human happiness"? Are not, then, all farmer goals merely a graduated series of means for achieving happiness? Thus, this reasoning process runs on inclusively and fruitlessly.

Finally, the student seeking to identify farmer goals and, therefore, inevitably attempting to distinguish between ends and means, is brought up short by the pragmatist's basic questioning of the scientific validity of separating social ends from means. Having been connected with two academic institutions, one of which might be characterized as leaning toward the Platonic in its approach to research, and the other toward the pragmatic, I feel that I should remain a mug-wump in this open-end discussion of the role of means and ends in setting the framework for research.

Nevertheless, on pragmatic grounds (to use this word in its popular sense) I am going to deviate somewhat from my original assignment of discussing the historical goals of American farmers, because a discussion of goals would not do the job which I think the committee desires here. I believe that these goals were viewed by the program committee merely as a method of gaining an understanding of the social and political obstacles to "adjustments in the scale of individual farm operations, in reallocation of resources between agricultural products, and in shifts of labor resources to nonfarm activities." Merely outlining farmer goals throws little light on the question of what adjustments in agriculture are politically and socially acceptable to the American commercial farmer. Little light is shed on the question because if such goals are to have that harmonious and satisfying consistency which makes for neat and tidy analysis, they must be stated in large and inclusive terms — such as freedom, security, democracy, education — which are so general that they are almost meaningless as guideposts to the politically possible. When farmer goals are made more specific, they become, on their face, so inconsistent and self-contradictory, when extended over the dimensions of time and place, that they only baffle and confuse the observer. Why, for example, do Nebraska beef farmers and Maryland poultry producers seem to cling more loyally to the concept of free enterprise than do North Dakota wheat farmers or Tennessee tobacco growers? Even more confusingly, why do Iowa corn farmers customarily give political support to the symbol of free enterprise at the same time they seek government price fixing and accept government production regulation?

Therefore, rather than to discuss farmers' goals per se, I believe I can more usefully attempt a selective interpretation of the farmer's social and political psychology. Moreover, because my training is in political science, my discussion will focus upon political behavior. What is the farmer's political temper? What are his fears, values, motivations? How is his psychology reflected in his voting behavior? What limitations, if any, do the farmer's political attitudes place upon his elected representatives' choice of alternatives in agricultural policy? In other words, does the farmer political mind set limits within which the governmental decision-making process must develop its policies?

In such an analysis, farmer wants and needs — whether immediate or far distant — can be examined without attempting to identify them as ends or means. But, although such an analysis avoids the dualism of distinguishing between ends and means and of appraising them separately, this selective interpretation of the farmer political mind may have the weakness of distortion and over-simplification. I realize I will be setting up a prototype which has no such distinct existence in reality.

Research methodology in political psychology is not yet sufficiently advanced to isolate and weigh the various determinants of voting behavior of any sector of the population. Nor have techniques yet been developed which make possible the reconstruction of the psychological field of the individual citizen as he enters the polling booth. But primitive as the field of political psychology is, we all know that there is no one farmer mind. The farmer, like all citizens, belongs to many publics. He is a member of many overlapping and conflicting groups. He has a variety of conflicting needs, interests, motivations, and wants arising out of his membership in these groups.

Even as an "economic man" alone, the farmer's personality is split by his membership in diverse producer interest groups. The farm group is a conglomerate of heterogeneous interests, arising out of differences in commodity, region, economic class, and so on. Hence, when we speak of the "farmer political mind," we know we are depicting an oversimplified creature who has no existence in the blooming buzzing confusion of the real world.

How, for example, can we piece together a composite figure out of such diverse personalities as the head of a western corporation farm and a Mississippi sharecropper? A subsistence Negro farmer and an Iowa operator of a commercial family-type farm? A Montana farmer gambling huge sums on weather and market and a farmer scratching out a "low input-low output" living in the upland Piedmont?

Nevertheless, I believe that with all its shortcomings, a broad composite picture of group behavior can provide valuable insights into political behavior. Despite the many egos in which the farmer is clothed, I believe that a psychological prototype of him can be drawn which will be useful in explaining the political reasons for the shape and substance of our present farm policies. By "psychological prototype" I mean a sort of group psychological norm, or set of attitudes, which strongly influences a group's behavior. I believe that despite their great differences, commercial, politically activated farmers — because they have repeatedly experienced the same common coercions — have certain common denominators in psychological characteristics which are important determinants of their political behavior.

Undoubtedly, the use of the concept of social and economic class for interpreting collective behavior is too static and all-inclusive a theory to fit the realities of our dynamic, diversified, democratic society. Nevertheless, when we attempt to analyze agrarian political behavior, it is meaningful to characterize the American commercial farmer as having a mind that is essentially "middle class" in its anxieties, values, motivations, and aspirations. As the farmer has become commercialized, his entrepreneurial operations have caused him to take on the psychology of a middle-class businessman, to bury deep back in his mind his old consciousness of being a manual worker.

The quest for security is a universal drive of all mankind. Therefore, to say that the single most important motivating force in the middle-class political mind is the drive for security does not differentiate middle-class psychology from that of any other group. But the middle-class quest for social and economic security has its own peculiar characteristics. The middle-class security drive is one of protecting and maintaining a previously attained economic position and social status. Generally, this drive is manifested in fear and distrust of groups whom the middle class views as both above and below it on the economic and social scale. These groups are big business and manual workers. The middle-class prototype sees himself in the vulnerable position of being squeezed between these two groups. We all know that this middle-class fear in Germany was behind Hitler's rise to power.

For the past hundred years the agricultural population has lived in an environmental squeeze which has bred fear of losing position to the groups in the industrial sector. Agriculture consistently has been in the unfavorable position of lagging in its adjustment to the evolving price and market economy. It has had to struggle constantly to get in step with that economy. Although rapid industrialization and urbanization in Europe and America brought about a temporary scarcity of agricultural products from 1885 to 1914, technological change in agricultural production was reversing this condition by 1914.

Although the catastrophe of a world war twice temporarily halted this trend toward overproduction, farmers for the past 50 years have been living in the unfavorable economic situation of having to contract their supply to fit demands of the industrial sector. This environmental squeeze in which farmers have been living has caused the farmer's security drive to take the middle-class form of attempting to maintain a previously attained favorable relationship with the other economic groups. This fear of losing position in the economy is behind the American farmer's almost blind allegiance to "parity." "Parity" to him has become a symbol of equality with other groups, while 90 percent of parity has become a symbol of security. Farmer loyalty to the concept of parity, then, probably places one set of outer limits on the scale of choices open to the farmer's elected representatives in developing a new agricultural price program. Such a program, whatever its form, undoubtedly will have to include a parity provision which closely resembles the provision for 90 percent of parity, if it is to quiet farmers' security anxieties.

The farmer's allegiance to the parity concept also reflects a fear and distrust of groups in the industrial sector. Historically, the farmer has consistently disliked and feared "the monied interests." The potentiality of agrarian mobilization against the business community has been and still is of great political significance. Historically, farmer fear and resentment of monied interests has been expressed in agrarian crusades against excessive railroad rates, eastern banks, corporations and monopolies, the grain exchange, the harvester trust, and the jute and binder twine trust, and so on and on.

Today's farmer has not lost his old fear of big business. This distrust is always at the back of his mind as a potential threat to the farmer-businessman alliance, which is the central axis of the Republican Party. The farmer does not believe that "what is good for General Motors is good for the rest of the country." He does not subscribe to the trickle theory of economic prosperity. He prefers to share directly, as an equal partner, in prosperity.

For the same reasons that the farmer fears big business groupings, he also distrusts labor, particularly organized labor, as a threat to his economic status. The farmer is probably more anti-labor than is the business community. Certainly we know, on the basis of overt performance, that the farmer who is a large employer of labor has the attitude of a 19th century industrial capitalist toward unions and right to organize.

But the problem to which we want to address ourselves specifically here is: How does the farmer's security drive affect the development of agricultural policy? How does it affect his attitude toward governmental intervention in economic life? How does his attitude toward use of the instrument of government affect his voting behavior? Does his attitude toward government conflict with his voting behavior? If so, how does the conflict affect the process of representation, and consequently agricultural policy.

The farmer commonly has been pictured as a laissez-faireist, a rugged individualist who fears or distrusts government. But the farmer's historical performance proves that he has not been reluctant to use the instrument of government to better his lot. He has never been willing to abide by the operation of beneficent economic laws when they were working hardships on him. Also, despite the late H. L. Mencken's allusions to the "Bible Belt," the farmer has not been willing just to "take his troubles to the Lord and leave them there."

Historically, the agrarian group has been the sector in the population which has pushed very hard to bring government into economic life. Agrarian publics, from the days of the Grangers and Populists movements, have crusaded periodically to push government into the economic arena. In the first place, they have wanted to have government act as a <u>regulator</u> of economic life. Secondly, off and on during the past hundred years they have wanted government to act as an agent for dispensing positive social services. Since the days of the McNary-Haugen public of the 1920's, farmers have accepted the need for positive governmental assistance in maintaining their economic equality with other groups. Thus, the psychology of the farmer has been an important factor in the evolution of the so-called "welfare state."

But without examining the farmer's historical record, we still probably could predict what the farmer's future attitude toward the use of government will be under given circumstances. We have only to consider certain factors in his psychology and in his environment. The first factor which determines the farmer's attitude toward the role of government is his middle-class feeling of being in a majority position. A group which feels that it is in a minority characteristically rejects the possibility of governmental assistance. For example, labor in the 19th century was acting like a minority in its fear and distrust of government, which for labor was symbolized by the injunction. Labor had no hope of controlling government and of making it serve its needs. Consequently, under the leadership of Gompers, labor sought salvation through toe-to-toe slugging in the economic arena.

In contrast, the farmer, despite his steadily diminishing numbers, has maintained his majority psychology. The first census showed that 80 to 90 percent of the people lived on farms. The last census revealed that about this proportion now live off farms. Still, the farmer feels that he is in a position to control and use government, and despite the statistics of the census, this majority psychology is not too unrealistic. The reasons are: The general acceptance by all sectors of the population of the philosophy of agricultural fundamentalism and the over-representation of rural interests in our legislative bodies give the farmer a political majority position which he no longer has population-wise. His feeling of being a majority, which singlehandedly can call the political tune, is reflected in his spurning of any alliance with labor, and his unwillingness to make concessions to business as a price of the business community's support.

Secondly, the farmer's drive for security and his economic circumstances combine to force the farmer toward government. Political psychologists, in studying the problem of what activates a group politically, have discovered that the factor which is almost always present when groups become politically activated is a group feeling of insecurity resulting from a deterioration of the circumstances in which the group lives. This causal factor explains the paradox of some depressed groups living quietly and submissively for years in abject poverty and misery, while other groups, who are comparatively much better off, act quickly to remedy the slightest economic or social ill. A change or a threatened change for the worse in the conditions of living creates that consciousness of a common need which stimulates a group to seek political redress.

For a hundred years, the commercial farmer has been living under adverse environmental circumstances because of agriculture's tendency to expand more readily than it contracts and because of the relatively inelastic demand for agricultural products. It is the insecurity which the violent fluctuations in agricultural income create which has turned farmers toward government.

It is no historical accident that the great waves of agrarian discontent have coincided with the periods when the terms of trade were particularly unfavorable to agriculture. It is significant that each of these agrarian movements sought to remedy agricultural ills through government. The farmer, then, has been oriented toward government because the economic instability of his product poses a constant threat to his security.

In our political vernacular, we have come to identify liberalism with a sympathetic interest in bettering the lot of the common man. Because labor has historically been in an under-dog position in our economy, the liberal is frequently characterized as a person with pro-labor sympathies. Probably because of his anti-labor bias, then the farmer is commonly pictured as a conservative. But, if conservatism is defined as an unwillingness to try new methods, then the farmer cannot be described as a conservative. In his drive to protect his security, the farmer always has been willing to try new and radically different methods.

He is not afraid to experiment. When his security is sufficiently threatened he is always willing, as someone has said, to try a new pill. The danger in this psychology to the development of sound agricultural policy is that the farmer may accept nostrums and palliatives which cannot cure his economic ills.

It is a mistake to think that violence is solely the tool of a proletarian mob. From the days of Shay's Rebellion and the Virginia and Maryland tobacco growers' revolt to the days of the Farmers' Holiday Movement, the farmer has demonstrated that he can resort to violence if his security is sufficiently threatened. This action does not mean that the farmer is inherently a revolutionist. But it does mean that the farmer, too, will take violent action to protect his peculiar type of picket line.

I started out by saying that the drive for security is the common denominator which gives a pattern to farmer political behavior. This common denominator provides an explanation for the apparent difference in attitudes among the various commodity groups toward government intervention. It explains why elected representatives who are at opposite ends of the liberal-conservative spectrum on almost all issues will be found voting together on the "farm problem." Why, for example, do Senator Karl Mundt, conservative South Dakota Republican, and Lister Hill, liberal Alabama Democrat, have the same voting record on the 10 or 12 key votes on farm programs since 1947? The answer is, of course, the intensity of the insecurity psychology which the economic behavior of wheat and cotton has created in their constituents. Generally, the political formula holds that the greater the insecurities created by the economic behavior of his crop, the stronger the producer's drive for security, and, consequently, the greater his willingness to use government to obtain security.

Let us take wheat and cotton as examples of commodities which have been driven to a need for government aid. Every crop has its own special assortment of hazards. But wheat and cotton seem to have had an undue share. Wheat must constantly face the risk of low rainfall. Moreover, certain secular trends have put both commodities in a chronic state of over-expansion. Wheat is a victim of a change in consumer eating habits. Cotton is the victim of substitution of new synthetic fibres for cotton. New farm technology has been particularly effective in increasing wheat and cotton yields. Moreover, in farm production neither has economically realistic substitution alternatives. In contrast, the corn farmer faces fewer hazards from the weather. Soil and weather provide him with substitute crop alternatives. Also, his feed can be diverted from hogs to feeder cattle, or even to dairy cattle or poultry.

This difference in the economic circumstances of their commodity appears to the casual observer — at least during certain periods in the economic cycle — to have created in the wheat farmer and the corn-hog farmer differing attitudes toward governmental intervention. But does this mean that the wheat farmer and the corn-hog farmer have different basic psychologies? When subjected to similar economic coercions, the hog farmer's security drive will become as strong as that of the wheat farmer. I believe that the recent political behavior of Iowa farmers and their Congressional representatives support this conclusion.

Before leaving the subject of the farmer's attitude toward government, I should mention one other phenomenon in the farmer's political psychology, for it has had an important influence on agricultural programs. The farmer has been mislabeled as a political conservative also because he, like millions of other Americans, is the victim of a sort of political schizophrenia. He suffers from what Felix Frankfurter in his little book, The Public and Its Government, describes as an "unresolved inner conflict."

What did Frankfurter mean by the "unresolved inner conflict"? He means that a citizen who feels the squeeze of his own environment appeals to the government for positive assistance to extricate him. But at the same time, he holds tight to the political symbols (such as least governmental intervention is best, and every tub should stand on its own bottom) which he has inherited from an earlier revolutionary-frontier period. Therefore, the farmer who does not experience the environmental squeeze of the laboring man and of the businessman is quite prepared to apply against them the full force of his political symbolism — even though he consistently violates those symbols where his own felt needs are concerned. Thus, because of this "unresolved inner conflict" in his political philosophy, this political schizophrenia, if you will, the farmer is prepared to be a "welfare state" man where his own immediate interests are concerned, and at the same time, a laissez-faireist where other groups are involved.

This inconsistency in farmer thinking about the proper role of government has had an important effect on agricultural policy. It has meant that agricultural policy has not been built upon the democratic concept of the right and the need of all groups to equal governmental assistance. Rather, agricultural policy has been built upon a power struggle process in which political might makes right. In this process, the economically most disadvantaged groups in agriculture largely have been immobilized politically. For instance, in the one-party South a caste system keeps the low-income Negro group from participating in intra-party decisions. With political immobilization of the economically most disadvantaged, farm policy has become oriented around the needs of the commercial, politically activated farm groups. The regressive nature of agricultural policy is not the result of the Machiavellian machinations of the big planters of the South, the imperial western ranchers, the owners of factories in the field on the West Coast, or the corporation farmers in the Midwest. Rather, the regressiveness in farm policy is due to the unresolved inner conflict in the minds of the middle group of farmers who do not see and appreciate the need for also adapting governmental services to the peculiar needs of low-income farm groups.

For this reason, suggesting that the farm problem can be solved by an all-out program for aiding sub-marginal producers to move off farms into industrial employment is probably politically unrealistic. However economically sound such a proposal is, it probably would be politically unacceptable. The middle-class farmer mind sets the outer limits on political choices in farm policy. Although this mind feels the need for welfare services for its own group, it has failed to see the need for that totality of welfare measures, which such an all-out program would require if it were to be carried out in a humane and responsible fashion.

The fact that farmers have not committed themselves to the permanency of welfare state measures has an important effect upon the manner in which agricultural policy is developed. Because agricultural programs still are considered to be emergency measures to meet temporary situations of maladjustment, agricultural policy has been developed in a negative, piecemeal and ad hoc fashion to meet particular needs and pressures at a particular time and place. Agricultural programs have been in the nature of emergency improvisations to meet crises.

Because the need for a permanent agricultural program never has been accepted, no organized planning process which attempts to diagnose and integrate all needs and interests has been developed. The systematic dismantling of the BAE as a planning agency by the legislative branch and Congressional refusal to permit new formal planning instruments to take the BAE's place in the USDA had popular sanction because of the "unresolved inner conflict" of the middle-group American farmer. This failure to develop a planning process for preparing integrated and balanced agricultural policies has given full play to the centrifugal interest forces in the policy-making process.

The play of these centrifugal forces has tended to create certain distortions in the substantive programs of agriculture. These forces have tended to create imbalances in agricultural programs in terms of: (1) inequitable demands upon the resources of the rest of the economy; (2) regressiveness in the distribution of program benefits among various agricultural classes; and (3) emphasis on the short-term goal of emergency income supplements rather than upon genuine adjustments in production and consumption.

The question now is: How does the farmer's security drive and his attitude toward governmental intervention affect his voting behavior? Does his voting behavior reflect his views in the political process? How does his voting behavior affect the governmental decision-making process?

Thus far, I am sure I have sounded like a complete economic determinist. To a degree, I am an economic determinist. I believe that the economic coercions of his commodity determines a farmer's attitude toward governmental intervention in the production of his commodity. But, at this point in farmer political behavior, economic determinism and I have to part company. The reason is that the farmer who goes to the polls is more than an economic man. If he were not more than that, the wheat farmer in North Dakota and the cotton farmer in Alabama would be voting the same ticket. The farmer who goes to the polls is a "political man," and consequently his vote is affected by more than economic considerations. Students of political behavior have found that other factors (such as old loyalties to political myths and symbols, family voting traditions, desire for social status in the community) are important determinants of voting patterns. Probably only in severe economic crises can a farmer's voting behavior be explained in terms of economic determinism.

The cash grain, dairy, corn-hog, cattle-feeder farmers of the Upper Mississippi Valley and of the Northern Great Plains areas are traditionally Republican in their voting behavior. Due to the historical coincidence of the Civil War and to the availability of lands in these areas as a result of the Homestead Act, much of this region was peopled by returning veterans of the Grand Army of the Republic. They transmitted their political symbolism to the foreign groups with whom they intermingled. They set the political pattern for the area. Thus, through a historical coincidence, these areas became Republican and continue to vote Republican unless economic coercions become too severe.

Perhaps I should point out here, however, that the midwestern farmer, even in times of prosperity, is not quite as Republican-minded as the election statistics seem to indicate. Many so-called rural precincts include a rural town, which, small as it is, has a main street psychology that gives Republicans a majority in the precinct's election returns. This majority fails to reflect accurately the farm vote. But even when the vote of the rural main street is discounted, the midwestern farmer vote is normally Republican.

Whenever economic conditions are depressed, however, the farmer characteristically has turned to the Democratic Party. The reason is that the Democratic Party is more inclined than is the Republican Party to give the farmer the governmental assistance he seeks. Let us look at a few examples of this "swing pattern" in farmer voting behavior. In 1932, when the parity ratio for wheat had declined to 50, the Republican wheat states were driven into the Democratic ranks. They voted Democratic again in 1936. But in 1938, when the parity ratio under the Democratic administration had dropped from its 1937 high of 91 down to 76, the wheat states returned again into the Republican column.

According to a study (made by the U. S. News and World Report in cooperation with such magazines as Wallaces' Farmer), of farmer voting behavior in 1954, the Republican Party lost heavily in farm votes in Wisconsin, Minnesota, and the Dakotas, where dairy and cash-grain farmers were already feeling the economic pinch. But it lost only moderately in Iowa, where corn-hog producers were not yet feeling enough of an economic squeeze to give up the privilege of voting Republican. In contrast, by 1956, Iowa farmers also were feeling economically hard pressed and they were an important element in electing a Democratic governor and a Democratic Congressman in the 6th District.

The 1956 election is a particularly good illustration of the swing pattern in farmer voting behavior. Twenty Congressional districts throughout the United States switched parties in the 1956 election. Eleven districts switched into the Democratic column. Six of these eleven switches occurred in the top twenty farm districts in value of farm products sold. Three switches to the Republicans took place in the 263 districts where five percent or more of the population is employed in agriculture. But none of these three switches was in the top 100 farm districts. What makes these farm switches to the Democrats particularly significant is the fact that no switches to the Democrats took place in the 172 districts where less than 5 percent of the population is employed in agriculture. In contrast, the Republicans picked up six seats in these nonfarm districts.

What, then, has been the effect upon agricultural policy development of this swing pattern of farmer voting behavior? Is farmer voting behavior in conflict with commodity interest? The answer to the latter question is a qualified "No," as far as members of the House of Representatives are concerned. Republican Congressmen who are elected from farming areas are under the same commodity compulsions and pressures as Democratic Congressmen would be. The intensity of the economic coercion experienced by the commodity and the economic importance of the commodity to his area generally measure the extent to which a Republican Congressman will deviate from his party's stand on a particular farm policy. Therefore, as long as the Democratic Party is standing in the wings, offering a program of large assistance to the farmers, it cannot usually be said that a farmer is not voting his commodity interest in voting for a Republican Congressman. The threat of a Democratic swing is usually sufficient to keep rural Republican Congressmen "right" on farm issues. However, because of the broader economic base of their constituencies, a Republican president and Republican senators are less coerced by the threat of farmer disaffection.

Some students of politics have cited as an example of irrational political behavior Iowa's election in 1948, which returned 9 Republicans to Congress and at the same time gave its electoral votes to Truman. In actuality, the Iowa farmer was not acting inconsistently in such voting behavior. In fact, because of their emotional loyalty to Republican symbolism, Midwest farmers, without calculated design on their part, have put themselves in a favorable political position where they are offered a sort of "blue plate special" in representation which exactly fits their taste. They can have real tailor-made political representation. They can elect Republican Congressmen who act like Democrats on farm issues, and like Republicans in all other areas.

Of course, the important question which still remains to be answered is: To what extent does farmer thinking and feeling on farm programming and agricultural adjustments break through into the governmental policy-forming process? We all know that the representative process is not merely a mirror which reflects the psychological norms of the various social and economic groupings. It cannot and probably should not be such a mirror. Democracy is based on the proposition that its elected representatives take leadership in the formulation of wise public policies and in the development of an informed public opinion in support of such policies. Moreover, such factors as the personal predilections of elected representatives, the shadows on the wall which Congressmen sometimes take for reality, the institutional obstacles and internal politics in the governmental process itself, all combine to prevent the legislative process from being merely such a mirror.

Before we can estimate the extent to which farmer views are ignored, magnified, or distorted in the representative process, answers are needed to such questions as: What sort of institutional drives for power, tensions, and conflicts are generated by the workings of our constitutional legislative process? What are the intra-governmental politics of the policy-forming process? What is the role of the party, the commodity group, the farm organization, the "farm bloc," Congress and its committees, the presidency, and the Department of Agriculture and its bureaucracy? How do they interact in the formulation of agricultural policy? How do their interactions affect that policy? Time here does not permit any speculation upon these imponderables. But we do know that despite the fact that farmer views are sometimes ignored, magnified, and distorted in the representative process, the farmer's psychology, his wants, fears, motivations, and aspirations do set limits on what is politically possible in the legislative process. They set the outer bounds within which the governmental decision-making process must formulate its policies for adjustments in the agricultural economy.

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Discussion

I FOUND Professor Parks' paper most interesting to read and, in places, even entertaining.* The amusing transformation that Professor Parks undergoes from a pragmatist to an economic determinist and then to a political determinist is described fluently and expressively. The fact that the two doctrines, pragmatism and determinism, are dialectically opposed to one another gives reason to speculate that he may have been better off remaining a mug-wump.

Seriously, I think we need to consider two points in Professor Parks' paper. The first is his abandonment of an assigned topic and the second is an evaluation of the results of this abandonment.

He says the basic reason for deserting the topic is the impossibility of distinguishing between ends and means. The argument is based upon the pragmatist's questioning of the scientific validity of separating means from ends. A more pragmatic reason for abandoning the topic would seem, at first glance, to be the difficulty of describing the nature of goals. But, even the great pragmatist, John Dewey, did not abandon the notion of ends in his theory of morals. Thus, recourse to the pragmatists appears to be insufficient ground for changing the objective of the paper. Had Professor Parks adopted the pragmatist's view on ends and analyzed the historical goals relating to agriculture in this context, an extremely useful study could have resulted.[1]

An evaluation of the methodology of political psychology which is forced upon us by Professor Parks' choice of topics leads me to my second point. I believe he had as much difficulty keeping separated the economic arena from the political platform, as he claimed the pragmatists do in keeping means distinct from ends. I am sure he would agree that the economic arena cannot be kept separate from the political platform, and he realized this when he said, "...we are depicting an oversimplified creature who has no existence in the blooming buzzing confusion of the real world." The confusion of analytical abstractions with concrete entities thus plagues the field of political psychology just as it would if there were a field of economic psychology. The identification

*This first discussion is written by A. N. Halter.

[1]Ends, according to Dewey, are those foreseen consequences, which influence present deliberation and which finally bring it to rest by furnishing an adequate stimulus to overt action.

of specific acts as "economic" or "political" is an analytical abstraction that often hampers the validity of analysis. In the first place, such abstraction is likely to result in oversight of factors amenable to specific empirical investigation. In the second place, it increases the possibility of missing interrelationships between the different acts separated by abstraction. I can understand how the methodology of political psychology can deduce what appear to be conflicting results when it is based on the fallacy of misplaced concreteness. I do not believe that the relative newness of the field is the cause of its failure to explain human behavior, for contrary to Professor Parks' statement, the same postulates of political psychology have been with us since Aristotle.

Let me illustrate this from Professor Parks' paper. He says first that the cause of political behavior is a "group feeling of insecurity brought on by a deterioration of the circumstances in which the group lives." Second, groups which are on the bottom of the economic scale live quietly and submissively because there is no feeling of insecurity. Earlier he implied that labor before Gompers was at the bottom of the economic scale. Yet labor did not live quietly and submissively; it engaged in "toe-to-toe slugging in the economic arena." Thus political psychology, as is expected, fails to account for all the stated facts.

Upon reading Professor Parks' paper I was at once struck by his interpretation of the program committee's statement about the importance of studying alternative goals in relation to adjustments in agriculture.* He believes that the committee viewed the study of such goals "merely as a method of gaining an understanding of the social and political obstacles to adjustments in the scale of individual farm operations, in reallocation of resources between agricultural products, and in shifts of labor resources to nonfarm activities." He doubts, however, that an examination of farmer goals can throw much light on obstacles to needed adjustments in agriculture. He believes that a more promising attack is to determine what characterizes the "farmer political mind" and thereby ascertain the limits within which the governmental decision-making process operates to bring about the required changes in agriculture.

My discussion of Professor Parks' paper pertains to the character and role of goals, the examination of which he considers to be so fruitless an undertaking.

I believe the conference outline sets up something that is treated as a final goal or end and declares in a general way what measures are required in order that this end may be realized. In short, it suggests a policy for agriculture, a statement of what had better be done about the present situation of the American farmer. Professor Parks apparently accepts this policy as a "good" one, for he is concerned simply with the question of what obstacles the political attitudes of the farmer put in the way of its enactment.

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*This second discussion is written by C. M. Bogholt.

It is significant, however, that when Professor Parks comes to spell out in more detail what comprises the "farmer political mind" he talks about the farmer's motivations, his interests, his values, his wants, his aspirations, and his security drive. I agree with the author in holding suspect the utility of the concept of goals as a tool of analysis. The term "goals" is extremely vague and in some of its usages contains implicitly an entire value theory. But when Professor Parks uses such terms as aspirations, motivations, interests, desires, and security drive (goal?) to characterize a "farmer mind" it is fair, I think, to ask whether he has not let in at the back door what he has been at such pains to usher out at the front door. Professor Parks' terms clearly point to the essence of farmer values, what the farmer prizes and holds dear and what as a consequence of deliberation he decides to do when he is faced with trouble and conflict.

What is the ground, in any event, for treating the "farmer political mind," however characterized, as an obstacle? An obstacle arises here only because somebody has decided — quite apart from the actual purposes and interests of the farmer — what is good as an end and the means thereto. That the farmer's purposes and interests might constitute obstructions to the enactment of a plan so contrived is understandable. What is less understandable is the ground upon which such purposes and interests are excluded from consideration in what is finally determined to be desirable policy.

It appears to me that a view that makes such exclusion plausible must hold that a final end can be determined as good or desirable apart from the means. The end is considered to justify the means. With the effectiveness of the means determined, let us say in the present instance fewer and larger farms, what else can be done with purposes and interests of farmers which are in conflict but to exclude them and treat them as obstacles?

I believe that such a view of the relation of means-ends is erroneous and that a correct view of this relation leads to an alternative conception of the conditions that are required for the formation of adequate policy.

Chapter 18

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The Value Problem in Agricultural Policy

IN discussing the question proposed by the designers of this symposium, "The Philosophical Bases of Goals in Agriculture," I have found it necessary to restate the question, and perhaps give it more generality than was originally intended. I am unable to conceive of goals, as things in themselves, handed down by either pure reason or revelation. This difficulty arises not because goals or ends do not present problems, but because they are integral parts of action, including inquiry and judgment. Such action occurs in the context of society, and the kind of society makes a great deal of difference as to what ends a person can choose and enjoy. As economists we have our own unique relationships to the problems of value. The matrix of these problems is agricultural policy, public and private.

The basic difficulty in the value problem in agricultural policy, which is unique to our times, is rooted in the fact that the structure of the American economy is changing toward larger spheres of economic activity and power and has in this century become continuously threatened with instability. These conditions create a need for innovations in agricultural policy. Professor Hibbard characterized past agricultural policies very well, almost 20 years ago: "The objectives involved in these older agricultural policies were of a broad gauged character. The settlement of the country; the establishment of an independent, sturdy yeomanry; the promotion of the highest type of citizenship; the promotion of the highest degree of morality, happiness and prosperity. These policies were not, as a rule, to cure ailments, but rather to induce growth, to foster development."[1]

The announced objective of this symposium is strikingly similar to this characterization of earlier policies. However, we now have the benefit of a quarter century of experimenting with curing the ailments of agriculture together with our efforts to improve methods of social and economic analysis, including reconsideration of the role of economists in policy formation.

The men whom we honor as founders of our profession were deeply interested in agricultural policy. Reading early papers leaves an

[1]Hibbard, B. H., "Objectives in our national agricultural policy," Jour. Farm Econ., Proceedings Number, 1938, p. 37.

impression, on me at least, that these men considered it their responsibility to have some wisdom on the great policy issues. We scarcely use the word wisdom any more, yet, unless I am seriously mistaken, the general public still looks to economists, and other professional people, for wisdom. I do not see how it can be otherwise if we are to have anything important to say.

I

The most systematic recent effort by economists to deal with the "goals" problem is that of welfare economics. This effort does not appear to have been very successful. However, we are not interested here in arguing the possibilities and limitations of this approach. Rather we are inclined to examine the problem from another standpoint and treat valuation in agricultural policy primarily in relation to judgments and social organization, rather than from the equilibrium position in choices. This means that we shall approach the value problem in policy, and economics, from philosophical premises — attempting an integrated view of valuation issues.

The judgments in public policy are social judgments. The term social judgment probably is not commonly used. We use it here to refer to the way in which courses of action, public or social, are chosen in a society such as ours — the consensus. This is the approximate meaning of Graham Wallas in his little book by this title, in which he observed that, "The function of social judgments is the guidance of human action."[2] In this study, which he never lived to complete, Professor Wallas was concerned primarily with two problems: (1) knowledge in relation to the guidance of human action, and (2) the social and political organizations, "the institutions through which judgment influences social action." The first of these problems, in reference to our subject, is approximately the role of agricultural economics and agricultural economists in policy formation; the second refers to social organization, what is sometimes referred to as the social framework of economy. The first is important and we shall return to a consideration of it, but the second is, in my view, the really fundamental ground from which we can analyze the value problem in agricultural policy.

I want to place this latter issue before you, in general terms, through some quotations — the first from an essay on "Scientific Method and the Individual Thinker," by G. H. Mead, long of the Department of Philosophy of the University of Chicago.[3]

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[2]Wallas, Graham, Social Judgment, Harcourt, Brace, New York, 1935, p. 30.

[3]Arranged from Mead, G. H., "Scientific method and the individual thinker," a chapter in Creative Intelligence — Essays in the Pragmatic Attitude by John Dewey et al., pp. 222-24.

. . . The conception of a disinterested truth which we have cherished since the Middle Ages is itself a value that has a social basis as really as had the dogma of the church. The earliest statement of it was perhaps that of Francis Bacon... The full implication of the doctrine has been recognized as that of freedom, freedom to effect not only values already recognized, but freedom to attain as well such complete acquaintance with nature that new and unrecognized uses would be at our disposal; that is, that progress should be one toward any possible use to which increased knowledge might lead. The cult of increasing knowledge, of continually reconstructing the world, took the place both of the ancient conception of adequately organizing the world as presented in thought, and of the medieval conception of a systematic formulation on the basis of the statement in church dogma of social values.

This modern conception proceeds from the standpoint not of formulating values, but giving society at the moment the largest possible number of alternatives of conduct, i.e., undertaking to fix from moment to moment the widest possible field of conduct. The purposes of conduct, are to be determined in the presence of a field of alternative possibilities of action. The ends of conduct are not to be determined in advance, but in view of the interests that fuller knowledge of conditions awaken. So there appears a conception of determining the field that shall be quite independent of given values...

We postulate freedom of action as the condition of formulating the ends toward which our conduct shall be directed. Ancient thought assured itself of its ends of conduct and allowed these to determine the world which tested its hypothesis. We insist such ends may not be formulated until we know the field of possible action. The formulation of the ends is essentially a social undertaking and seems to follow the statement of the field of possible conduct, while in fact the statement of the possible field of conduct is actually dependent on the push toward action. A moving end which is continually reconstructing itself follows upon the continually enlarging field of opportunities of conduct.

In these few powerful sentences, the late Professor Mead seems to me to have stated the case for the general approach to the value problem, as values have been incorporated into the fabric of Western civilization. We have concentrated, he says, upon giving wide scope to the field of possible conduct. We have sought to expand the possibilities for conduct, to expand alternatives and opportunities. What is good must first be possible. The structure of social organization embraces the good as possible, as value possibility.

Very similar is the idea of Professor Knight, in the familiar essay on Value and Prices:

Society cannot accept individual ends and individual means as data, or as the main objective of its policy. In the first place, they simply are not data, but are historically created in the social process itself and are inevitably affected by social policy.[4]

From Professor T. V. Smith:

The greatest single social insight of the human race was institutionalized, if not indeed discovered, by the Founding Fathers of America. They discerned in the political field that the other man's "error" was but his way of seeking the truth. This led them to see that men do not need to agree upon their fundamental beliefs in order to live together in peace and to build a prosperous society. They had the grace to discern that virtue thrives on variety.[5]

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[4]Knight, Frank H., The ethics of competition, Harper, 1935, pp. 247-48, reprinted for Encyclopedia of the Social Sciences.

[5]Smith, T. V., Live Without Fear, Signet Key Book, 1956, p. 38.

From such insights we infer that the fundamental value considerations, in the literal "foundation" sense of fundamental, relate to the structure of society. What we may call social values are primary, and social valuation processes are a part of social processes — with "social" meaning the inclusive form of interaction, joint action, and association among men, embracing the economic, political, religious, etc. From this it follows that the primary focus of agricultural policy must be on social organization and social activity. If so, then considerations of agricultural policy, including the reckoning of goals, which rests upon the basic reference point of the equilibrium position of individuals, must be treated as a secondary and derivative phenomenon.

But having said as much, it must be conceded, I believe, that something is left over or left out — even if derivative — and this something does concern people as individuals and families. This is the field of private policy. We might call this area the locus of responsible acts of individuals — of natural as well as artificial persons (corporations), of families and all voluntary associations. In terms of individuals and families, this is the area of ability and capacity to act in contradistinction to opportunities, or the array of opportunities in the socio-economic structure. This is the field for conscience, for private choices and acts. The scope for individual freedom of choice and of conscience is basically — though not wholly — a function of the socio-economic order. It is an integral feature of society. This ability or capacity aspect is of very great importance to agricultural economists, of course. This is the area of education, of management decision, of citizenship, dignity, independence — of farm and home planning — and a whole host of other considerations.

The structure of social organization which makes the "good life" possible on a farm, through freedom of choice, etc., also provides a wide scope in American society for voluntary group action. But the sheer possibility of individual and private group action comes not from inherent rights or capacities of individuals; these possibilities are institutional and institutionalized. They are made secure and available for the choosing through social organization — more precisely through the channeling of authority and the resolution of power conflicts within society, which assure a zone of private discretion and security of expectations.

In his recent essay on "The Theory of Economic Policy," Professor Knight remarks:

> This new conception of freedom is that it exists in an exchange economy only if the parties are equal in economic power. It follows that if the state is to preserve freedom it must assure equality in that sense, or at least act to prevent too much inequality; and that duty becomes the main guide to rightful economic policy. The truth clearly is (I think) that the central issue of economic policy is the distribution of power between individuals (families and other actual units or organizations) and between these and the community, ultimately the sovereign state. This is the concrete form of the issue as to how far "society" ought to go in the direction of one or the other of the opposite extreme conceptions of freedom, or what is effective or desirable freedom.[6]

[6]Knight, Frank H., "Theory of economic policy," Ethics, July, 1953, p. 282.

From this sketchy foundation of indicated positions on issues which we take to be basic in considerations of political and moral philosophy, we now turn to a more direct consideration of "basic" goals, or the value problems, as they arise in discussions of agricultural policies and problems.

II

We might agree that we could call some aspects of our universe of experience social values. If so, we could probably also agree that what we refer to in general as Freedom, Equality, Security, Justice, Order, and Efficiency are social values. In one way or another the achievement of something suggested by these words makes life richer, more meaningful, more endurable, even possible as significant existence. Unless the argument of this paper so far is completely mistaken, humanity can enjoy such social values only because these values are ingredient as possibilities to the society in which we live and have our being. Many, many millions of people are born and die in societies pathetically lacking these values.

In respect to such social values, farm people in America have been among the uniquely blessed. Even so, these blessings are theirs not just by chance. Professor T. V. Smith has suggested that we are fortunate to have had, as predecessors, founding fathers who institutionalized, if they did not discover, what he called "the greatest single social insight of the human race" in devising a society in which people who differed in fundamental beliefs could live together in peace and prosperity. Furthermore, this way of living together is efficient in any and all senses of the term, as anyone can see for himself, by brief study of a highly civilized European country, where people of different religions associate so little with each other that they have separate social organizations, from political parties down to 4-H clubs. The inefficiencies of segregation in our country also illustrate this point.

Our own history, the settlement and development of this country, is so brief that we cannot, I believe, get adequate perspective on the value problems in policy except by considering our experience in the larger context of history and experience. Our basic institutions were imported. They, or some of them, have since become naturalized and modified. But in terms of the "goals" and values of life, we had in America a reasonably open field in which ideas of European enlightenment could demonstrate their possibilities, freed of the restrictions of the remnants of feudalism, class snobbishness, cramped quarters — and all the other impediments. Here the common man had a chance because the ideas intended to emancipate him could take root and grow.

Furthermore, what we may call the common-law method of developing law and administration, as in England, rests fundamentally upon the assertiveness of self-propelled people. Although the movement may have been rationalized in earlier centuries as an expression of "natural rights" in a manner now unacceptable to many scholars, the simple fact remains that the laws of property and business relations were derived through resolution of misunderstandings and differences, in ways which minimized conflicts and provided security of expectations to parties who were trying to assert themselves and their "rights."

The really tough fibre in the fabric of social organization is the law — for the obvious reason that the sovereignty which enforces it is essentially the monopoly of violence in a civilized state. Therefore, economists, with their interest in resources and markets, must turn to the law of property and contract if they would understand social organization as the matrix of the values of economic policy. Justice and public order are peculiarly achievements of the law; for purposes of this discussion we accept them as a part of the social overhead capital, so to speak.

Among the great social values, freedom is preeminent, I suppose. This in effect makes the conception of a free society the operative ideal, in the sense that persons have both the latitude for significant choices and the capacity to actualize them.[7] The central message of the British classical economists, J. S. Mill and his predecessors, was that economic freedom was the basis for national welfare and progress. As Professor Robbins has so eloquently reminded us, these men were social reformers, intent upon transforming institutions to make freedom operative.[8] Central to their system of policy, of course, was their emphasis upon private property and the market as instruments of freedom of choice. Even if we accept the judgment that failure to give adequate emphasis to the "power problems" is a serious defect in the classical theory of freedom, we must still view their accomplishments with awe and wonder.

The formative stages in the economic growth of American agriculture, particularly of the social and economic institutions, were approximately contemporary with the great years of articulation of classical economists. What we might call our basic economic philosophy came from the same roots, if not the same branches, as the classical economics of Britain. It came from Hobbes and Locke and their predecessors who gave meaning to commonwealth and related ideas; but especially from the Magna Charta, which eventually made ruler and ruled equal before the law, and from that long arduous struggle of the great jurists to differentiate the prerogatives of the crown into sovereignty and property, as depicted in Professor Commons' incomparable analysis, <u>Legal Foundations of Capitalism</u>.[9] All of this, and much more, was available, if not free, still for the taking through hard thinking by our ancestors who came to this vast wilderness.

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[7]For a recent illuminating discussion of these issues see, Haworth, Lawrence, "The free society," Ethics, Jan., 1957.

[8]Robbins, Lionel, The Theory of Economic Policy, Macmillan, London, 1952.

[9]Commons, John R., Legal Foundations of Capitalism, Macmillan, 1924, Chap. 4, The Rent Bargain - Feudalism and Use — Value, p. 214ff.

What was done is a matter of familiar history. In agricultural policy, to repeat Professor Hibbard's comment, we were intent upon inducing growth and promoting development. In this endeavor the law was truly an obliging servant.

In his recent book, Law and the Condition of Freedom in the Nineteenth Century United States, Willard Hurst of the Wisconsin Law School, has shown how the law was used to stimulate the release of energy. As he puts it: "The release of individual creative energy was the dominant value."[10] This effort to release energy was more than a protection of individuals from interference by other parties. The release of energy was a positive purpose and through the doctrine of the enforcement of contract "involved delegating the public force in the aid of private decision making"[11] — though not without qualification or reservation.

III

It is against such a background that the farm programs of this century can be understood. Much of the "push toward action" of farmers, their spokesmen, and representatives was directed toward improving the farm economy as a market-oriented system. But out of the distress following World War I, farm programs emerged which were directed toward replacing the market, or at least the "free" market, as the "governor" of the agricultural economy.

The farm programs of this century have modified in some degree the structure of alternatives of farmers, and consequently the accessible range of value possibilities. In public policy also, necessarily, some issues of public value in a free society are inherent in the rules by which private conduct and public action are canalized. Consequently in any adequate consideration of the "ends" of conduct in rural society, some attention must be given to the public value aspects of agricultural policy.

The agricultural adjustment programs have been criticized, sometimes severely, because of their abandonment of the market as the regulator and arbiter in economic affairs. Some critics have emphasized the prospective inefficiencies in production resulting from such innovations; other critics have lamented the dangerous encroachments upon freedom. The criticisms rest on common historical ground — the view that freedom of choice and of contract are the solid foundations of economic order.

The great concern over inefficiency does not seem to have been substantiated by experience. Certainly from a general social viewpoint, where aggregate efficiency is measured in terms of output per acre or man hour, the ratios have been increasing. When examined

[10]Hurst, James Willard, Law and the Condition of Freedom in the Nineteenth Century United States, University of Wisconsin Press, 1956, p. 7.

[11]Ibid., p. 11.

microscopically, the programs do not seem to have strikingly inefficient consequences; Glenn Johnson's study of the burley tobacco program indicated that this scheme actually increased one narrowly defined form of efficiency.[12] But the real basis of the concern over control programs evidently did not stem from research with respect to consequences but rather from value considerations.

Furthermore, the emphasis upon efficiency by economists was no doubt intended to give efficiency the status of an instrumental goal, rather than an ultimate end. However, the lack of inherent reference to more general value considerations tends in actual practice to give efficiency the status of an absolute value and seems to close the avenues of thought to the larger issues of policy in relation to social organization.

An issue of the latter sort is suggested by the fact that the central programs designed to achieve "equality for agriculture" have been built around a parity index which measures the relationship between two sets of independently variable markets. Perhaps the real explanation for the original use of the parity index is to be found in the necessity of administrative simplicity; perhaps the continued use of such indexes is to be explained largely in its value for commodity politics — a value enhanced by the implicit imputation of technological gains to farmers rather than consumers or "middle men." But whatever the reason for its persistence, the parity formula emerged originally from economic thought.

By the time the great difficulties of the twentieth century were upon American farmers, economics was well along the road to making the "commodity" the "basic abstraction of economics," to use the phrase of Professor Boulding.[13] Therefore, it was natural for persons trained in economics to provide at least the basic rationale for a conception of equality in terms of a ratio of commodity prices. It has become to be accepted by farmers, at least, as a statement of the principle of justice.

This simple conception of the measurement of equality and justice is evidently only an extension of the general view of modern mechanical economic analysis that exchange value is the only value of relevance to economics and that this value is measurable in price ratios. Professor A. P. Lerner stated the issue with his usual incisiveness in his review of Ayers, Theory of Economic Progress: "In economics the word 'value' is used to indicate the rate at which goods exchange for each other in the market, and this can be measured in a monetary economy by the ratio between their prices."[14]

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[12] Johnson, Glenn L., "Burley tobacco control programs," Ky. Agr. Exp. Sta. Bul. 580, Feb., 1952, pp. 80-83 esp.

[13] "The basic abstraction of economics is the commodity: its basic concept the transformation of commodities through exchange, production or consumption." Boulding, Kenneth E., "A new look at institutionalism," paper read at the Annual Meeting of American Economic Association, Cleveland, Ohio, Dec., 1956.

[14] Lerner, A. P., AER, Mar., 1945, Vol. 35, No. 1, p. 162.

The central idea of these action programs implementing the push toward "equality for agriculture" has always been, and remains, an intent to enhance the value of aggregate economic opportunity from agricultural production through restriction of sales in the face of an inelastic demand. This is equality toward other sectors of the economy. This touches a profound issue in an age of economic power with big business and big unionism combining to protect their own interests in strategic spots. This is the great question of equality of bargaining power or "two-sided collective action" in Commons' terms or "countervailing power" in Galbraith's felicitous phrase. The conceptions spring from analysis of urban economics, and precise analogies are lacking in agriculture. However, making this idea of equality operative requires a restriction of output; and restriction of output operates through the rationing of opportunities among farms — by acreage allotments, marketing quotas, participation in soil banks, etc. This rationing sets farm against farm and farmer against farmer. The idea of equality which operates against other sectors of the economy — parity prices — has no relevance to equality among farms and farmers.

These relationships among farmers have been worked out as a part of the rationing processes by which allotments are made to individual farms. In this process a conscious effort has been made to protect the small farmer, but the mechanical parity conception of equality and justice is simply inadequate for coping with the intense conflicts that arise within agriculture over allotments. Consequently, we resort to such rules as the historical base, "first come, first served" method of settling disputes.

Such controversial issues cannot be adequately discussed in this context. It is interesting, however, to note that the allotments to individual farmers characteristically attach to the farms, thereby raising issues of the relative sharing of benefits between owners and tenants. Laborers outside of the sugar allotment program have been beyond the pale. Reflection upon this aspect of current agricultural policy in relation to the agricultural policy of the nineteenth century, tempts us to conclude that in our earlier land policy we assumed that given opportunity to "get at" the land, our farmers would become owner cultivators; and that the policies of this century have assumed that this did, in fact, occur.

If the action programs in agriculture are, as they seem to be, a part of a great change in the structure of the American economy toward a more "administered" economy, then these programs will eventually have to be geared into the basic economic order and public procedures. There is much evidence that the twentieth century America is going through a new phase in the sequence suggested by the famous dictum of Sir Henry Maine that a society progresses from status to contract. We are evidently moving from contract to a new status; yet it is not precisely status, it is security through administrative determination of permissible practices in business and industrial organization. Social security is achieved partly through compulsory savings. Wage and labor standards stipulate the conditions under which labor may be employed. A principal common ground of all such administrative procedures is an intent to stipulate the limits within which freedom of contract may operate.

Despite all the regulations of this century, including all the agricultural adjustment programs, the right of alienation of land has never (or certainly almost never) been modified. One reason for this might be that such matters fall within the constitutional prerogatives reserved to the state. Taken altogether, however, and in rather sharp contrast to most other countries, not only are there no (or virtually no) restrictions on buying and selling land; there are only very limited regulations on rental contracts and only the most elementary minimum standards for the employment of labor on farms.

This does not mean that tenants and laborers have had no security, or that they would have had more security by regulations, but rather that such security as these people have had has been in the order of "good will" rather than legally enforceable rights, and especially because of opportunities in alternative employments.

The restrictions on land, as we understand them, have been on land use rather than on the conditions of purchase and sale through the police power. The very character of the "interest" in land is qualified. The qualification runs in terms of what is transferred when land is bought and sold, not the conditions under which it shall be bought or sold.[15]

Any adequate consideration of the value issues of agricultural adjustment programs would take note of the fact that the social values of freedom, security, and other rights have a substantive dimension in the operation of the economy as well as a procedural dimension within the social organization of the economy. But this aspect cannot be discussed here. Yet the significance of the emergence of administrative agencies in this century as what Commons has called the Fourth Branch of Government[16] cannot be grasped without the realization that freedom and security, for example, have both substantive and procedural dimensions. The total of each is a product of these two dimensions — as area is a product of length and breadth. As Glenn Johnson has so significantly remarked in the tobacco study: "Freedom to determine what and how much to be produced has been reduced under the programs; freedom has been gained, perhaps, in terms of increased ability to act which has come with the high level of real incomes."[17] In general terms, and as noted by Professor Haworth of Purdue University, in a free society

[15]As a corollary to this, the permitted size of farm is not restricted. This point is emphasized by Professor Murray Benedict in his Farm Policies of the United States 1790 to 1950, Twentieth Century Fund, 1953, pp. 509 and 518. In the latter citation he observes that there have been persistent demands for measures designed to check the growth of farm size, and to break up large holdings where these already exist. He makes no specific reference to the demands.

[16]See Commons, John R., Economics of Collective Action, chapter on Agribultural Administration.

[17]Supra, p. 82.

freedom includes both the opportunity to make choices and power in action.[18] The action programs of agricultural adjustment in our day are evidently attempts, however fumbling, to assure at least some farmers that freedom shall have a tolerable dimension of "power to act."

IV

The problem of "ends" in agriculture of farm people is a part of the consideration of conduct. It seems appropriate for economists to focus attention initially upon the treatment of ends in economic analysis.

It has long been an accepted professional ethic for specialists as counsellors in farm management to take the "theoretical" position regarding the purposes of farm families by saying "If you are interested in maximizing profits, I can help you find (some of) the means for doing so." In this view economic analysis is purely instrumental. It seems to me to be intellectually acceptable, and although I suppose an alerted restraint on the part of an economist is required to stick by this view, it seems possible. Such procedures have the merit of trying to avoid imposing our views on other people.

In this way the problem of ends is by-passed. The end is taken for granted, partly because the product is money, a fund of purchasing power. The genuine decisions regarding use of means in relation to ends are made in a different context from this money base. Professor Dewey once remarked that: "Business calculation is obviously of the kind where the end is taken for granted and does not enter into deliberation. It resembles the case in which a man has already made his final decision, say to take a walk, and deliberates only upon what walk to take."[19]

In rigorous statements in economic theory, ends are often accepted as given. In the most rigorous statements, ends are treated as given in order to provide the conditions for defining the equilibrium position of an economic system. A common practice is to speak of the hierarchy of given ends, conformable with the indifference function formulation of the demand function. Professor Black in his recent text puts it this way: "A soundly conceived science of economics' . . . takes as given any ends or values or sets of ends or values, that an individual or a family, or a nation, or a society of nations may set for itself consciously or unconsciously and proceeds from that point to discover how resources can best be used to realize these ends or values."[20]

Professor Heady has recently demonstrated how this general position on ends can be used on the central concept in "The Basic Logic of Farm and Home Planning." He says:

[18] Supra, Ethics, Jan., 1957, p. 120.
[19] Dewey, John, Human Nature and Conduct, Modern Library, New York, 1930, p. 215.
[20] Black, John D., Introduction to Economics for Agriculture, Macmillan, 1953, p. 12.

> Economics is the science of choice and decision making: planning must relate to some end to be maximized.... Defining the optimum plan for the farm family... requires knowledge of the slope of the family of indifference curves, and, hence of the relative values that farm families place upon different items or activities of consumption. We doubt that extension workers can or should do much about selecting this final optimum. The choice (presumably of the final optimum) should be left up to the family, after they have been provided the relevant economic principles for making choices.[21]

In another context Professor Heady has defined the principle of choice, as based upon the use of a "choice indicator": "a criterion indicating which of two or more alternatives is optimum and will maximize a given end."[22]

These are all different ways of saying the same thing. Two points are common to the positions of these economists: (1) ends and means are separated; ends are data, which stand alone so to speak, independent of the means of realization. (2) Whatever evaluation, whatever judgment, which exists about the worth of an end is made antecedent to, or independently of, any act of economizing or any analyzing by economists.

At least this much can be said with certainty about such positions. They do not touch the problem of value; indeed they avoid it. It is logically necessary to the rigorous conception of equilibrium that certain of its constituent elements be mathematically constant. Though the condition of total optimality requires that the other constituent parts be optimal, it does not follow at all that the constant constituent parts are in fact optimal. Still further, if these constant parts were to become optimal, the other parts would have to change in order to maintain optimality. To assume that all parts are optimal is to confuse fact and idea. In fact, this whole procedure, when related to the problems of value, simply amounts to saying that "whatever is, is right," except possibly for some reproportioning.

When the currently popular conception of the hierarchy of given ends is considered in relation to the formulation of the value problem by Professor Mead in the above excerpts, this current practice would seem to be a case of reverting to the formulation of "ancient thought" which allowed the "assured ends of conduct" to determine the world against which hypotheses were tested; or perhaps more accurately, it holds the possibility of opening the way for a reversion to the medieval view that the world of thought and action should be organized around social values presented to mankind as dogma. Actually, however, the position is in a sense worse than either dogma or reversion to the assured ends of conduct, as it makes answers to questions a matter of accident.

On the face of it, is it not preposterous for scientists to assume that the people of this country have actually arrived at final and wise positions on most of the things that really matter in planning their lives; or

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[21]Heady, Earl, Jour. Farm Econ., Vol. 38, No. 1, Feb., 1956, pp. 80 and 88.

[22]Economics of Agricultural Production and Resource Use, Prentice Hall, 1952, p. 33.

on the issues of public policy? Since no one considers people omniscient, this is only a way of saying that they have made up their minds. This, of course, is not true and not intended. In fact, I would have supposed that having tentative and suspended judgments on a whole array of issues was the mark of a cultivated and civilized mind.

We do not rid our work of value implications by declamation. What we do in our research programs, as well as what we write in journals, etc., is done in response to needs and problems, and our findings are inherently related to such needs and problems. Furthermore, economists, including those who assert that ends are to be taken as data, do not refuse to make recommendations and pronouncements on policy issues. The key issue in this matter is the question of whether facts have meaning. In my judgment all social facts have meaning; if they do not, they are either not social or not fact. Economists have traditionally been expected to have something to say about policy, beyond merely stating that "if you do this, that will probably happen." The function is indispensable. If economists do not do this, someone else under some other name must do it. If we define economics so narrowly as to exclude all consideration of ends, economists, to be economists, as the public understands the term, must study something more than economics.

What is the trouble? Where is the problem? Formally, it is very simple; economists are trying to handle the value issues by assuming whatever theory of behavior is required to justify the use of the analytical apparatus at hand. Practically this is not the way the human mind and judgment operate — as far as I have been able to understand them. What economists call ends do not operate in thought as targets do in archery. The technical name for positions taken and withheld from examination is prejudice. What we refer to as ends are really ideas or notions to which people anchor for direction and steadiness of thought particularly at the career-shaping strategic moments of decision. They are a part of the very process of deliberation. What we refer to as ends are really principles of action. These principles or guiding ideas function in the practical judgments of farm people about what to do very much as the concepts of economic theory operate in the minds of economists. They function as predicates. The guiding ideas of everyday life are interpretations of the meanings of things encountered in life; such as "when a farm boy goes to college he is not likely to return home and farm." The neighbors predicate that the boy will not come back, let us say, because they have seen similar cases over a number of years.

We call the fund of such meanings common sense; or for individuals we call such meanings a philosophy of life, for it has a design. People obviously can and do gradually add a more scientific content to their common sense views about farming. People do learn from each other — by watching and appraising how neighbors do things and invest their lives. The conceptions and ideas which serve as the intellectual structure of careers over a lifetime can certainly be investigated so that the "philosophies of life" of succeeding individuals can actually be made more effective, by any reasonable criterion.

The reluctance to tamper with the "ends" of people, the unwillingness to invade their privacy and tell them what to do, is a sound instinct. But giving people help and direction in such things can be, and should be, an educational process.[23] Whether or not any person can help a farm family in this educational process depends, exactly as in the classroom, on whether he knows enough and is a true educator. The tragedy of the assumption that ends are "given" is that it leads eventually to the idea either that "ends" — the guiding conceptions in conduct — cannot really be studied or that they should be handed down authoritatively. In either case the implication is that creative intelligence cannot be brought to bear on such vital problems. Regarding the relation of acts to values, Professor Mead has remarked:

> When we actually get two values into our experience in conflict, they do not appear so much as ultimate satisfactions as in terms of the process of getting them. What we actually think about is the process of doing this and that. We want to do both, and then we present to ourselves the action as going on. In presenting the values in terms of imaginary experience, we bring them into relation, and we finally find ourselves doing this rather than that. We state values more in the actual process of carrying out the project than in terms of pleasure and pain, and then we bring these projects into relation with one another. We may be able to get both of the values by rearranging our conduct.[24]

In looking closely at an American farm with its most astounding complexity of interrelations as a physical plant and as a business enterprise, with its intricate connections with the lives of the family members who create and maintain this organization and are in turn nurtured by it, the conclusion seems inescapable to me that some genuine understanding of economics and economic processes is required by anyone who would attempt to help farm people evaluate their goals, the courses of action which should be taken.

We do not, it seems to me, need a very elaborate set of propositions to start analyzing and evaluating ends — the ideas by which farm people guide their conduct. The beginning point is life as it is lived, the experience of farm people. The very conception of conduct, of the responsible act, requires that people have at least some idea of where they are going. It would be rare indeed for a farm family to be successful, by anyone's criterion, by sheer accident alone. Rather, it is to be expected that the career of a whole lifetime is given guidance by a few basic ideas which gradually develop and unfold as life is lived — "a moving end, continually reconstructing itself" in Mead's terms. William James has remarked that the most important achievement

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[23]See Shepherd, Geoffrey, "What can a research man say about values?" Jour. Farm Econ., Vol, 38, Feb., 1956, No. 1, p. 15 esp.

[24]Mead, G. H., "Moral behavior and reflective thinking," Essay 24, The Philosophy of the Act, University of Chicago Press, 1938, p. 463.

anyone ever makes is to work out a philosophy of life. This would seem to be emphatically true for farmers who carry the responsibility of the coordinated organization and development of a farm as a going concern for decades, during which time they also are heads of families and are responsible for the investment program which provides the financial endowment for their old age and possibly the beginnings of careers for their children.

The problem is how to "construct the good" from experience. In this, wants or desires are but the raw materials. Not the desired, but the desirable is the criterion. Speaking to this point John Dewey has observed: "Enjoyment becomes a value when we discover the relations upon which its presence depends . . . or when enjoyments are the consequences of intelligent action."[25]

The problem of evaluating goals, of deciding what a family ought to do, may be illustrated by the questions that have to be faced when a decision is made in the family regarding whether or not a son should be taken into the business as a partner with a future. Such questions may involve the future lives of two families and the way they can be fitted together; the use and disposition of the family capital; the maintenance, expansion, or contraction of the scale of operations, and so on. Farm families simply do not have clear and dependable ideas about many aspects of such complex decisions. They are frequently so much involved emotionally that they cannot even bring themselves around to talking with each other in the family about what they all profess to think worth doing, father to son, parents to children.[26]

Our conclusion is that goals as principles of conduct can be investigated. If they are principles of conduct, they form a pattern for an individual of the conception of the good life. The economic element, the struggle to make a living, or keep a business solvent, is a major if not the dominant factor in the farmers' problems. What we evaluate are possible acts, acts that really count. Many acts are routine and automatic; some are strategic and shape lives and concerns. The farm as a going concern consists basically of coordinated action, with the acts variously implemented. In a family farm, family members are the actors. What they do is a means to their objectives. But the means and objectives form a continual flow, where the objectives give meaning and direction to what is done, and the doing is the means of realizing what is intended. What needs to be done requires the insights of professional analysts including economists. The relation of means to ends is a problem to be investigated, not a hiatus.

The choice of individual objectives or ends in a free sociaty is fundamentally a matter of the methods by which experience is assayed for better or worse ways of acting upon accessible alternatives, and the capacity of the person to actualize value possibilities — all within the field of conduct made possible by social organization.

[25]Dewey, John, The construction of the good," Quest for Certainty, p. 259.

[26]For example see Long, E. J., and Parsons, K. H., "How family labor affects Wisconsin farming," Wis. Agr. Exp. Sta. Res. Bul. 167, especially pp. 12-14 and 30-32; and Parsons, K. H., and Waples, Eliot, "Keeping the farm in the family," Wis. Agr. Exp. Sta. Bul. 157.

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Discussion

THE consideration that led the planners of this conference to include a discussion of the present topic is stated in the conference outline. If the farmers in our growing economy are to have a commensurate share of the rising national income, important adjustments in agriculture are required, namely fewer and larger farms, a transfer of labor resources, increased efficiency in use of farm resources, and a conformity of the supply of products to consumer demand. To accomplish these adjustments we must, among other things, know more about "the nature of alternative goals which have relevance to the number of farms and the size of the farm population or labor force."

I suspect that were I more familiar with the field of agricultural economics than I am, this statement would be quite clear to me. As matters stand, I am puzzled by it. Does it suggest that farmers and, perhaps, public officials concerned with matters of agricultural policy have interests the pursuit of which might impede the declared necessary adjustment? And that a study of these interests in their bearing upon the scale of farm operations and the size of the labor force is, therefore, recommended in order to expedite the required adjustment?

I expected that Professor Parsons' paper, directed as it is to the subject of value problems in agricultural policy, would help to clarify matters for me. It did not. Actually his is not a discussion of the conference outline question at all. The upshot of his remarks, if I understand him, is to raise a question about the question put by the Conference Committee.

Values (goals) are social affairs primarily. I take Professor Parsons to be saying that values (goals) are prior, antecedent to the career of any given individual in the sense that language is so. The American farmer inherits the values (goals) of the complex of insititutions that constitute his culture, the most important of which are freedom, equality, security, justice, order, and efficiency. It is clear, therefore, that the primary focus of policy questions in respect to agriculture must be upon social organization and social procedure. Viewed from this standpoint, Professor Parsons declares, it will be seen that questions of agricultural policy will be adequately formulated only within a more comprehensive framework of ideas than that of agricultural operations and rewards. His suggestion is that the central question of policy at the present time is how to assure equality of opportunity through procedures for resolving power conflicts. Economic freedom thus attained nourishes the other values (goals) which are the basis of the good life on the farm or anywhere else.

The term values (goals) that is used in these discussions has, I confess, bothered me. I believe something would be gained in dispelling the vagueness of this term if we were to follow the lead of John Dewey who distinguishes between two usages of the term "value." In one usage "to value" means to act in a certain way toward an object, the sort of action that can be indicated by saying that something is "cared for," "cherished," or "prized." Thus a mother cares for her son; an academic man prizes his freedom. In this sense of the term, "to value" marks nothing deliberate, nothing into which decision enters.

Another and distinct usage of the term "to value" marks something that is the outcome of an activity of comparing and relating, of deliberation and decision. Here "to value" means "to evaluate," to appraise. As we all know, we may prize something which turns out upon reflection to be unworthy, we may hold something to be good which is not as we say "really" good.

I take it that Professor Parsons when he speaks of freedom, equality, et cetera, as social values is pointing out that social organization and procedures in being are such that specifiable practices falling under these general heads are permitted and intermitted, that, generally speaking, we value in the sense of prize these practices, hold them dear, and that we insist that the new generation do the same.

I take Professor Parsons to be saying, as well, that a given status of the American farmer in respect to income level is properly conceived as chiefly an outcome of existing social practices and that the condition of successful control is the establishment of connections between the outcome and specific practices. What is advisable, desirable to do about the American farmer's plight, the policy question, is a matter to be determined only in the light of knowledge achieved about such connections. The objectives, the goals, the policies so determined are outcomes of deliberation and decision with respect to situations that are unique. As such they always contain a novel factor, always reconstruct in some respect existing values in the sense of prizings.

We go astray, in short, when we suppose that the desirability of some objective, goal, or end is so securely established that all that remains to us in dealing with existing troubled situations is to find the means to this end. This statement stands whether we declare the end to be freedom, security, or maximum satisfaction of wants.

It is my opinion that this is one of the main contentions of Professor Parson's paper concerning value problems and agricultural policy. I agree with him and agree with him, too, in considering it a matter of primary importance in defining areas and methods of research.

PART VII

Summary

Chapter 19

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Summary—Prospects and Proposals for Adjustments in Agriculture

THIS is a summary paper of the conference proposals in the preceding papers, with emphasis on regional and local research needs. It is intended to be a rather broad and general summary concentrating on discussion of the areas of research that appear most urgent.

TRENDS IN COMMERCIAL AGRICULTURE

This conference has clearly demonstrated that commercial agriculture in the United States is in the midst of a huge and continuing technological breakthrough that is putting pressure on farm prices and incomes and forcing widespread readjustments in resource use.

The major indicators of this technological change are well known to us. Since 1940 the number of people in agriculture has declined from about 30 million to about 22 million. Man-hours worked in agriculture have declined by one-third. Output per man-hour has about doubled. Yields per acre have increased. In 1956 production of crops was almost 25 percent larger than in 1940 with only a 2 percent increase in acreage of cropland.

Clearly there has been a significant technological breakthrough and we expect this to continue. In the next 15 or 20 years the farm population will continue to drop if appropriate adjustments are made. Output per man-hour in farming is expected to increase by more than 35 percent in the next 10 years.

Heady and Ackerman in their opening paper have pointed out that agriculture's share of the gross national product has declined from 16.1 percent of GNP in 1910 to 5.9 percent in 1954. In 1955 farm income was 77.9 percent of 1947-49 whereas gross national income was 148.5 percent of 1947-49. National income has increased 6 percent per year since 1950. Net income per farm from farming has declined by 23 percent since 1950. Off-farm earnings of farm families have increased significantly, however, and with the decrease in numbers of farms, the real income per farm family has not materially declined

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since 1947-49. But farm families in general have not shared proportionately with nonfarm people in the upward surge of the real level of living in the United States.

This great technological shift, which is bringing material benefits to the people of the United States, raises important economic problems for agriculture. These problems call for adjustment of resources both within agriculture and between agriculture and the rest of the economy. The upward surge in productivity per man, without a corresponding flow of labor out of agriculture, has increased the value of the marginal product ascribed to land and has shifted the terms of trade against agricultural labor resources. Land prices have risen. At the same time that terms of trade have been shifting against agriculture the price of land has risen relative to prices of farm products as well as absolutely. Labor saving and/or output increasing technological advance would, with constant prices, increase the value of the marginal product of a given unit of land. Also this advance, accompanied by excess labor resources, or by certain scale economies in equipment and non-divisibility of family labor units, has resulted in increasing the marginal rate of return to land in the family-farm unit as size of unit increases. This enables farmers to pay more per acre for an additional piece of land than they would be justified in paying on the average for the entire farm acreage.

We are therefore properly concerned with the following types of problems: (1) adjusting enterprises and size of farm (that is land and capital) to technological advance; (2) increasing the mobility of labor; (3) dealing with the capital problem which is heightened by the existence of excess labor resources; (4) finding ways of exploiting off-farm sources of income; and (5) developing policies or programs designed both to adjust supply and demand and to bring about the suggested resource shifts. We are concerned with the over-all problem. The purpose of this conference is to examine the entire structure of economic phenomena involved in solving the basic problem of adjustment.

Major elements in policy can be identified by examining the various kinds or areas of research. These can be listed as follows: (1) research on the economics of adjustment of the individual unit to technological change; (2) research on population movement, examining problems encountered and solutions reached by people who are displaced in agriculture by technological advance; (3) research on the capital problem of agriculture, including the problem of financing the increasing amount of productive assets used per worker (now at about $18,000 per worker in commercial agriculture); (4) research on off-farm sources of income available to farm people and on the changing role of part-time farming, to determine how off-farm income can best be used to supplement the income of farm families from farming and best contribute to the productivity of the American economy; and (5) research on the role of policy or the types of programs that will be most effective in adjusting supply and demand to technological change. Such a program of research would give emphasis to the types of adjustments required for technological growth and development and the methods of bringing about such adjustments.

There are, of course, other important areas of research in the field of agricultural economics, such as adjustments in agriculture occasioned by the development of superhighways and other transportation facilities, and changes brought about by the changing structure of markets. Also questions of taxation, school reorganization, and the like are important in the field of agricultural economics although these are somewhat outside the scope of production economics. This paper is not intended to review the individual papers in detail but rather to comment on a few remarks and attempt to concentrate on suggested areas of research.

ADJUSTING THE ECONOMIC UNIT

We agree on the long-run solution to most efficient use of agricultural resources and to more satisfactory incomes for farm people. The answer is to be found in fewer labor resources in agriculture and in a smaller number of farms, such as would be achieved by a continued decline in the number of farms at a rate of 10 to 15 percent every 4 or 5 years for 15 or 20 years. If this is the case, or approximately so, then our task is to discover the alternative ways by which the agricultural economy can best reach the assumed equilibrium.

Crickman remarked that the adjustments are complex and varied depending on the structural changes needed in different farms. He placed some emphasis on the fact that farms in the Corn Belt and wheat regions have too little land rather than too much power and machinery. This clearly suggests that modern technology has changed the economies of scale and is giving some relative advantage to family farms that are considerably larger than the mean. This advantage apparently arises out of the fact that many technological developments have important secondary effects.

Robertson, in discussing "The Agricultural Production Plant," has pointed out the need for farmers to be able to choose among alternatives in modernizing enterprises and in selecting enterprises for modernization. Farmers who try to keep abreast of all technological changes at the same time encounter problems of obsolescence and capital rationing. Robertson suggests that our problem is to show how to choose among the major alternatives and how to select the most profitable enterprises on which to concentrate in the process of modernizing. He also points out that the process of selecting enterprises should include alternatives of off-farm employment. Robertson and Crickman agree that what will be appropriate or profitable to the innovator will depend on his resources and given situation.

In this connection some research effort on the decision-making process should begin with ways to identify major alternatives. Considerably more is lost to the individual and to society by failure to identify the broad scope of alternatives than is lost through mistakes in management once the scope has been narrowed or is restricted to a given type of enterprise. Thus, considerable loss is suffered by farm youths who pass up major career opportunities either through wrong counseling, no counseling, or lack of vision on the part of themselves or their family. We have been woefully weak in career management and in the identification of major career opportunities as compared with our successes in farm management. This does not mean that the pinnacle has been reached in farm management or in production economics. Rather it suggests that the concept of management should be broadened — where this has not already been done — to cover all major alternatives of the members of the family.

In recent years production economists have made substantial progress in linear programming. The device is useful, given certain resource restrictions. Our problem now is to examine these restrictions and to develop new techniques for reaching the optimum solution when the bundle of resources is not fixed. Relationships are not linear when important economies of scale are involved. Production functions assume new shapes with technological improvements, and the problem becomes one of figuring out what new shapes are being developed and how resources can best be adjusted to new factor-product and factor-factor ratios.

The underlying assumption here is that increasing agricultural output is a continuing and basic objective of our work. Sherman Johnson points out that most innovations in agriculture have been output increasing. Shifts in production functions are not due to any one factor or technology alone, although technological advance is the only real shifter of the supply function. Thus the size of farm and the number of people in agriculture need to be changed continually if labor resources in agriculture are to receive rates comparable to those outside of agriculture. This suggests that research should concentrate on institutional changes required to adjust to technological change. As Haver points out, certain institutional rigidities must be overcome to facilitate adjustments in size of farm and in labor supply.

Jensen cites conclusions by Heady and others that farm technological advance has been output increasing and also cost increasing. If demand is inelastic and does not change, aggregate market receipts will be depressed and so will net income. I am not certain how costs are being calculated in this case as innovations must decrease average and marginal cost if they are to be adopted. They must be either factor saving or output increasing for the firm, or both; while for the industry they will be generally output increasing. The more important consideration, however, is a policy proposal for reallocating resources for technological research. Jensen suggests that research should be concentrated on commodities such as fruits, vegetables, and livestock, since this is where he expects the pinch to come first; and that research should be concentrated on cost-decreasing rather than output-increasing innovations.

Under perfect competition, which is the condition postulated for agricultural production, all innovations will increase aggregate output. Innovations, such as more efficient use of feed, that appear to be factor saving or cost decreasing in respect to the firm or to a segment of the industry, will result in economizing on given factors, thus lowering their supply price and contributing further to increases in output. Innovations have been output increasing and must continue to be. Heady clearly recognizes this in his paper on the labor force in relation to farm size, resource productivity, and output. The criterion for technological research is the relative probability of eventually increasing output from whatever product, factor, or combination; with the allocation of factors and products being guided by relative prices. Of course, research can be accelerated or delayed for income or welfare reasons. Increasing the output of wheat or cotton under current circumstances, for example, would just add to surplus stocks. This in no way invalidates the general proposition, however, that technological innovations will be output increasing for the industry and the test of research in this field is its contribution to increases in output.

Daly, Mehren, and Cochrane apparently agree on the estimate of demand expansion, i.e., that demand will probably be 20 percent larger by 1965 and 40 to 50 percent larger by 1975. Expanding the demand for farm products, however, is not the solution to the farm problem in the next decade. Our production potential is too large. Demand is, of course, important. But changes in demand alone will not be sufficient to bring returns to labor resources in agriculture that are equal to those outside of agriculture. To equalize labor returns between farm and nonfarm, extensive reorganization of units is required, and our job is to suggest how such adjustments can best be made.

RESEARCH ON POPULATION MOBILITY

The discussion by Bogholt of Parks' paper raises a fundamental proposition in respect to goals and values: i.e., that ends cannot be appraised without regard to means. Fewer and larger farms, for example, are not necessarily the correct goal of policy or cannot be adequately appraised as a policy goal without regard to the means for achieving this situation. Under certain conditions I would not hold this as a goal and would not contend that those who object to the goal are wrong. On the other hand, given a certain action program or a given type of situation in which this goal could be achieved voluntarily, the goal might be acceptable to a large majority. As I understand the discussion, Bogholt is right in asserting that the farmers' political mind is not an obstruction but rather a clear reflection of the values they hold and of their concepts of the programs or policies available for achieving various goals. Possibly many object to the goal of fewer and larger farms, for example, because the policies that they visualize in achieving this goal, or the situations for achieving it, are objectionable. Here is a rather clear challenge to agricultural economists and others in the formulation of programs.

General reasons for the malfunctioning of the labor market have been rather clearly identified by Bishop, D. Gale Johnson, Sitterley, and Heady. People do not have enough information about alternatives and job opportunities; the information is not made available in a form easily translated into action; most people in rural areas are not well trained for alternative opportunities. As Baker points out, we are unanimous with respect to the need for migrations out of agriculture, both to increase the marginal productivity of labor in agriculture and to reduce the number of claimants. The solution, however, is not in moving marginal farm people to industry but in providing opportunities for greater mobility between farm and nonfarm employment.

In this connection we should lay much greater emphasis on the problems people have in migrating and how these problems have been met. We should team up with sociologists, political scientists, and others with the objective of determining how opportunities can be developed for greater mobility. What problems have people met when they migrated? Where have migrants gone? How have they integrated with the community? Mobility has been negatively associated with income. What steps should be taken with respect to education and the demands of the labor market in order to enhance mobility? Gale Johnson points out that the role of extension education should be to indicate to farm people the various alternatives available to them in their lifetime and that primary and secondary education is the real answer to the problem of mobility and readjustment. Given these basic needs and objectives, should we not team up with other social scientists to determine the educational needs of our time? Such research should be given high priority by some group. As Nesius points out, in addition to more and better primary and secondary education we need more information on lifetime earnings, and this information should be specific as of any given time. Employment agencies should be more skilled in locating and developing jobs for the individual. Loans and grants to finance education and to develop the abilities of the individual who is going to migrate should be a part of our policy.

THE CAPITAL PROBLEM

We are well aware of the fact that capital per farm has increased substantially. According to USDA estimates the investment per worker on "typical" family cash grain farms in the Corn Belt was about $59,000 per worker in 1956 compared with about $19,000 in 1940.[1] Family cotton farms in the Southern Piedmont averaged $8,000 investment per worker in 1956 as compared with $2,000 in 1940. In current dollars the average production assets used per farm worker has risen by 340

[1]U. S. Department of Agriculture, Agricultural Outlook Charts, 1957, p. 17.

percent since 1940. In constant dollars the volume of resources per worker has increased by 70 percent.

One of the greatest needs in viewing the capital problem of agriculture is finding ways and means for financing efficient family-size farms. If capital per worker is about $18,000 and if optimum sizes of farms are built around a two- or three-man unit, then an investment of $40,000 or $60,000 is the minimum as an average for efficient family farm operation. We need to know more about the risks involved in financing various sizes of units. We need to know more about the "quality" of credit among different types and sizes of production units. We need to determine the efficiency of various types of tenure in different situations. For years economists have been suggesting that agriculture requires a new source or method for supplying equity funds. Should we not explore more carefully how equity funds could be applied to agriculture? Certainly research in the capital market is one of our most urgent needs.

This conference has placed relatively little emphasis on the capital problem involved in establishing efficient family-sized units. Perhaps this is more appropriately considered as a problem in credit or finance. This is one of the most fundamental problems facing farm management workers, production economists, or agricultural economists in general.

OFF-FARM EARNINGS AND PART-TIME FARMING

As agriculture has advanced in technology the off-farm earnings of farm families has increased. In order to determine how farm people can maximize their total income we need to determine how they can best combine off-farm employment with a given farm unit. We have paid very little attention to the problem of designing the farm units to maximize off-farm labor opportunities. Here is a problem uniquely adapted to production economics research. Off-farm earnings of farm people are increasing and the problem is to maximize the over-all efficiency of the farm family in farm and nonfarm employment. Since 1949 the number of part-time and residential farms (Census Classes VII and VIII) has declined sharply. The number of farms in the middle income bracket with off-farm sources of income exceeding the return from the sale of farm products has increased. Apparently, part-time farming is losing its subsistence nature and is becoming more of a complementary enterprise to off-farm work. What are the possibilities for using part-time farming as a means to facilitate migration out of agriculture? Considerably more research could be concentrated on part-time farming as a means for creating greater mobility between farm and nonfarm occupations.

PRODUCTION CONTROL AND SUPPORT PROGRAMS

The crux of the problem discussed in Brandow's paper is that, with our large production potential, agricultural income will be subject to considerable downward pressure unless government programs are maintained at least in the immediate future. He suggests that one way to support farm income without stimulating overproduction is to support only a portion of the products raised by an individual farmer and to let the amount produced above this level move at market equilibrium prices. This suggestion has the merit of supporting farm income without increasing farm output. We should be aware, however, of the difficulty of carrying out such a policy in actual programs. As I have discussed elsewhere,[2] the effect of income payments will depend in part on how the funds are distributed. The possibilities appear to be: (1) If the income payments are made on the basis of current output as a supplement to market price, the output effect will be similar to that of price supports above market equilibrium levels. (2) If the payments are made on the basis of the previous output of the farm, their output effect will not be so great since they will not increase the value of the marginal product. Current farm income will be the sum of farm produce at existing market prices plus the income payment which is independent of current output. But the output effect likely will be positive, especially if farmers are unable otherwise to borrow or obtain all the funds they could profitably employ at going rates of interest, because the income payments will increase the funds available both for farm operation and family living. (3) If income payments are a combination of previous output plus some allowance for family living, the output effect likely will be still smaller since the less efficient farmers will receive a larger share than if payments were based entirely on production. (4) If income payments are based on a given output quota, this will have the least effect on output in the short run. However, if payments continue to be made, the tendency would be for this money to be used for increasing the production potential of the farm unit.

CONCLUSION

Within the professional lifetime of most of us assembled here, the agricultural plant of the United States will undergo a fundamental and far-reaching change. If agriculture becomes fully adjusted to the technological possibilities of this age, the number of farms in 1970 will probably be about half of the number existing in 1940. Production per man will be three or four times as large. Capital used per man in constant dollars will probably be at least double and in some cases three or four times as much as was used in 1940. If farm people are to reach a favorable income situation in a relatively free economy, the implications of this great technological breakthrough must be understood and appropriate adjustments made. Our task is to define this problem of readjustment, to discover the alternative ways in which the adjustment can be accomplished, and to develop our economic tools as an aid in the adjustment process. This is an important challenge, and we are fortunate to have the opportunity to work on it.

[2] Agricultural Policy of the United States, Prentice-Hall, 1953, pp. 323-24.

Index