Structure Issues Of American Agriculture

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Agricultural Economic Report 438

Setting

Farm Production

Public Policies

Marketing

Rural America

The Experience of Others

Foreword

The structure of American agriculture—how farming is organized, who controls it, and where it is heading—has been a source of concern for more than three decades.

Rightly so.

We have lost over half our farms since 1940, average farm size has more than doubled, and control of agriculture's productive resources has been concentrated, bit by bit, in fewer and fewer hands.

Of the more than 2 million farms counted by the agricultural census, 200,000 now produce nearly two-thirds of the Nation's food and fiber. Agriculture's marketing system has become increasingly geared to large-scale producers, as have the businesses that sell fertilizers, seeds, and other materials to farm operators. Spiraling land prices have increased the entry barriers that confront beginning farmers and have done much to turn agriculture into a restricted profession.

Scarcely a farming community in America has been unaffected.

These developments have been part of an agricultural revolution that has boosted productivity dramatically. The benefits to the national economy, to consumers, and to many farmers as well, have been enormous. But the cost has also been high, especially in rural areas where the price was frequently measured in terms of dwindling populations, dying small-town businesses, and a vanishing way of life.

We have few programs today that deal specifically with farm structure and no comprehensive policy on the subject at all. The rate of agricultural change was so rapid that for 30 years Federal policy could do little more than react. It responded to immediate crises and tried to provide a measure of stability, but in so doing had results that were neither planned nor expected.

Most of the income benefits from traditional commodity programs, for example, go to the largest producers. Our tax laws have favored larger operations and encouraged outside investment in agriculture. And our credit system may well have fostered a kind of economic cannibalism within agriculture by giving aggressive operators the means to buy out their neighbors.

These circumstances disturb me greatly, as they do many other Americans. Recently, however, the rate of change in U.S. farming has eased. We have an unprecedented opportunity today to anticipate the future—to begin considering the effects of our current programs and the kind of agricultural structure that will best serve society and our family farm operators in the years ahead.

We must not let this chance escape us. If we want to maintain the diversity of American agriculture, if we want to protect a place for family farming in the fabric of rural society, if we want to promote an agricultural system that will use our natural resources wisely, then we must commit ourselves now to developing policies that will be in our best longrun interests.

I have called for a national dialogue on farm structure. It is my hope that wide-ranging, informed discussion will give us a better understanding of our options and enable us to choose wisely among them.

This collection of essays, prepared by USDA's Economics, Statistics, and Cooperatives Service, is part of that dialogue. Although not an exhaustive analysis, it touches on and is a starting point for a look at important aspects of farm structure and at many of the forces that have shaped our present agricultural system. I have asked that the book be published as a resource to be used by policymakers and citizens in the months ahead as we consider the future of farming.

Bob Bergland
SECRETARY OF AGRICULTURE

PREFACE

American agriculture has played a vital role in the economic development of this country. The rapid development of the country was made possible by the quick and efficient utilization of the Nation's abundance of natural resources and favorable climate for food production. The rapid adoption of technical advances for crop and livestock husbandry enabled the vast majority of Americans to engage in other economic activities that have produced the vast array of necessities and consumer goods which make possible the high standard of living Americans enjoy today.

Today, we are at a crucial crossroads in the continued evolution of agriculture and its structure. Should there be public policies and actions which directly shape the structure of agriculture? Or, should agriculture be allowed to evolve without explicit public guidance? This issue is of paramount importance to American farmers. It is also important to consumers of the produce from America's farms, both in this country and abroad, to people who live in our rural communities, to the suppliers of farm inputs, and to the marketers and processors of the products.

Most people agree that the greater the understanding of a public policy issue, the better will be the ultimate decision. The purpose of these articles is to provide information that will increase understanding and facilitate discussion on the structure of agriculture. The articles provide a description of current farm structure, the factors that have influenced it, the problems that may arise in the future, what is known about the structure today, where knowledge is deficient, and an overview of considerations important to the issue. The staff of the Economics, Statistics, and Cooperatives Service prepared the articles as background to assist consideration of the structure issue initiated by Secretary of Agriculture Bob Bergland.

These essays were prepared within a limited time period. Some gaps in the treatment of relevant topics are inevitable. Yet, taken together, they represent the most comprehensive treatment of farm structure to appear in recent years. While most of the discussion focuses on the economic aspects of structure, the volume also treats the related demographic, sociological, and historical aspects. It thus represents the first coordinated attempt by USDA's social scientists to address this important issue from the perspective of the several disciplines. Information in this volume will become the base for subsequent research on agricultural structure within and outside of the U.S. Department of Agriculture.

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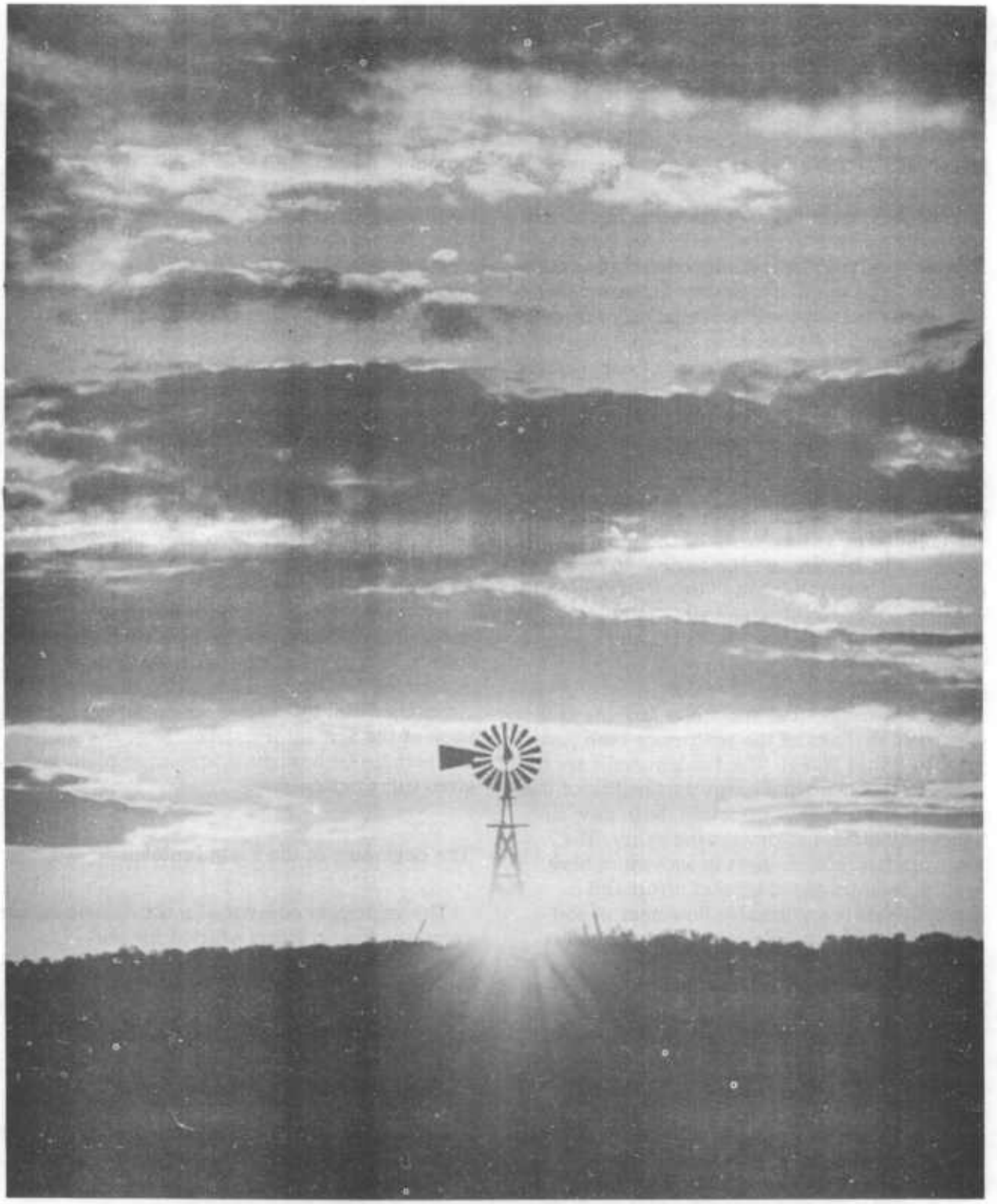
Setting



The Structure of Agriculture: An Overview of the Issue

J.B. Penn
ESCS Agricultural Economist

INTRODUCTION

American agriculture is perhaps as important for what it means to people as for what it is. American agriculture has long been seen as characterized by values esteemed in American society: self-sufficiency, self-determination, rugged individualism, independence, individual battles against the elements, assumption of risk, and the like. In the minds of some Americans, agriculture is perhaps still viewed as little changed since the turn of the century—a family struggling against all odds to secure a livelihood from the land through backbreaking dawn-to-dusk labor, living in rural isolation with few of the amenities enjoyed by the majority of the population. Attached to farming are the associated rural communities and the many virtues attributed to them—honesty, loyalty, concern for one's neighbors, a sense of community, thrift, and a pragmatic attitude toward life, at once accepting and optimistic.

Farming today little resembles farming as it existed at the turn of the century or even just prior to World War II. The fundamentals are the same, to be sure—reliance on the fertility of the land and the blessings of nature, both now enhanced by human effort and ingenuity. The most fundamental changes in agricuture have been those introduced by that effort and ingenuity. Nature's original endowment of soil fertility is now regularly supplemented and replenished. Undesirable plants and organisms are selectively excluded. The research laboratories have yielded plant and animal varieties adapted to the most special of conditions, and they yield far in excess of nature's own creations. Applied throughout the food production process are man's ever-increasing knowledge of husbandry, specialized machines, and in general,the substitution of knowledge for the brute, physical strength once a prime requisite for farming.

Today, the rural areas of America are far different from that turn-of-the-century stereotype, even though many of the characteristics continue to exist. Rural areas and rural people have been affected by the technological advances in farming. Technology has reduced the need for people in farming and their numbers have declined significantly. Many once viable rural communities have disappeared; many remaining ones have fewer, more tenuous ties to agriculture, which now is but one of the many economic endeavors of the rural populace. Rural areas also reflect the changes that have occurred throughout the country—a more transient population, a less communal atmosphere, and perhaps, in many cases, less neighborliness and sharing. In fact, the problems in many rural communities today are indistinguishable from those of their more populous counterparts, the cities and towns of urban America; economic decay, crime, declining financial bases for support of public services, citizen disinterest in public affairs, and distrust of central authority are problems for all Americans now.

Although often recounted, the recent experiences of agriculture provide a useful background from which to view the evolutionary structure of farming and the changes taking place in rural America. From this background, the immediate issue of the agricultural structure of the future can perhaps be brought into sharper focus and given some perspective.

The Beginning of the Farm Problem

The principal endeavor of most Americans for years was the provision of food for self-sustenance. As the Nation developed, industrialization and specialization, once begun, increased rapidly. People engaged in nonfarm occupations soon earned sufficient income to purchase the necessities of food, shelter, and clothing, and often enough income for the amenities that enhanced the quality of life. Such industrialization and specialization continued over the years until it reached a crucial point for agriculture in the early part of this century.

The Nation was being transformed from a rural, agriculturally-based society to an urban, industrially-based society. Incomes of the urban population attained levels in the twenties that enabled people to buy adequate quantities of food from current earnings and other items with the remainder. Most Americans could purchase all the food they wanted.

The farm sector, through continued technological adoption and specialization, further increased its capacity to produce. In fact, it could produce far in excess of the needs of the domestic population and of the small export business of the day. Essential to life, food in scarcity becomes nearly priceless, yet in excess, nearly worthless. Such excess production commanded a low price, if a price at all. The result was direct—during periods of excess supply farm products were low priced and farmers' incomes were consequently low—low relative to the incomes of their nonfarm counterparts. This situation led to the development of Federal programs in the early thirties that directly regulated the production and marketing of agricultural commodities. Modified over the years, those programs continue today.

The "farm problem," as it was termed for many years, fundamentally derived from an excess of resources in the agricultural sector—more resources (land, labor, and capital) were engaged in agricultural production than could earn an adequate return for their services. The low prices from abundant production meant these resources received a lower return than they might have commanded elsewhere in the economy.

Theoretically, the solution was a removal of resources—the release of unneeded resources from agriculture and their use in the nonfarm economy. This solution, of course, was not practical because of the high human cost that would have been associated with such an extensive adjustment; it would have required an uprooting of thousands of individuals and families. In the absence of any Government intervention, many of the farmers that could not have secured an adequate living in agriculture would have been forced to move their families to the cities to seek employment. And, these people were often poorly educated and lacking in the skills demanded in urban labor markets. Many that did migrate often had to perform the menial tasks at the low end of the wage scale.

It can be argued that Government programs prolonged the inevitable—the necessary resource adjustment and, hence, the problem itself. It can also be argued that the programs, by at least treating the symptom (low income), eased the transition, allowing it to occur more by attrition than by force, and thus lightened the burden of the adjustment for millions of farm families.

Changing Agriculture

After the thirties, the "farm problem" continued, and Government programs continued. All the while, agriculture was slowly but definitely changing. A world war occurred, necessitating full production and temporarily alleviating the farm sector's problems. Technology continued to advance—mechanical power replaced animal power, new crop varieties were introduced, chemical fertilizers became widely available, chemical pesticides were created, and other husbandry and management advances became commonplace.

A more subtle change was the continued outmigration of labor from agriculture. The adoption of the mechanical cotton harvester transformed agriculture in the deep South, producing one of the greatest population shifts this country has ever experienced. Thousands of blacks migrated from farms in the South to the urban centers of the North and became a major segment of the work force in many industries. The increasing use of capital (in the form of chemicals, machinery, and the like) released more and more labor, and production continued to increase. The Government production control programs became more extensive, idling an ever-increasing proportion of the cropland acreage. They did not fully succeed; the excess production accumulated in Government storehouses, and this readily available surplus kept commodity prices at relatively low levels.

The farm problem continued into the seventies. The symptoms were perhaps most acute at the beginning of 1972. The storehouses of Government-owned grain were full while 62 million acres, fully one-fifth of the Nation's cropland, were idled by Government programs. But, beginning in 1972, a series of events occurred in a short time space that fundamentally altered the agricultural environment: Crops were poor in many parts of the world (notably the Soviet Union), some countries made major shifts in policy, the value of the dollar was allowed to float (unpegging it from the value of gold) in world currency markets, and demand soared for U.S. agricultural produce.

The Seventies in Retrospect

A retrospective view of the situation suggests perhaps one of the most important factors relating to the structure of agriculture. Most economists now agree that, although this was little noticed and certainly masked by the enduring symptoms, the agricultural sector was nearing relative resource equilibrium by the beginning of the seventies. Most of the excess labor had left the sector, having moved to other sectors of the economy. The large commodity surpluses carried out of the sixties kept domestic prices relatively low in the early seventies, but demand pressures for these commodities were building as incomes in many countries rapidly increased. This situation became acutely apparent with the shortfall in 1972 world crop production. Once the excess grain stocks had been drawn down, U.S. farmers committed all cropland acreage to production. The volume of U.S. exports doubled in 1 year, and it has continued to increase. Except for relatively minor annual adjustments in some years, the Nation's cropland base is being nearly fully utilized. This suggests the sector is also in relative equilibrium with respect to the land resource. Thus, it is in this decade that agriculture has reached relative resource equilibrium for the first time in over four decades—since its acute problems emerged in the twenties.

STRUCTURE—AN URGENT ISSUE TODAY?

It is frequently pointed out that the "structure of agriculture" is not a new issue. The survival of the "family farm," for example, has been a periodic concern since the turn of the century; Secretary of Agriculture Charles Brannan focused on structure in the late forties; and "saving the family farm" has been part of the rhetoric accompanying the development of most major farm legislation since World War II. It is also often remarked that the family farm has survived two world wars; the attention of several Presidents, both Democratic and Republican, and Congresses, both rural and urban, liberal and conservative; a technological revolution; and all the extremes of weather from dust bowls to floods: so why worry about it now? Why should we be more concerned with the farm sector of the future today than we were a quarter-century ago?

There are pieces of evidence which, viewed in combination, may suggest an answer. The agricultural sector for the first time in over 40 years is in relative resource equilibrium. The income the sector generates is sufficient to provide all resources employed a rate of return comparable to that which resources in the nonfarm economy are able to earn.

Most of the technical efficiencies available from the combination of resources for agricultural production can be realized by farms of a relatively modest size (regardless of whether size is measured in sales, assets, labor employed, or in other ways). Once a farm attains this size, agricultural commodities *cannot* be produced more cheaply *per unit* even if the farm becomes larger. Can the available evidence be telling us that further consolidation would give us little additional gain in efficiency of resource use or in lower food prices?

There is a realistic limit to the continued decline in the number of farms. The number has fallen from the peak of near 7 million to near 2 million today, of which about one-fifth produce nearly 80 percent of the Nation's food and fiber. Present trends continued, the result would likely

be a bimodal distribution—few farms large in size and many relatively small in size. A very small number would be of inbetween size (say, farms with gross sales between $20,000 and $40,000).

The above evidence, if accepted, quickly brings us to another question: What tradeoffs exist between having many farms of modest size operated by family units and fewer farms of ever-increasing size?

The best evidence currently available suggests that the many forces which singularly and together determine farm size and structure, if left unchecked, will continue and perhaps accentuate the trends of the past several decades. The result will be fewer and fewer farms of larger and larger size. Simply put, the question for society is: do we want this to occur? What do we lose if it does occur? As this result would be practically irreversible, now is likely the last time society will have the opportunity to make the choice. If so, it ought to be a conscious choice, with full information about the tradeoffs, not something that occurs by default.

Structure Defined

Structure is not an easy concept to define. It involves the following components:

- Organization of resources into farming units.
- Size, management, and operation of those units.
- Form of business organization, whether a sole proprietor or several individuals in a partnership or corporation.
- The degree of freedom to make the business decisions, and the degree of risks borne by the operator.
- Manner in which the firm procures its inputs and markets its products.
- Extent of ownership and control of the resources that comprise the farming unit.
- Ease of entry into farming as an occupation.
- Manner of asset transfer to succeeding generations.
- Restrictions on land use; immediate "sovereignty" versus stewardship for future generations.

The term "family farm structure," although loosely and imprecisely used, often means a relatively large number of modest-sized farms, each operated by a family unit, perhaps employing some nonfamily labor, but with the husbandry and management decisions by the operator and family and the inputs purchased from and products sold in open, easily accessible, competitive markets. Obviously, a wide range of structural configurations would fit within this definition.

PERFORMANCE OF AGRICULTURE

Why does society care about the structure of agriculture; why would society prefer one structure over another? Society is not interested in structure, *per se.* What it does care about is the *performance* of the alternative structural forms for agriculture and the welfare of the participants. How, then, do we measure the performance of agriculture resulting from different structural forms and how is participants' welfare affected in each type of structure?

The overall performance of agriculture or of any sector is determined by developments in several important areas. How that performance is judged—good or bad, desirable or undesirable—depends on the *relative importance* placed on the elements of performance. The major performance characteristics for agriculture include:

- Quantity, quality, and price of food available for domestic and foreign consumers.
- Efficiency of resource use and contribution to national economic growth.
- Care and preservation of the environment.
- Relationship to rural communities.
- Flexibility and adaptability—the ability to respond to changing consumer preferences, to adopt new technology, to withstand shocks, and the like.

Quantity, Quality, and Price of Food

A prerequisite to the advanced development of any society is the assured availability of high-quality food priced reasonably in relation to other necessities. Thus, any agricultural system must first have the capacity to produce adequate, assured quantities of high quality food for the population, at reasonable cost. One way to judge the "reasonableness" of the cost is to examine the proportion of disposable personal income that consumers must devote to the purchase of food. The American experience in this regard has been impressive—the proportion spent has declined over time.

The element of assurance of supplies is important for foreign as well as domestic consumers. For the United States to retain its status as a major trading nation, it must be a reliable supplier in the commercial markets of the world. Countries that purchase our products want assured access to supplies without disruption. Lacking that assurance, they turn elsewhere.

The United States has long provided food assistance to other nations in times of emergencies. Since 1954, the Food for Peace Program has been a formalized means for providing food assistance to the poorest of nations, and agricultural development assistance to many nations. The availability of quantities to meet such national commitments is another component of performance.

Efficiency of Resource Use

The efficiency with which resources are used to produce raw agricultural commodities is a key economic indicator of performance. Technical efficiency exists when any recombination of resources will not result in increased output or the same output with fewer resources. In a market economy, price allocates resources to their most efficient use, where their contribution to output is greatest. Inefficient resource use in any sector of the economy impairs overall economic growth; the resources could be more productively used elsewhere to produce the goods and services that improve the standard of living enjoyed by the Nation. Society thus has a stake in the way resources are used in agriculture, as one of the sectors of the economy.

Relying on prices as efficient allocators of resources implies that resources can move freely to their most efficient use. However, there are often constraints; Government policies and programs are important ones. An essential, but often overlooked, consideration in the formation of Government programs is their impact on the efficient use and movement of resources. The slowed productivity growth in the economy today is increasing the examination of the Government's regulatory programs.

Resource organization on individual farms is an important aspect of the structure issue. Essentially, at what minimum size of farming unit can technical economies be achieved, at what size are unit production costs the lowest? The size is not static; it changes over time as the availability of new technologies enables additional efficiencies in resource use (more output from the same amounts of resources or the same output from the use of fewer resources), and the prices of inputs and products change relative to one another. Studies that indicate the minimum efficient-sized farms for commodities and regions are now dated. Yet, updates of some of these studies suggest that most efficiencies are attained at relatively modest farm sizes.

The importance of size, put simply, is that farms beyond this minimum size are not necessarily more efficient than farms that are smaller (how small is unknown). From society's viewpoint, resources are not misallocated once a farm achieves minimum efficient size. Society does not get its food more efficiently produced from a few tremendously large farms than from a much larger number of farms, if all are above the minimum efficient size.

The Nation's cropland base of 370 to 380 million acres could thus be used by an agriculture of a very few large farms or many smaller ones. The question for society then becomes one of gains and losses from allowing the more concentrated structure to evolve. The available evidence suggests that there are few, if any, gains in resource efficiency or lower food prices to be

achieved from further concentration. Thus, the argument must hinge on other indicators of performance and on the welfare of the participants.

Care and Preservation of the Environment

During the late sixties, the issue of environmental quality gained national attention as damage in many areas was rapidly reaching the point of being irreversible. This situation is generally regarded as resulting from market failure. The market system was not appropriately reflecting the costs of environmental degradation nor were those responsible for the damage bearing the cost. One solution proposed was that the cost for the damage done or for preventing further damage be borne by the person or firm directly responsible. This solution was the intention of many Government regulations that were promulgated because of the public attention. An example is the requirement that "scrubbers" be installed on smokestacks of coal burning plants to clean the air before releasing it into the atmosphere.

The nature of modern-day farming makes agriculture potentially a major polluter. The chemical fertilizers and pesticides so widely used leach through the soil and can potentially harm animal life generally, and humans in certain circumstances. The concentrated production of livestock has made the disposal of the animal wastes a concern. The erosive depletion of soil resources and the degradation and depletion of water resources also create situations that must be treated.

Most people would prefer an agriculture which does not adversely affect the environment, which utilizes wise conservation practices of the land and water resources, and is compatible with wildlife. The policy question here becomes one of the impacts of alternative structures on the enviornment. Does one form or system of crop and livestock production have a more adverse impact on the environment than another?

Flexibility and Adaptability

Public policies and programs, as noted earlier, can introduce rigidities into the farming system. They can also become ingrained through institutional and social traditions. Such rigidities, which often require years to become instilled, may remain unnoticed until some event occurs which necessitates change, and the inability to respond becomes apparent. An obvious example is the U.S. economy's pervasive reliance on fossil fuels and its inability to adapt quickly should such fuels become unavailable.

Because the world is dynamic, a farming system must at once be both resilient and adaptable. Such flexibility and responsiveness are needed in several situations. Consumer tastes and preferences change continually; the ultimate objective of any agricultural system is to meet consumers' needs and wants. A responsive agriculture, free of rigidities, will adjust as necessary.

The preoccupation of Americans for many years was gaining an assured *quantity* of food. Now, with assured quantities available to all the population, many consumers want assured quality and, with continuing advancement in the knowledge of diet and health, assured nutritional content. Some traditional foods produced in abundance by the farm sector may adversely affect the health of consumers over prolonged periods, according to evidence available. Also, long-standing processing methods may be having harmful effects on health. Eventually, new processing methods may have to be found. As the scientific knowledge continues to accumulate, no doubt other diet-health related changes in consumer preferences will occur. Most people would agree that a farming system readily adaptable to these changes, able to alter production patterns, cultural practices, and the like, is more desirable than an inflexible system that cannot respond.

Another attribute of efficient performance is how well agriculture can incorporate and assimilate new technologies as they become available. An outstanding characteristic of American agriculture is its continued increase in productivity—

its ready adoption of output-increasing or cost-reducing technologies as they become available.

Resiliency, as used to characterize agriculture's performance, means the ability to remain viable through a variety of circumstances, both natural and manmade. These may be economic or natural shocks—crop failure, an abrupt change in foreign demand, energy shortages, and the like. A fragile system cannot continue to operate; a resilient system can. This raises the structure related question of whether traditional family farms are more or less resilient to shocks than large corporate farms?

Agriculture's Relationship to Rural Communities

Seven of every 10 people engaged in farming have left agriculture over the last 30 years, one of the most visible of its structural changes. This exodus has significantly affected rural America. Many communities and the business and social institutions that served them were consolidated. Local small schools, churches, and businesses disappeared as the use of automobiles for access to regional facilities—schools, shopping centers, churches, and the like—increased.

Simultaneous changes in the rest of the society—transportation and communication advances—also affected concentration in farming and location of industry, and they altered the trade and social patterns in rural towns and the countryside. The most recent private sector growth in rural areas has been in the manufacturing and personal service industries. Many areas have emphasized industrial development and tourism. Rural-urban migration patterns have reversed since the late sixties, however, partly because of this nonfarm devleopment. Most rural areas are now gaining population faster than most metropolitan areas.

Aggregate assessments of the importance of agriculture in rural areas overemphasize its significance in some areas and underemphasize it in others. In many Corn Belt, Great Plains, and Mississippi River Delta counties, agriculture remains preeminent, although the farm population in these areas is still declining. In many of these places, efforts to introduce alternative economic opportunities have met with little success, and the decline in farming means a general decline in population.

Aggregate assessments of the relationship of the structure of agriculture to economic and social conditions in rural areas also conceal the significance of changes for certain groups. Black migration patterns and the rural life of black people have been affected dramatically by changes in agriculture. In 1940, more than 680,000 black farm owner-operators controlled a major part of the 46 million acres owned by minority farm operators. By 1975 only 50,000 black farm operators controlled a smaller portion of the 13.3 million acres owned by all minority farm operators. Southern black sharecroppers and tenant farmers were affected disproportionately by the mechanization of cotton, peanut, and tobacco farming. Yet, in 1976 there were more than 700,000 minority farmworkers, some of them probably illegal aliens. The attractiveness of farm labor for illegal aliens and the potential set of related problems represent an aspect of the relationship of farm structure to the rural community.

Aside from the obvious economic and social effects of agriculture on rural areas, the structure of farming also influences the character of rural areas. A series of studies performed in the forties and replicated since suggest that patterns of farm ownership, the use of casual or migrant labor, the use of mechanization, and the size of farms make a difference in the local economy of the areas where the farms are located. They also affect social patterns and the level of political participation as well as the character of political institutions. Where there are many owner-operated farms, rather than a few large, highly mechanized farms, there is not only more economic vitality but also more social and political democracy.

About 900,000 workers in rural areas now hold two or more jobs, one of which is in agriculture. The farm-related earnings are lower than those from nonfarm jobs. Such part-time farming is a significant characteristic of the current

farm structure. The median income for all rural Americans is only 80 percent of the median income of metropolitan people, and underemployment rather than unemployment represents a critical economic problem in rural areas. The degree to which future structural changes will increase or decrease part-time opportunities will affect rural life significantly.

Although less easily measureable and quantifiable, the role of agriculture's influence on rural America generally and rural communities specifically is significant. A criterion of performance of farm structure is how it affects the viability and quality of life in the vast rural reaches of the country. Enhancing that viability and quality of life would obviously be viewed by most people as preferable to a rapid erosion of those attributes.

Welfare of the Participants

A second major aspect of the performance of the farm sector, closely related to much of the above discussion, is the welfare of the people involved in agriculture, rural America, and the food system. Specifically, how do various farm structures affect farmers (crop and livestock, large and small, East and West), residents of rural America (affluent and poor, town and country dwellers), and rural businesses (farm related and other)? Obviously, an important factor in well-being is income—the level of income and its distribution, the wealth of individuals, and its distribution. A basic tenet of American society has been individual entrepreneurship, yet avoidance of concentration of income and wealth in the hands of a very few.

A second major indication of well-being or quality of life involves the individual's freedom in decisionmaking, not only the freedom to choose, but to have a wide array of alternatives from which to choose. Such basic choices as an individual firm's business decisions—to increase investment or not, to remain in business or not—are involved. Similarly, occupational choice is important—to have the opportunity to choose farming, a combination of part-time farming and off-farm work, or work in an agricultural related service industry.

Certainly, some structural configurations would restrict the freedom of decisionmaking—the range of choices—much more so than would others. Two obvious and related examples of structure are a large number of modest-sized farms versus a small number of extremely large farms. The nonfarm but agriculturally related employment opportunities would likely be greater in the former structure than the latter. Also, the barriers to entry—capital requirements and the like—would likely be less formidable under the former than the latter. These contrasting structures also involve the distribution of wealth. Most of the wealth in agriculture is vested in the land. If landownership is concentrated, the wealth is also—a more diffused ownership would distribute the wealth more widely.

EXTENT OF GOVERNMENT INTERVENTION AND STRUCTURE

The level of societal (governmental) intervention in the affairs and operation of a sector also helps shape its performance. American society has generally preferred intervention to be less rather than more. However, a society, in this case, ours, frequently deems it appropriate for the government to undertake the accomplishment of specific goals which might not be attained in the absence of such intervention. For example, the rationale for the initiation of Government farm programs, as noted earlier, was society's desire to end the inequity in incomes between the farm and nonfarm sectors. While such intervention has generally been accepted by our society, a growing concern has been the specific forms and cumulative amount of that intervention.

Many Government activities, oriented to real problems and the perceived needs of one or another segment of society, have often lacked specific criteria by which to measure their success—the costs and benefits of the activity. As a result, many of the programs initiated have taken on a life of their own, losing their originally intended

focus. But, perhaps more important, and especially as these relate to the structure issue, are the often unintended and undesirable impacts of those programs. In some cases they have produced situations perhaps worse than the original problem they were to treat.

A related consideration here is that the political process usually approaches issues on a singular basis. A problem is perceived and eventually programs are initiated to treat it. Another problem emerges, is treated, and so on. The result over time is a collage of public policies and programs. Evaluated independently, these programs may appear advantageous. Yet, operating in concert, the programs often produce effects far different than anticipated. They may cancel one another out or they may combine to magnify an impact. For example, little attention has been given to the *combined* effects on farm firms of regulations of the Environmental Protection Agency and the Occupational Safety and Health Administration, the provisions of the tax code, the commodity programs, the national credit programs, and others. Are these programs, simultaneously operating, producing a mutation quite unexpected?

Obviously, the extent of Government intervention that one structure would require relative to another would be a consideration in the choice of a particular structure for agriculture. One that requires extensive regulation would likely be less preferable to one requiring little Federal regulation, all other things being equal.

Intangibles

Values, mores, and ethical considerations are elusive, difficult to describe and measure, yet with little doubt, they are important in evaluating alternative agricultural structures. American society holds certain values to be desirable and, from the time of the founding of this country, it has seen agriculture and rural life as possessing many of these values. Thrift, ambition, concern for others, honesty, loyalty, self-determination, independence of spirit—these have all at one time or another been ascribed to agriculture and farming. In fact, Thomas Jefferson was a proponent of an agrarian society because he thought farmers were apt to more virtuous than city dwellers! As the times have changed, many people would argue that rural residents have become less distinguishable from urban dwellers. Yet, others believe that intangible values will be lost if farming is foreclosed as a way of life for many American families. Societal values too, then, become a consideration in the choice of alternative structures for farming, dependent on the importance one attaches to such values that may be inherent in rural life and farming.

FACTORS SHAPING STRUCTURE IN THE RECENT PAST

The previous discussion has focused on developing some notion of what is meant by structure and why it is important, what consequences flow from alternative structures, and how the performances of alternative structures might be judged. Before turning to emerging structural issues that will necessitate choices by society, let us consider the forces of the recent past that have most shaped the structure that exists today.

An Overview of Structural Change

Agriculture has been subject to constant change since colonial days. In fact, several of today's structural issues are old ones. The trend toward larger farms, for instance, was evident in the 19th century and it has been almost continual for 80 years. Except for brief periods after the World Wars and during the Great Depression, the farm population has decreased steadily throughout most of this century.

The speed of change in agriculture since World War II has been extraordinary. The internal combustion engine so completely replaced animal power that by the midfifties horses were no longer counted in the agricultural census. Improved plant and animal varieties have appeared, together with an array of new farm chemicals and sophisticated machinery. The

number of farms has dropped by more than half since 1940—from 6.1 million to 2.3 million—and the farm population, nearly a quarter of all citizens in 1949, now accounts for less than 5 percent. Yet production has nearly doubled since 1940. The farm structure today is basically the product of developments since World War II.

Postwar changes in agriculture have produced major benefits for the nonfarm public. The productivity of the farm sector has held food costs relatively stable as incomes have increased. As mentioned earlier, consumers spend a relatively low portion of their income on food—about 17 percent today, compared with 22 percent in 1950. In addition, changes in agriculture have released workers to the nonfarm sector, expanded markets for industrial production, and contributed substantially to exports. The Nation's economic growth since World War II has in no small measure been aided by the farm sector's transformation.

The foundations of the current agricultural revolution were laid early in the century. Shortly after World War I, a fund of technology began accumulating—improved tractors, hybrid seed, better planting, tillage, and harvesting equipment. But low commodity prices and abundant labor during the twenties and thirties prevented widespread adoption of these innovations. The technological storehouse remained essentially untapped until World War II, when high prices, scarce labor, and the Government's urging of full production motivated farmers to modernize their operations and seek ways to use less labor. The end of hostilities in 1945 freed industry to provide additional machinery and chemicals. Foreign needs and Federal price support programs encouraged producers to step up technological conversion after the War. Thus, agriculture's metamorphosis continued, even though the original reason for it had passed.

Within a short time, the syndrome of technological advance, rising capital requirements, growing farm size, and declining labor requirements became self-perpetuating. Greatest profit went to the operators who adopted first and thus lowered their production costs below average. As use of major innovations grew widespread, however, alert operators, seeking to maintain their advantage, became eager for more technology. Further, the Federal farm programs, by setting a floor under prices, greatly reduced the risks to farmers of further expansion.

The transformation of U.S. farming has continued. But recently the rate of change has slackened. Farm size growth and consolidation have both slowed, as have the productivity increases that have been typical of agriculture since World War II. Perhaps most important, there seem to be no technological breakthroughs on the immediate horizon with potential impacts comparable, say, to the development of hybrid corn or DDT. Thus, U.S. agriculture is approaching the end of its postwar revolution.

Within this most recent revolution, three broad factors have been especially important: labor and demographics, technology, and Federal policy.

Labor and Demographics

Forces outside agriculture also help determine farm structure. Of these, few have been more significant than the health of the national economy, particularly as it affects the labor market. In 1946, the Congress passed legislation declaring full employment to be a national goal. Achieving the objective depended on an expanding economy, and indeed, during most of the postwar period that condition has been met. The Gross National Product, measured in 1972 dollars, stood at $343.6 billion in 1940. By 1978, it had risen to $1,399.2 billion. Per capita disposable income, also measured in constant dollars, climbed from $1,848 annually to $4,449 during the same time. Throughout this 38-year period, unemployment has been held to a low rate, rising to about 6 percent only a few times and for short durations.

For much of this period, urban areas faced a shortage of indigenous workers, caused partly by the low birth rates of the Depression years. Job opportunities existed in the cities, and that fact was reckoned with not only by farm policymakers but by farmers themselves.

Net migration out of farming in the twenties had averaged over 600,000 people annually. As mentioned, that rate increased with the surge in urban industrial and commercial activity in the forties and fifties. From 1940 to 1960, 21.5 million people moved off the farm, more than a million annually. By 1960, the farm population stood at only 15.6 million. Still, the annual emigration continued; during the early sixties about 5.7 percent of the farm population moved away each year. By the early seventies, farm residents numbered only one-third as many as they had 30 years before.

The people who left were mainly those who would have had the least chance of success had they remained in agriculture. Generally, they were individuals who had small farms, were located in areas marginally suited for agriculture, were tenant farmers, or had specialized in agricultural products that underwent radical changes in production technology.

Yet, large numbers of others also departed who might have done well in farming but simply were not needed due to the technological revolution. The size of farm families in the postwar years was such that, even in the most prosperous agricultural areas, young people frequently could not find jobs in the local economy.

The urban job market had a powerful influence on farm structure. Urban job opportunities meant that Federal policy could encourage farm producers to achieve economic efficiency through expansion and to reduce their reliance on human labor. Not until the urban riots of the sixties did the limits of the cities' ability to absorb people receive serious attention.

For farm operators, the full-employment economy required careful calculations about how to organize their businesses. The lack of labor—or the fear that labor supplies would become unavailable—doubtlessly hastened farm mechanization. A practical mechanical cotton-picker was available by the early thirties, for example, but did not receive serious consideration in the cotton-producing regions until the labor shortages of World War II. Later, lack of skilled labor at wages that growers considered acceptable contributed to the mechanization of sugar beet production. And the anticipation of labor shortages in California's tomato fields during the midsixties helped spur the adoption of the mechanical tomato harvester.

This substitution of technology for labor has raised agriculture's capital requirements, increased entry barriers, and thus reduced the number of commercial farmers. Whether a cause of rural-urban migration or a response to it, the substitution has contributed to our current agricultural structure in which the bulk of our food and fiber comes from a relatively few operators.

Beginning in the early seventies, however, the movement of people out of rural America halted and reversed. The Nation's nonmetro counties gained 2.3 million people between 1970 and 1976, giving them a growth rate higher than that of metro areas. The increase was notable in remote rural counties as well as in those adjacent to cities and suburbs.

Much of the return to the countryside has been due to a rise in the number of nonfarm job opportunities. Declines in farming employment have continued during the seventies, but at a much slower rate. Outside farming total employment in nonmetro counties increased about 22 percent between 1970 and 1977, twice the rate in metro areas.

Prior to World War II, only about 6 percent of all farm operators worked off the farm 200 days or more a year. By 1974, the proportion had increased to 30 percent, and an additional 10 percent worked at least 50 days off the farm. Part-time farming, once seen as a way to get into agriculture or out of it, has become increasingly common, apparently as an end in itself.

Producers with every size of operation now have off-farm income. But it is especially frequent among small-scale farmers. Nearly 70 percent of U.S. farms, accounting for almost one-third of our farm resources, sell less than $20,000 worth of goods annually. The great majority of these have nonfarm income. Without it, many of these farmers would almost certainly be forced out of agriculture. The growing number of nonfarm job opportunities in rural areas could well have a stabilizing influence on farm structure, allowing people to remain in farming

who would otherwise leave, and buttressing the economic health of the remaining small-scale operations.

The available evidence adds weight to this possibility. Between 1954 and 1974, the number of places where the operator worked off the farm less than 200 days a year declined 56 percent. But places where the operator worked 200 days or more at a nonfarm job decreased 36 percent.

Technology

Technological advancements since World War II have basically involved a change in the mix of inputs used in farming—an increase in capital as a substitute for land and labor. Chemical and biological breakthroughs have resulted in greater yields per acre. Technology of this sort basically represents a substitution of capital for land. Adoption of technological innovation such as machines that increase production per man-hour represents substitutions of capital for human labor.

The structural impacts of technological change have been especially evident in farm sizes, specialization, and the entry barriers that must be overcome. Technology has meant that fewer workers can now operate more acreage than at any other time in the Nation's history. Average farm size has more than doubled since 1945; production per man-hour has risen over sevenfold. The value of productive assets per agricultural worker increased from $6,625 in 1945 to $143,043 in 1978 while productive assets per farm climbed from $10,994 to $223,076. During the same period, the hours of labor used in agriculture declined 76 percent.

The technology causing farms to grow larger has also influenced regional production patterns. Cotton production has moved westward, for example, into areas of broad, flat fields where machinery can be used to optimum advantage. Specialization in crop production is also due in part to technology. Farmers once relied on crop rotation and diversification to conserve soil fertility, prevent erosion, and control pests. These results can now be achieved with chemical fertilizers, insecticides, and herbicides. Farmers can thus grow one crop exclusively year after year, specializing in commodities that have the most profit possibilities. Similarly, the development of new disease-control techniques has given poultry and livestock farmers unprecedented opportunities to specialize. The integrated broiler industry of today would have been impossible without the scientific advancements in disease control that allow more birds to be raised under a single roof.

These scientific breakthroughs have generally enabled both small and large farmers to specialize more. However, improvements in farm machinery have perhaps been most important in fostering large-scale, specialized operations. A decision to invest in a specialized piece of equipment means an operator will emphasize production of the commodity for which the machine is intended, quite likely at the expense of some other commodity. And, insofar as a machine is most economical on a particular size of operation, expansion to that size is encouraged. Thus, specialization and firm growth frequently occur simultaneously.

Technology has also made barriers to entry more formidable. The cost of machinery raises the capital requirements for beginning farmers. Technologies that allow individuals to farm increasingly larger acreages have added to the competition for land, resulting in higher land prices, the single greatest expense in farming today. The average investment in a farming operation with gross sales between $40,000 and $60,000 ranged from $302,000 for fruit and nut farms to $700,000 for livestock ranches in 1978.

Future technological breakthroughs are not easy to predict. Yet, such advances will likely have structural impacts similar to those already experienced. Even if the extent of the impact is less, the result will still likely be one of encouraging farm size growth.

Public Policies

Many public policies singularly and in combination affect the structure of farming. They influence resource use, capital requirements, freedom of decisionmaking, exchange arrange-

ments, risks, expectations, and, of course, costs and profits. Some policies are oriented specifically to the farm sector, such as price and income policy (the commodity programs). Others affect agriculture directly but are more broadly oriented, such as tax, environmental, and worker safety and health policies. Still others are general, national macroeconomic policy for example, and affect agriculture indirectly.

Several studies have reported the estimated impacts of individual policies on farm firms and the farming sector, but, as mentioned earlier, information on the *collective* impact of these policies is lacking. What information does exist suggests that the effects have been significant.

Public policies offer the most viable means to maintain or alter the structure of the farm sector. Their likely impacts on structure in recent years are now examined.

Farm Policy

Policies oriented exclusively to the agricultural sector are referred to collectively as "farm policy" by most people. The most important of these have been policies directed at the enhancement of commodity prices and farm incomes.

Judged solely in economic terms, farm commodity programs through the years are thought to have impaired economic efficiency by regulations preventing the type of production, resource use, pricing, and trade that could flow from unbuffered markets. These programs have tended to be inflexible, restrictive, oriented toward individual commodities, and poorly adapted to prevailing market conditions. Some reform began in the midsixties, and the programs since have tended to reflect greater economic rationality.

A major effect of these programs on structure derives from one of their basic tenets, benefits based on volume of production. As a result, the relatively few large producers have generally received more benefits than have the more numerous small farmers. Thus, the programs contributed to a concentration of income and a widening disparity of its distribution in agriculture.

The programs have also influenced agriculture's structure by affecting the amount of risk borne by farmers and their expectations about future economic conditions. The commodity programs—price supports, deficiency payments, disaster payments, crop insurance, grain reserves, marketing orders, and others—reduce farmers' risk (socialize it). Risk influences several characteristics of structure:

- Specialization—as farmers' risk is reduced, they tend to specialize in specific commodities to achieve technical, pecuniary, and external economies that are reflected in reduced unit production costs.
- Farm size—the less risk, the greater the inducement to expand. As risk is reduced, farmers can leverage their equity to a greater extent, and lenders are willing to provide more debt capital relative to equity capital.
- Entry of new farmers—less risk tends to encourage entry.

Closely associated with risk are farmers' expectations about future economic conditions as these relate to prices and potential profitability. Major investment decisions involving assets which are highly specialized, have a long life, and are relatively fixed (for example, milking parlors, fruit orchards, and tractors), often hinge on expectations. Farmers' expectations about commodity prices and returns are influenced strongly by the commodity programs. To the extent that these programs guarantee certain levels of returns (as the target price/deficiency payments do), farmers will have more positive expectations than otherwise. Guaranteed returns thus encourage expansion in size through the acquisition of capital assets, primarily land.

Land, largest single investment item in farming, is unique because it represents both an annual production input and a capital investment, a store of wealth in agriculture. Many factors influence land prices and the land market. Benefits from the commodity programs—the actual income transfers, the reduced risk, the heightened expectations—have provided incentives that motivated farmers to acquire more

fixed assets, especially land. Thus, program benefits have tended to be bid into the price of land.

High land prices have raised structural considerations:

- To the extent that programs have benefited larger farmers more than smaller ones, large farmers gain a competitive advantage in purchasing land.
- Rapidly increasing land values have given existing landowners a comparative advantage in purchasing more land. Capital gains on land owned have increased the owners' equity position, which makes securing additional capital easier.
- Rapidly rising land prices—by helping farmers who already own land to purchase more land, and by being a formidable barrier to entry—have led to greater consolidation of wealth in farming. (Today, approximately half of all cropland is farmed by people other than the owners.)
- When this concentration of wealth is considered together with the capital gains provisions of the tax laws and with the inheritance tax laws, the trend seems fairly clear in the aggregate—landownership and wealth in the farm sector are fast becoming concentrated in the hands of a few. This trend has prompted the question of whether a landed class is now being created in this country.

If it is true that these programs are providing unequal benefits among large, medium-sized, and small farms, among farmers of different commodities, and between landowners-operators and tenants, should these inequities now be corrected? If commodity programs have not been neutral in their effects on structural characteristics such as farm consolidation, should they be?

Tax Policy

Federal tax policies have contributed significantly to structural change in agriculture; some would argue they have been the single most important force in recent years. Farming has been accorded preferential treatment, generally most valid at the time of enactment, under national tax laws. When the income tax was adopted, for example, legislators thought that farmers had less access to sophisticated accounting expertise, and thus allowed them to use cash rather than accrual accounting for tax computation. This provision often allows a significant reduction in the total tax liability. Only since roughly the midsixties did most farm businesses reach values making them subject to estate taxation. Other special provisions treating agriculture more favorably than other sectors include:

- Special valuation of farms for estate taxation and deferred payment of estate taxes.
- Liberal deductions for capital expenditures.
- Liberal interpretation of what constitutes a capital (versus a production) asset for capital gains treatment.
- Investment tax credit and accelerated depreciation provisions.

The limited evidence available, which is sparse and not universally accepted, suggests that the tax law provisions may have cumulatively affected agriculture in some of the following ways:

- Further encouraged farms to grow larger.
- Made agriculture an attractive investment, and attracted outside capital that perhaps contributed to the increase in land prices, absentee ownership, and the further separation of ownership from farm operation.
- Helped alter the mix of production assets in farming, favoring some assets relative to others, notably land and certain land improvements, and helped to influence the capital/labor proportions.
- Benefited high-income taxpayers more than low-income taxpayers; the special provisions provide relatively greater benefit to high-income taxpayers. This fact suggests that the smaller number of high-income farm operators will tend to accumulate assets. Also, because some provisions are applicable only to owners (as opposed to operators), the provisions explicitly favor owners.
- Altered the flows and timing of input purchases and product sales somewhat, so that tax benefits can be gained.

The estate and gift tax provisions, which signi-

ficantly affect the intergenerational transfer of farm assets, have consequences for structure over a much longer time horizon than some of the other tax policies. The preferential valuation (use rather than market) of farmland for estate taxation and the allowed deferral of the taxes almost certainly make farmland an attactive investment for transferring wealth to subsequent generations. This longer run impact raises questions about the impact of such tax-motivated investment on land prices and about who gains and who loses because of the provisions.

Macroeconomic Policy

National economic policy is now more directly important to the farm sector than perhaps ever before. The farm sector's greater dependence on world markets in the seventies served to increase the sector's interdependence with the domestic economy. This strengthened further the linkages that the changes in agriculture have brought, such changes as the growing industrialization of farming and increased concentration in the input and food marketing sectors. Thus, the health of the national economy now influences more directly the health of the agricultural economy.

Today, the major general economic influence on farming is inflation, rather than any explicit macroeconomic policy. For many years, conventional economic theory suggested that farmers generally benefited from inflation, that only land values were primarily affected,and this asset appreciation increased the wealth in agriculture. Few people hold that view today; it is now generally recognized that farmers, as everyone else, are ultimately hurt by inflation.

Unlike the situation several years ago, farmers now purchase annually 65 percent of their production inputs from the nonfarm sector of the economy. Price increases for these inputs basically reflect changes in the general price level. The structure of the input-supplying industries is such that cost increases can be fully and quickly passed to farmers. Thus, the rate of price inflation in the general economy influences farmers' production costs directly.

Inflation at times is also a major determinant of land prices. It encourages investors from outside agriculture to acquire land as a hedge against inflation, which thus contributes to the upward pressure on prices. Such appreciation, while economically advantageous to existing landowners, hurts renters (higher land prices subsequently mean higher rental rates), further concentrates landownership and wealth in the sector, and makes the increasing capital requirements more formidable as a barrier to entry of new farmers. Finally, inflation, over time, by increasing farmers' cost of production, ultimately raises the cost of food to consumers.

Macroeconomic policies also affect the demand for farm products, as they influence the rate of economic growth, income growth, and the level of employment of the labor force. Sustained economic growth, rising consumer incomes, and a fully employed labor force expand the demand for farm products and, importantly, influence the mix of food products demanded (ultimately altering production patterns). The success of national economic policies also helps shape the input mix in agriculture and the organization of some farm units. An economy operating at full employment means that agriculture must compete actively with other sectors for the available labor, which usually means higher wage rates and total labor costs. This situation, in turn, encourages farmers to substitute capital in the form of machines, chemicals, and so on for labor.

Macroeconomic policies also affect capital investment, research and development, and the rate of productivity growth in the nonfarm economy—all important to agriculture. More recently, a new element of policy has come to directly influence farming. That is, the effect of policy on the value of the dollar in foreign currency markets affects directly the competitiveness of U.S. farm products in world commodity markets.

Credit Policy

Although less visible and less frequently debated than are other policies oriented directly to the farm sector, farm credit policies have operated for some time. Their general intent has

been to ensure appropriate capital availability for agriculture. They encouraged the development of the farmer-owned farm credit system which exists today. Government lending agencies such as the Farmers Home Administration, and the treatment accorded rural banks through Federal banking regulations. Farmers have also been provided credit in special circumstances such as natural disasters.

These policies and their attendant programs have influenced the structure of the farm sector, although the extent of their impact has not been studied thoroughly. Many people hypothesize, however, that these policies have tended to have at least three impacts:

- By the ready availability of credit, often at subsidized interest rates, these policies may have increased the competition for land, further increasing land prices.
- By hastening the adoption of new technology and allowing farmers to bid input prices higher, these policies have generally encouraged growth in farm size and consolidation of farming units.
- Through special programs such as those of FmHA, these policies have enabled many people, who would otherwise have left, to remain in agriculture and develop viable farming units.

Farm credit policies have achieved much of what they were intended to do. And, as with most other policies, they have in the aggregate had unintended, in some cases undesirable, consequences. They have not been neutral in their impact on the structure of agriculture.

Other Policies

Many other public policies undoubtedly have by themselves and together affected the farm sector significantly. Again, impacts of some of these policies operating individually have been studied but impacts from their operation together have not. These policies include:

- Transportation—rural rail line abandonment, deregulation of the trucking industry, maintenance of the national waterways and waterway user fees, the maintenance of the Interstate Highway System, subsidization of the railroads, and the like. Policies in each area influence the movement of agricultural products and farm production inputs.
- Environment—generally, the focus of Governmental regulations aimed at restoring environmental quality and preventing its degradation has been to place the cost with the source. For farms, the effect has been to increase costs.
- Worker health and safety—relevant programs have not been a major influence on agriculture. To the extent they have been an influence, they have increased costs.
- Energy—national policy until recently was to make available abundant, low-priced energy. Regardless of specific future energy policies, the cost of agriculture, which relies heavily on fossil energy for machinery, chemical fertilizers, and pesticides, will be much higher, and significant changes in production systems will occur. Structural impacts can only be conjectured at this time.

EMERGING ISSUES AFFECTING STRUCTURE

The momentum of current trends in agriculture seems largely established. The consensus is that, left unchecked, the trends will continue and the results are largely predictable. But, regardless of whether there emerges an explicit public effort to alter these trends and to achieve different results, many issues, addressed below, will soon require public attention. And, the resulting decisions through the political process will have significant implications for future farm sector structure, whether explicitly recognized or not.

Entry Barriers

At no time in our history have people had unlimited opportunity to take up farming. High land prices, the lack of credit, and the cost of farm equipment have all restricted access. Nevertheless, barriers to entry have attracted unusual attention in recent years—mainly because the

costs of farming have risen steeply at the same time that farm numbers have declined dramatically.

Opportunities in farming depend, first of all, on how much land is available. As the amount of agricultural land is basically fixed, the supply for purchase or rental by new entrants is determined largely by the rate at which current operators leave farming.

Additional factors restricting entry include:

- The high cost of machinery and equipment.
- Rising land costs.
- Lack of income during a new entrant's early years as an operator.
- Competition for farmland from nonfarm investors.

Traditionally, the farm children of one generation have been the farm operators of the next. Inheritance continues to be the most likely method of entry. Over four-fifths of today's farmers are the children of farmers.

Those who would design policies to influence entry into farming must recognize that there are two types of potential farmers—those who will inherit an existing operation and those who will not. Their interests are diametrically opposed. Entry by heirs would be helped by easing inheritance and estate tax laws. But this action would reduce the amount of land available to other potential entrants and, over time, would probably contribute to farming consolidation and growth. Entry by people who are not heirs to existing farms would be eased by holding down increases in land values and by raising the burdens of inheritance taxes, so that more farms would be sold at the operator's death.

Rising Land Values

Farm real estate values have risen steadily during the last four decades. In only 2 years since 1939 did they fail to increase. The value of real estate on the average farm in 1978 was almost 40 times higher than in 1940. Since 1970, the increase has been dramatic—14 percent in 1978, alone—and the spiral shows little sign of appreciably slowing.

These increases are in part justified by the economic returns to land in farming operations. But other factors, referred to previously, have doubtlessly also pushed land values upward. They include the competition for acreage among farmers themselves, speculative pressures, Federal price support programs, and tax code provisions that have encouraged nonfarm investment.

High land prices have unquestionably made it more difficult for the beginning farmer to get into the business. Beyond that, however, their consequences are less clear. For example, one might assume that because they have restricted entry, land costs have led to a decline in farm numbers and contributed to the growing concentration of productive resources in a few hands. Yet, there are more landowners today than there are farmers. It may be that rising land values have actually slowed the trend in concentration by attracting nonagricultural investors.

What do rapid increases in land price portend for the agricultural credit system? Are they attracting foreign investors? Can the high prices be sustained? Any attempts to deal with the issue must face these dilemmas.

High land values make it difficult for potential farmers to gain entry, but they are the major source of wealth for most established producers. What seems excessive to one group may appear reasonable to the other. Purchase assistance programs will increase the number of potential land buyers. Given the competitiveness and restricted scope of most land markets, they might succeed only in driving up local land prices. In that case, the seller would benefit. The buyer would end up with higher interest and amortization costs offsetting the original loan subsidy.

Tenure and Equity

Three basic types of tenure exist in U.S. agriculture today: full owner, part-owner, and tenant. The full owners own all the acreage in the operation, although the equity will vary according to outstanding loans. The part-owners rent land in addition to whatever they own. The

tenants rent all land operated and thus have no equity in it, although they may have in machinery and livestock they own.

Part-owners have dominated changes in tenure patterns during recent decades. The number of tenant operators has declined, 91 percent between 1935 and 1974, while full owners have increased as a percentage of the total. The most notable change has been the increase in part-owner operations. As a portion of all farmers, part-owners nearly tripled between 1935 and 1974, and the proportion of farmland under their management more than doubled

Part ownership represents a compromise. By owning some land and renting additional acreage, part-owners can operate a larger farm that might otherwise be possible and thus increase their current income. According to the 1974 Census of Agriculture, the average part-owner owned 433 acres and rented 409—a size of operation considerably beyond the average for tenants or full owners.

Care must be used in assessing the implications of today's tenure pattern. Tenure is a less accurate guide to economic well-being now than previously. For example, full tenants, as well as part-owners, today operate farms that on the average are substantially larger than those run by full owners. Full owners, who account for 62 percent of all farmers, operate only 35 percent of the Nation's farmland. Many full owners sell less than $10,000 worth of agricultural products annually. Among part-time and part-retirement farms, full ownership is the most common form of tenure. Full ownership does not, in itself, guarantee against economic insecurity. Nor can it be assumed any longer that families on tenant farms are necessarily worse off, economically, than other members of the farming community.

The use that farmers as a group make of their equity in land may raise serious questions for policy makers. What is the Government's obligation to producers who, through leveraging their equity, expand rapidly by additional land purchases but later have trouble paying off their debts? Should low-cost emergency funding be made available to these operators as part of Government policy? Such an approach rewards operators for what may be questionable business decisions. It reduces the risk of using scant equity to leverage large purchases. In so doing, it adds to the competition for land and drives up land prices. Yet, if enough operators are overextended, failure to provide assistance could mean massive disruptions in the farm sector, foreclosures, and possibly further concentration of landownership.

Farm Labor

Hired farm labor in the United States is especially important along both coasts, most areas of the South, the Rio Grande Valley and the Southwest. In general, hired workers tend to outnumber family workers where irrigation is extensive, where fruits and vegetables are the main crops, in the vicinity of large metropolitan areas where horticultural operations are concentrated, and in plantation and ranching regions where farming units have always been larger than could be handled by a single family.

The old "agricultural ladder" leading from hired hand to tenant farmer to farm operator is no longer a reality for most farmworkers today. Instead, hired farmworkers, whose numbers have been largely stable during this decade, are basically a permanent working class, although not necessarily bound to farming. The increasing mobility of the rural population coupled with the urbanizing effects of mass communication and school consolidation, has put agriculture into direct competition with nonagricultural employers for labor. Insofar as labor costs and availability influence farm structure, conditions in the nonfarm sector—especially employment opportunities—will likely be more significant in the future than technological developments within farming.

Some structural impacts are also possible due to the extension of protective labor legislation to cover agriculture. Beginning with social security coverage, and extending to wage and hour legislation, workmen's compensation, and unemployment insurance, most of the blanket exemptions for agriculture have been eliminated. Much of the current protective legislation covers only

large farms. But because these regulations apply to the largest employers, they set the standard that others must meet. The managerial burdens these measures impose may fall hardest on small producers because of the specialized knowledge required to deal with the regulations.

Water

Water is one of agriculture's critical resources. Policies affecting its availability inevitably influence farm structure, although the extent of impact is not known currently. Two widely publicized issues now confront agriculture. The Reclamation Act of 1902 limits the benefits of federally funded irrigation projects to operations of 160 acres or less. This limit was not widely enforced in the past, and now 2.2 million acres are held in excess of the statutory restrictions. The U.S. Department of the Interior, which administers the law, has announced plans to enforce the 1902 act, a move that would redistribute farmland in several of the Nation's most profitable agriculture areas. Also, the Congress is currently considering legislation that would rewrite provisions of the 1902 law.

Although not directly involving Federal policy, the falling water table in parts of the United States where pivot irrigation systems are used extensively has become an important problem. Large areas where such irrigation systems are common may well be forced out of production because of increasing costs (notably for energy) and the depletion of ground water stocks. The consequences for food and fiber production, while not known, will likely influence geographic production patterns and changes in farm size.

Generally, water policies and programs have probably contributed to the trend toward fewer and larger farms. Irrigated land requires considerable amounts of capital and a high degree of managerial skill to operate successfully. The benefits of Federal efforts have likely accrued to owners rather than renters, because of such programs' effects on land values.

Environment

Federal, State, and local environmental regulations continue to be established and their structural implications are, as yet, unknown. To the extent that such regulations require capital investments, they impose an added economic burden on farmers, because such investments do not produce additional revenue. If economies of size exist in pollution control, environmental regulations will likely encourage further growth in farm size and increase the entry barriers for beginning farmers. However, smaller operations, if exempted from the regulations, could gain a competitive advantage over their larger counterparts.

Land Use

It can be argued that the Federal Governmen had a much more active land use policy 100 years ago than it does today. It actively encouraged settlement of the continent through such measures as the Homestead Act. Today, the Government is directly involved only in the management of publicly owned land. Otherwise the States have the primary authority to contro land use, although Federal environmental regula tions are a growing consideration in land use decisions.

The Federal Government has no single land use program, but pressures to establish explicit, comprehensive land use policies are growing. Such legislation has been introduced in every Congress since 1970. These proposals have sought to provide Federal grants to encourage reform by the States and to foster initiatives underway in some States to take back certain land use control authorities delegated to local governments.

At last count, 48 States had some form of preferential property tax provision for agricultural lands. A number have enacted or are considering measures to preserve land for farming. The impact of such programs is likely to be

greatest near urban centers where the programs may help maintain diversity and slow shifts in the location of agricultural production.

Much of the current interest in land use planning and the preservation of agricultural land originates outside farming. As long as planners and the agricultural community share common goals, cooperation seems likely. But, as the interests of the groups diverge—such as with proposals to restrict farmers' rights to sell their land—conflict is more probable.

Foreign Markets

U.S. agriculture has come to depend increasingly on foreign markets, especially for wheat, coarse grain, and soybeans. The United States accounted in 1978 for 41 percent of the world trade in wheat, 68 percent in coarse grains, and 73 percent in soybeans. Export earnings are important not just to the farm sector, but to the whole economy. They are a major positive contributor to the U.S. balance of payments. These earnings now comprise, for example, over one-half the value of U.S. petroleum imports.

As the United States has become more involved in world trade, it has grown more vulnerable to changing international conditions. Price instability in grain markets has risen notably during this decade. International shifts in supply and demand, modifications in foreign governmental policies, and fluctuating exchange rates all influence the farm sector significantly, and, ultimately, the domestic economy.

Federal policy has sought to temper the potential instability for two main reasons:

- Extreme price fluctuations are disruptive to the farm sector and, thus, the national economy.
- The Nation's share of the world market depends on its reliability as a supplier, and it is diminished by disruptions in the farm sector.

By reducing instability, Federal policy has also reduced the risks of expansion, investment, and modernization. Thus, this policy may well be contributing to the trend toward fewer, bigger, more mechanized farms.

Marketing

Changes in farming since World War II have been paralleled by changes in the structure of agricultural markets. Food manufacturing companies, principal buyers of farm products, have declined from over 40,000 in 1947 to near 17,000 today. Current trends suggest the number will decline more in the years ahead.

Increasingly, farmers and their customers are developing new market arrangements. One of the most publicized is vertical integration, in which a single firm controls several stages in the food production and marketing chain. Another increasingly used arrangement, forward contracting, may have wider implications for market structure. As forward contracts become increasingly common, the importance of traditional terminal markets declines accordingly. While marketing costs are reduced as a result, the amounts of market information—especially reliable price quotations—decreases as the open competition that once determined prices diminishes.

Forward contracting appears best adapted to large, specialized farms that can guarantee specified quantities of products with uniform characteristics. A growing question is how well such mechanisms as forward contracting are serving small-scale farmers outside the mainstream.

Transportation

Transportation costs are a major farm expense. They have influenced production patterns, market locations, and probably farm size as well. For example, the poultry industry, once centered in the Northeastern United States, has since moved to the Southeast, largely because of the lower cost of transporting feed grain to that region. As for farm size, volume discounts in transportation encourage growth to the extent that they favor big operators over small ones.

Because commercial transportation of all sorts—rail, truck, and barge—depends on motor power, fuel availability presents a major problem. Declining supplies and corresponding cost

increases could cause regions with large population centers to reduce their dependency on distant markets. That would mean not only greater agricultural diversity in such regions, but it could also mean significant impacts on specialized producers in parts of the country who now ship crops to the cities.

Deregulation of the railroads and the trucking industry, waterway maintenance, and user charges, all current policy issues, could alter location and costs of agricultural production and, regardless of how they are resolved, will unlikely be neutral in their impact on farm structure.

Rural Communities

Significant changes continue to take place in many rural communities across the country. The most notable is the growth in population in many small towns and in parts of the open countryside. New jobs in manufacturing, services, and government (chiefly State and local), are making it possible for persons who have long expressed a preference for rural living to move into rural communities. People with pensions and other forms of transfer payments, as well as independent sources of wealth, are also moving to the country. At the same time, tourism and other forms of occasional visits to the country seem to be increasing.

The long-term effects of these developments depend in part on energy prices and on other factors, such as the expectations of rural immigrants for public services and amenities. Clearly, however, rural, nonfarm growth puts pressure on the financial (tax) base of small units of government, at least in the short run Where the property tax is an important source of revenue, this pressure may eventually mean added costs to farmers. There is also likely to be increased demand for land, some of it farmland. This possibility is apparent from the form of rural growth in many places—similar to the suburban growth around large cities in the fifties and early sixties. It is characterized by "sprawl" and developments of large lots, rather than revitalization of deteriorating portions of small towns.

The growth of manufacturing employment in rural areas seems to have passed its peak. Just as the Nation as a whole has moved from manufacturing as its primary source of employment to service jobs, the rate of growth in the service sector has become more rapid in rural areas. Because supplementary employment is important in rural areas, which have proportionately more poverty and significantly lower per capita incomes than urban areas, the decline in new opportunities to combine factory wages and farm income may put stress on part-time farming. It is not clear that service employment will offer the same opportunities to the low-skilled operator of small farms. Yet many recent rural immigrants have brought personal service skills with them and may also seek to become part-time farmers.

The absence of outside income opportunities in the few areas where rapid farm population losses are still taking place probably increases farm concentration in those areas. Because this situation exists in parts of the South, where rural poverty is concentrated, it probably contributes to the rapid decline occurring in the number of black farmers.

The presence of illegal aliens who are seeking, or willing to accept, relatively low paying farmwork probably also has an effect on farm structure. Little is known about the numbers of such immigrants. They appear to be concentrated in the Southwest, in areas where farm holdings have traditionally been large and dependent on significant amounts of hired labor.

CONCLUSIONS

American agriculture, by any set of reasonable standards, can be judged to have performed well throughout history to the benefit of all citizens of the country. Further evolution will continue from the current structure, caused by the forces which have shaped it in the recent past. The direction of agriculture seems reasonably predictable:

- Farm size concentration will continue; farms will decrease more in number and grow larger in size. A bimodal distribution will evolve; a small number of large farms will produce most of the food, and a much more numerous group of relatively small farms and few medium-sized units will continue to exist.
- Continued land price increases further concentrating the wealth in agriculture will lead to greater separation of the ownership and operation of the farms and capital requirements that few beginning farmers will be able to meet.
- More complex organizations will be formed to cope with tax provisions and other institutional relationships; exchange arrangements for inputs and products will become more complex and will involve contractual arrangements, integration, and the further erosion of open competitive markets.
- The agricultural influence on rural communities will decrease further and rural America will become more and more like urban America.

These generalizations cannot portray fully the future of American agriculture, but they illustrate the outcome of the present evolutionary path. Do we as a society want this outcome? If the answer is no, what type of structure do we want? Many tradeoffs are involved in whatever decisions are made. Not all groups are affected evenly—there are gainers and losers in any decision, even the decision to do nothing. Understanding these tradeoffs is necessary for making informed public decisions while serving the best interests of all citizens.

The pitfalls of any action, even nothing, are potentially great. Well-intentioned public policies have had unintended and undesirable consequences. Avoiding unintended outcomes in the future should be a primary goal. Achieving the desired result will be helped in large part by comprehensive study of proposals before they are adopted and by educating all participants about the issues and the impacts on participants of any public actions. The expressed intent of this and the other articles in this report is to help delinate the issues and to contribute to an increased understanding of this important public policy issue.

Farming in the United States

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ESCS Agricultural Economist

INTRODUCTION

The number of farms, a primary indicator of the current agricultural transformation, declined rapidly in the past 20 years, but the decline has recently slowed. The average size of the remaining farms has increased rapidly. Larger amounts of nonfarm resources have been used in farming and the productivity of these combined resources has increased.

Production is becoming concentrated among the largest producers and, increasingly owners of the farmland are not the people who farm it. Owner-operated farms continue, however, to be the dominant tenure arrangement. Farm activities of farm corporations are large; they averaged close to 3,400 acres and $500,000 of sales in 1974. Corporations are especially dominant in fruits and nuts, vegetables, nursery and forest products, poultry, and cattle production.

Changes in the mix of land, labor, and capital used in farm production are fundamental to the transformation occurring in farming. The substitution of capital goods incorporating new and different technologies for land and for labor has been especially large.

There have been significant changes in the distribution of income among farmpeople and a big increase in the wealth of landowners.

Several forces have combined to bring about these changes. Among these are:

- Availability of capital goods incorporating new and different technologies.
- Commodity programs supporting farm prices.
- Programs providing credit for purchase of farm real estate and capital goods.
- Sustained increases in U.S. farm exports.
- Nonfarm employment opportunities for people not fully employed in farming.
- Income and estate tax rules related particularly to farming.
- Continued inflation.

The effect of these forces will likely mean declining numbers of farms and increasing concentration of production among the largest producers.

Prospective higher energy prices inject substantial uncertainties for the future organization of U.S. farming. The higher energy prices will affect the mix of resources used in farming. There will be increased economic incentives to use energy-efficient systems of production, but the eventual effect on how U.S. production of livestock and crops is organized and managed is highly uncertain.

FARMS, DECLINING IN NUMBER, HAVE BECOME LARGER

The number of farms has decreased since reaching a peak of nearly 7 million in the mid-thirties. The number had declined to 5.6 million by 1950. In the following 25 years, the number dropped more than 50 percent to less than 2.7 million (fig. 1). About a third of the farms remaining are small and have annual sales of less than $2,500.

The rate of decline in the number of farms has slowed. Farm numbers dropped 30 percent in the fifties, but only 9 percent so far in the seventies.

Practically all of the land of the farms that "disappeared" was incorporated into other farms. Some land went out of production, especially in the Northeast and in the South. New land, particularly in the Southeast and along the Mississippi River, also came into production. So, total cropland used for crops in recent years has been almost identical to the total of the mid-thirties—370 to 380 million acres (fig. 2). But, the average farm size in acres in the mid-seventies was almost twice that of the early fifties (fig. 3).

The increase in farm size is greater when measured in actual dollars of cash receipts (fig. 4). Adjusted for inflation, however, the relative changes in average receipts per farm (1978 dollars) have been roughly comparable to the changes measured in acres.

FIGURE 1
NUMBER OF FARMS

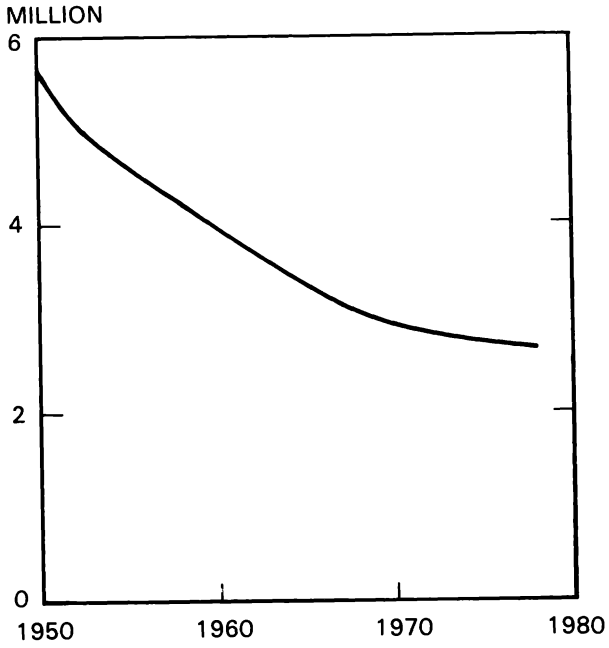


FIGURE 2
CROPLAND USED FOR CROPS

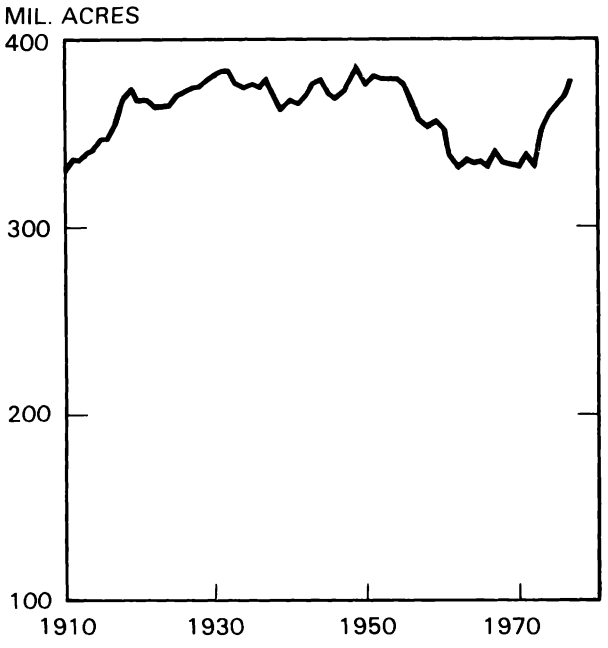


FIGURE 3
AVERAGE FARM SIZE, ACRES

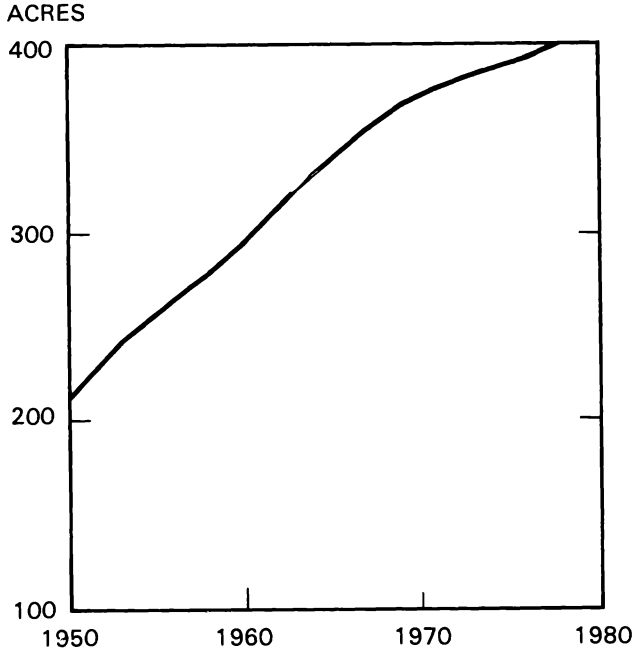
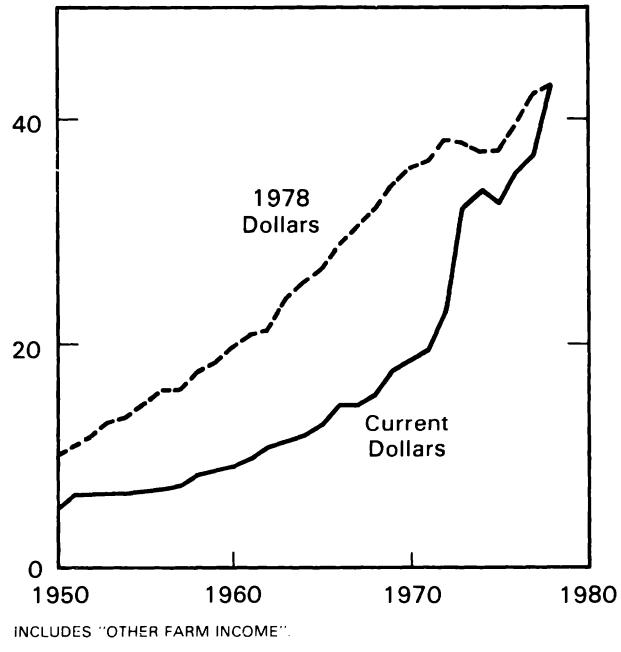


FIGURE 4
CASH RECEIPTS PER FARM



INCLUDES "OTHER FARM INCOME".

RESOURCES AND PRODUCTION ARE CONCENTRATED

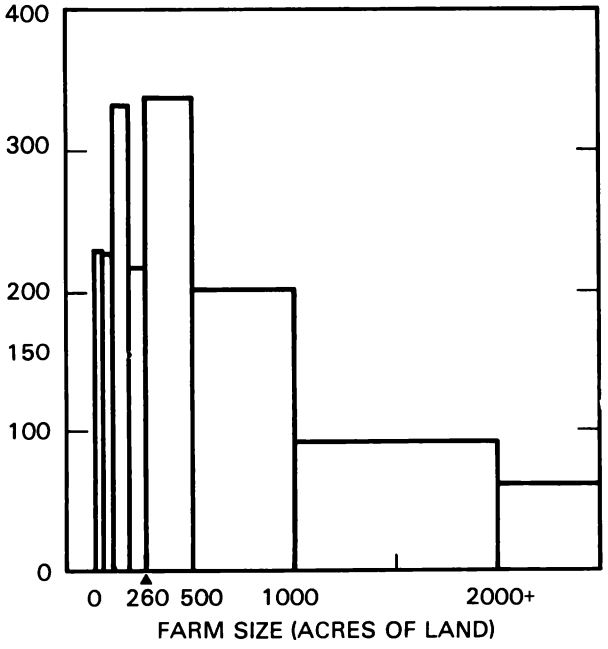
National averages can be severely misleading as indicators of the organization of individual farms. They mask great differences among farms. For example, more than 225,000 farms had fewer than 50 acres of land in 1974. Conversely, 150,000 farms had 1,000 acres (fig. 5). These distributions indicate substantial concentrations of land in large units (fig. 6). The concentration is greater for total land in farms than for either cropland or harvested land. For example, 1,000-2,000 acre farms harvested only 42 percent of their land in 1974 while farms with more than 2,000 acres harvested 12 percent. Rangeland is an important component of land not harvested.

The concentration of land harvested by larger units has increased over time. For example, all farms with 1,000 or more acres of land harvested about 70 million acres in 1964. The total acres harvested by the same size of farms was 100 million acres 10 years later. Thus, in 1974, slightly less than 10 percent of the farms accounted for one-third of the land harvested in the United States.

Data on the number of farms categorized according to sales of farm products also indicate great diversity among farms (fig. 7). Almost 1.8 million farms in 1978 had sales of less than $20,000. Conversely, 187,000 farms had sales of greater than $100,000. One-third of these 187,000 had sales over $200,000.

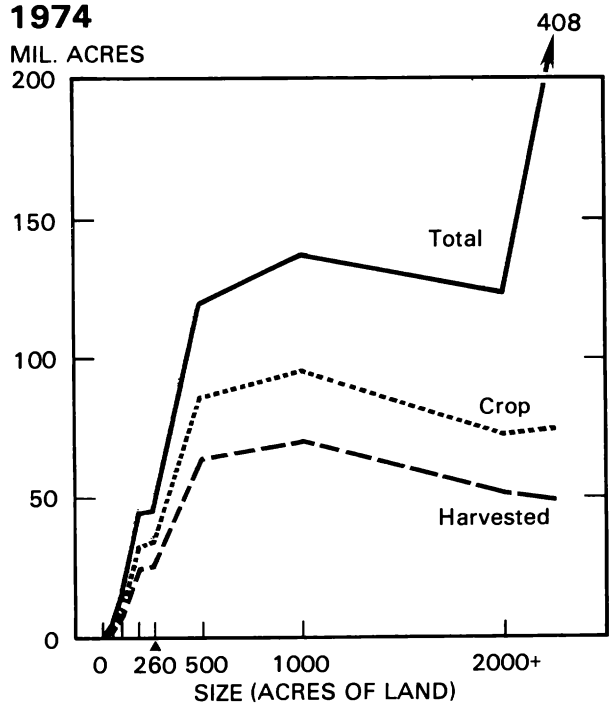
Comparisons over time of the number of farms in different sales classes are difficult because of the increases in farm product prices. For example, prices received by farmers increased 121 percent from 1960 to 1978. They doubled from 1966 to 1978 (up 98 percent). One way to make a rough comparison, however, is to adjust the sales class "boundaries" by

FIGURE 5
FARM SIZE DISTRIBUTION BY ACRES, 1974



FARMS WITH MORE THAN $2,500 SALES.

FIGURE 6
LAND IN FARMS BY SIZE CLASS, 1974



FARMS WITH MORE THAN $2,500 SALES.

changes in farm prices. Figure 8 reflects this adjustment for 1960. For example, farm product sales of $20,000 in 1960 would have been worth $44,000 at 1978 price levels and $40,000 of products in 1960 would have been worth $88,000 at 1978 price levels.

Concomitant with the drop by 50 percent in the number of farms with sales of less than $40,000 (1978 dollars) and the increase of the number of farms with sales of over $200,000 is an increased concentration of sales among the large farmers. The percentage of farms in the $200,000 and over sales class (1978 dollars) almost tripled from 1960 to 1978 (0.6 percent to 2.4 percent) and the sales of this group doubled (from 17 percent of all sales to 39 percent.

An indicator of concentration not influenced by inflation is the share of total farm receipts received by the 50,000 largest farms. Their share in selected years was: 1960, 23 percent; 1967, 30 percent; and 1977, 36 percent. These 50,000 farms constituted 2 percent of total farm numbers in 1977 (*14*).[1]

Other indicators of the heterogeneity of U.S. farming are the contrasts in the average farm size among regions measured by acreage, as well as by sales (figs. 9 and 10). Some of the differences, of course, are attributable to differences in the productivity of lands.

Many other factors also explain the heterogeneity of farms. Some of these are the original land settlement patterns, availability of labor, location of off-farm job opportunities, irrigation investments, and implementation of rules associated with available water.

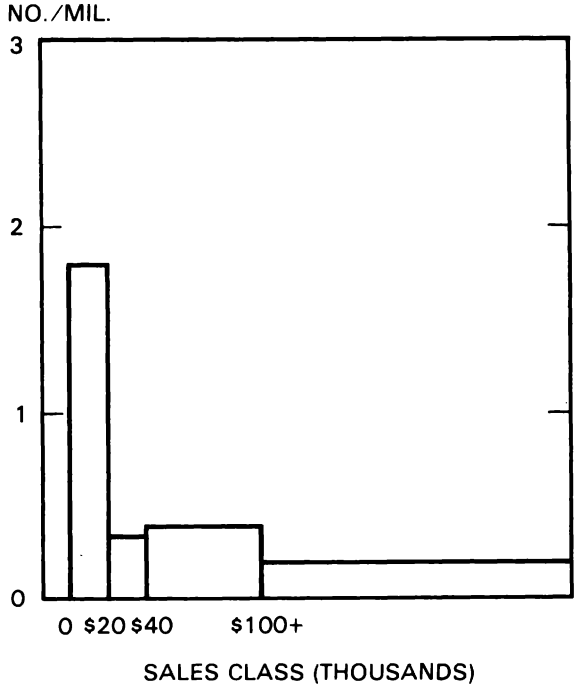
PART-OWNER FARMS HAVE BECOME MORE DOMINANT

Relevant facts related to land tenure on a national basis for the last 30 years are depicted in figures 11, 12, and 13. Note that:

- Number of farms for each tenure category is declining. However, the number of part owners (those who both own and rent part of the land they farm) is declining less rapidly; thus, as a percentage of the total number of farms, the part-owner category has gained. In 1974, part owners were 27 percent of all farms. Full tenants are rapidly declining in both numbers and percent. Full owners have increased slightly in percentage terms.
- Part owners and full tenants have larger farms than full owners, and the size of their farms has increased faster than the average size of full-owner farms.
- The amount of land operated by full owners and full tenants has dropped dramatically. Land farmed by part owners now accounts for more than half of all land in farms. The decline from 1969 to 1974 was in three regions: the Plains, the Southwest, and the Northwest.

Even with the decline in actual acreage in part-owner farms from 1969 to 1974, the per-

FIGURE 7
FARM SIZE DISTRIBUTION BY SALES, 1978



[1] Italicized numbers in parentheses refer to items in References at the end of this article.

centage of land in these types of farms increased slightly.

One estimate indicates that, of the more than 900 million acres in farmland, close to 60 percent is operated by the owners (*16*). However, these statistics are not fully adequate and are complicated by the changes between the 1964 and the 1969 censuses in the way that farms operated by managers were shown in the tabulations. Based on these census data, Lewis and Boxley showed that the percentage of land owned by farm operators declined from 62.3 in 1954 to 58.0 in 1964. There was also a slight drop from 1969 to 1974 (*4*).

HIRED LABOR IS MAJOR ROLE OF MINORITIES IN FARMING

Minorities, especially blacks, were extremely important to cotton production and, in turn, farm income and U.S. export earnings during much of the 19th century. Primarily, blacks were laborers and a few owned land. This section on minorities is based on a manuscript by Lewis (*5*).

There has been a great exodus of blacks from farming. Most black operators have been in the South. The number of black farm operators in the fifties declined by 287,000 or about 50 percent (from 560,000 to 273,000). The decade declines since 1940 were:

Dates	Thousand	Percent
1940 to 1950	122	18
1950 to 1959	287	51
1959 to 1969	185	68
1969 to 1974	34	39

While the number of operators leaving farming in the sixties was smaller than in the fifties, the relative change was greater. In the mid-seventies, 75,000 farm operators were classified as minorities, including blacks, Hispanics, Orientals, and Indians. They operated 13 million acres of farmland.

FIGURE 8
FARM SIZE DISTRIBUTION BY SALES, 1960

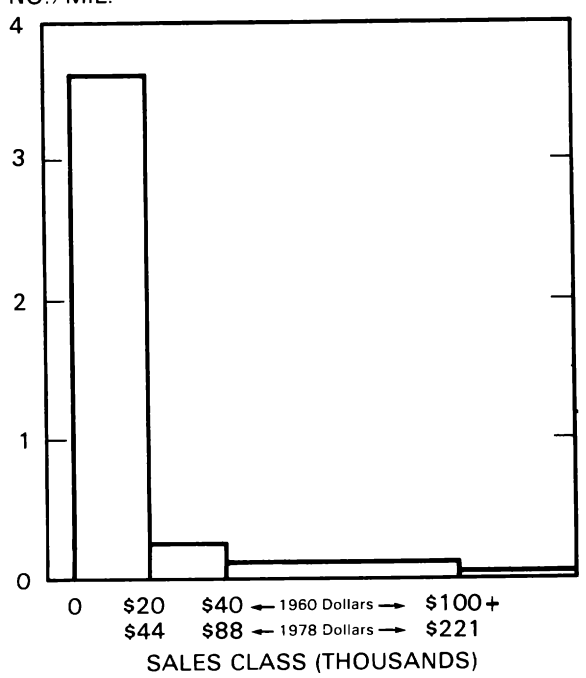


FIGURE 9
AVERAGE FARM SIZE BY REGION, 1950 AND 1978

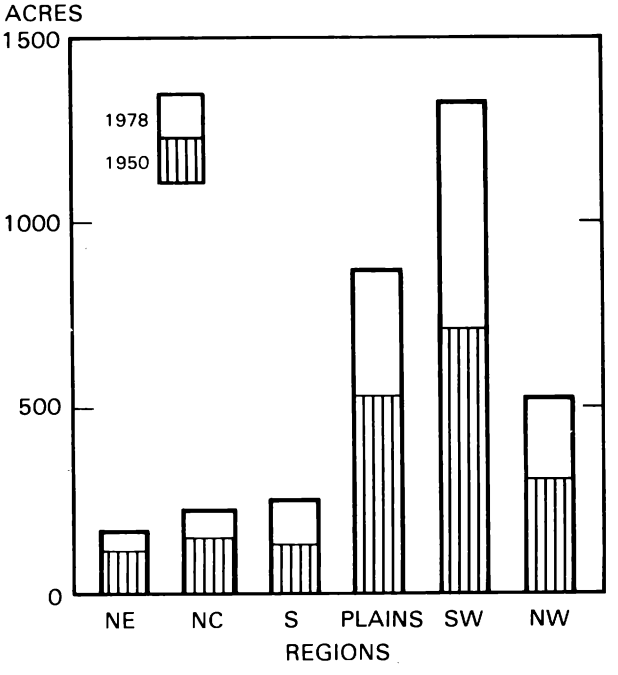


FIGURE 10

AVERAGE FARM SIZE BY SALES, SIX REGIONS, 1959 AND 1977

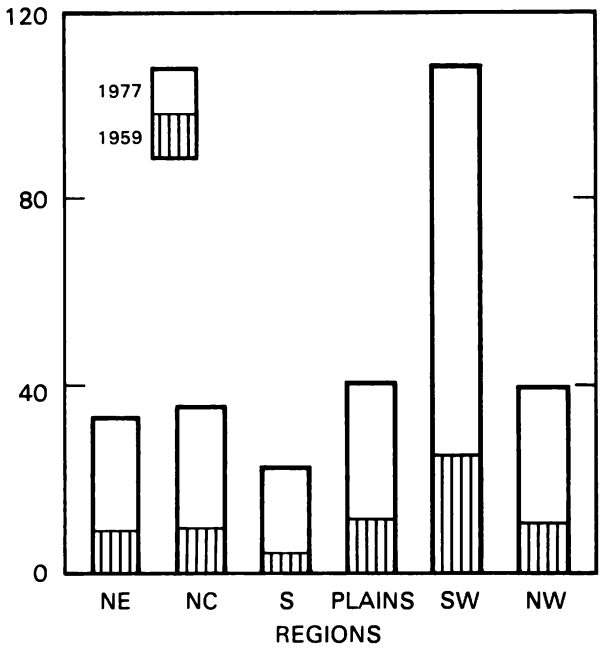


FIGURE 11

NUMBER OF FARMS, BY TENURE OF OPERATOR

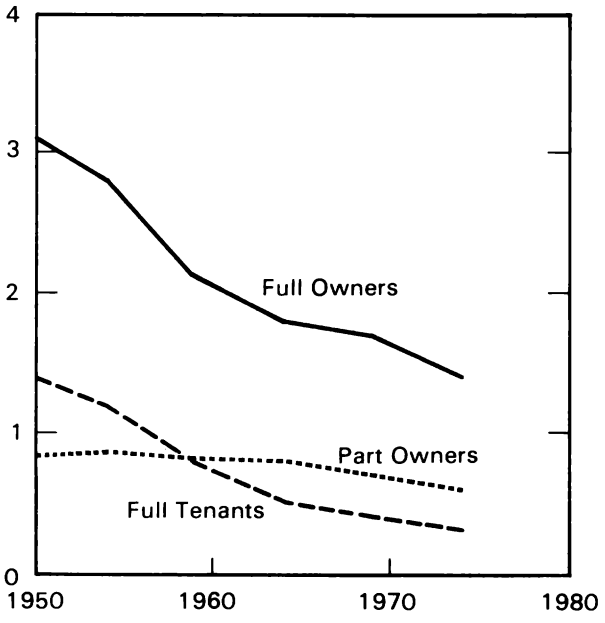


FIGURE 12

FARM SIZE, BY TENURE OF OPERATOR

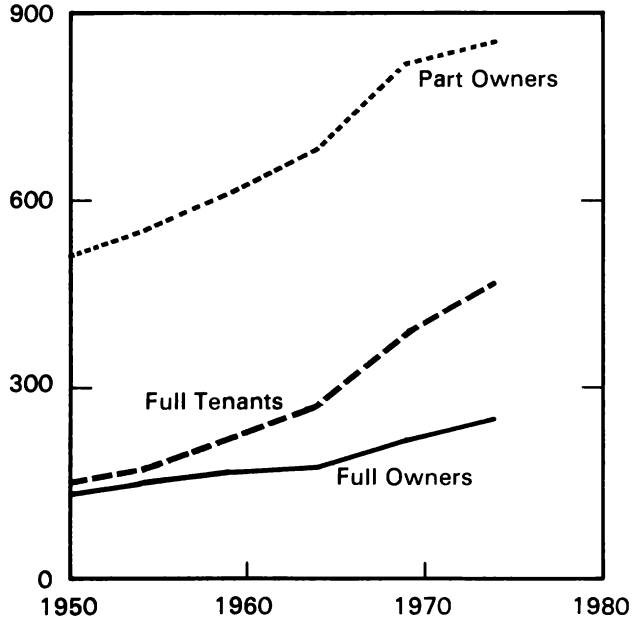
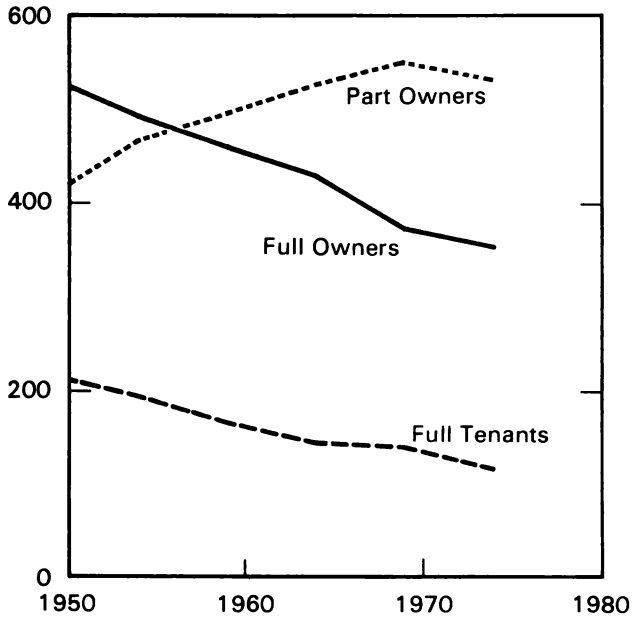


FIGURE 13

LAND IN FARMS, BY TENURE OF OPERATOR



The major involvement of minorities in U.S. farming, however, is in the role of laborer. Over one-fourth of the hired farm work force are minorities, 750,000 people. Hispanics make up almost 40 percent of this total; blacks and "others" account for the remainder.

In addition to 2 million acres privately owned and counted as part of the 13 million acres operated by minorities, Indians have almost 40 million acres as tribal property. A portion of these lands are in agricultural uses.

The number of minority farm operators other than blacks has not declined as precipitously as has the number of blacks. For example, the number of Indian farm operators declined 4 percent from 1969 to 1974, while the number of Hispanics and Orientals increased.

CORPORATE FARMS ARE LARGER THAN OTHER FARMS

Three primary forms of business organization have typified the operation of farming and ranching establishments: sole proprietorships, partnerships, and corporations.

Individual ownership has historically been the main form; in 1974 it accounted for nearly 90 percent of the farms with sales above $2,500. Individually owned farms are generally smaller than partnerships or corporations, measured both by farm acreage and farm sales in 1974:

Type	Farms with over $2,500 in sales	Number	Acreage	Sales
	Thous.		*Percent*	
Individuals	1,518	89	75	67
Partnerships	145	9	14	14
Corporations	28	2	11	18
Other	4	less than 1 percent		

These percentages correspond to the average acreages and sales per farm in 1974:

Type	Average size	Average annual sales per farm
	Acres	*Dollars*
Individuals	447	36,000
Partnerships	859	77,000
Corporations	3,380	417,000

About three-fourths of the 28,000 farming and ranching corporations in 1974 were classified as family corporations. Most of these corporations, classified as "primarily farm," received more than 50 percent of their corporate receipts from farming:

Type	Privately held		Publicly held and other
	Family	Nonfamily	
	Number		
Primarily farm	20,300	4,500	162
Business associated	1,500	1,200	785

Some terms describing corporations have special meaning:

- Primarily farm: 50 percent or more of corporate receipts from farming.
- Business associated: Less than 50 percent of corporate receipts from farming.
- Family: 51 percent or more of stock owned by persons related by blood or marriage.
- Other: Held by religious orders and incorporated charitable and nonprofit organizations.

Over one-fifth of all farming corporations in the mid-seventies were located in California, Florida, and Texas. Over half of these were in California. These corporations were primarily involved in cattle feeding and fruit and vegetable, nursery and greenhouse plant, and sugarcane production.

Farm corporations are large relative to other farms by most measurements:

- Family corporations in 1974 had 1.3 percent of the farms, 7.8 percent of the land in farms, and 9.1 percent of the farm product sales.

• Publicly held corporations had greater farm assets and farm production than family corporations and in the same year had 0.1 percent of the farms, 0.6 percent of the land in farms, and 3.4 percent of the farm product sales.

Family farm corporations dominate corporate farm numbers and acreage, but produce only half the corporate sales, indicating substantial concentration of sales among large corporations:

Item	Privately held		Publicly held and other
	Family	Nonfamily	
	Percent of total		
Farm numbers	77	20	3
Acreage in farms	74	20	6
Sales	50	31	19

Corporate farming has attracted much attention in the last decade. Nationally, corporations are dominant in fruits and nuts, vegetables, nursery and forest products, poultry and cattle production and sell 28 percent or more of each of these commodities in the United States. Corporations account for 18 percent of all sales of farm commodities (table 1).

Corporate farming activities are large; each averaged almost 3,400 acres and over $400,000 of sales in 1974. However, they vary greatly as indicated by average acreages and sales for different types of corporate farms (table 2).

Table 1—Sales of all farm corporations, 1974

Item	Share of total U.S. marketings	Distribution of corporation sales among commodities
	Percent	
Grain	5	8
Cotton	16	2
Tobacco	3	[1]
Other field crops[2]	25	10
Vegetables	37	6
Fruits and nuts	32	6
Nursery and forest products	60	7
Poultry	28	12
Dairy	6	4
Cattle	33	41
Other livestock	8	3
All sales	18	100

[1] Less than 1 percent.

[2] Including peanuts, potatoes, sugar beets, sugarcane, popcorn, and mint.

CAPITAL GOODS HAVE SUBSTITUTED FOR LABOR

Dramatic shifts in the mix and productivity of resources used in farming have helped to transform farming. There has been:

• A sharp, long-term decline in the use of labor.

• Relative stability in the amount of land farmed.

• An expanded use of water.

• A large expansion in the use of capital goods incorporating new technologies such as chemicals and machinery.

These trends have been associated with:

• A substantial increase in farm production, with increases in crop production relatively greater than the increases in livestock production.

• Increased production per unit of labor input.

• Decreased production per unit of capital input.

• Increased productivity of all measured inputs as a whole.

Labor

During 1918, 24 billion hours were used in farmwork. By 1950, the figure dropped to 15 billion hours. And, by the mid-seventies, less than 5 billion hours were used per year. About 40 percent of this labor is devoted to the pro-

Table 2—Size of farm corporations, 1974

Item	Privately held		Publicly held and other
	Family	Nonfamily	
		Acres	
Size:			
Primarily farm	3,300	2,900	3,800
Business associated	1,900	5,300	6,500
		1,000 dollars	
Sales:			
Primarily farm	347	855	4,864
Business associated	200	578	2,475

FIGURE 14
NUMBER OF FARMWORKERS

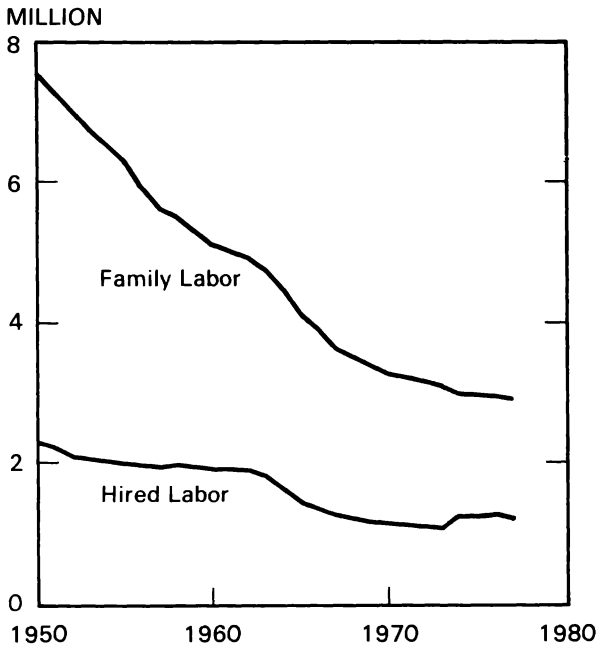
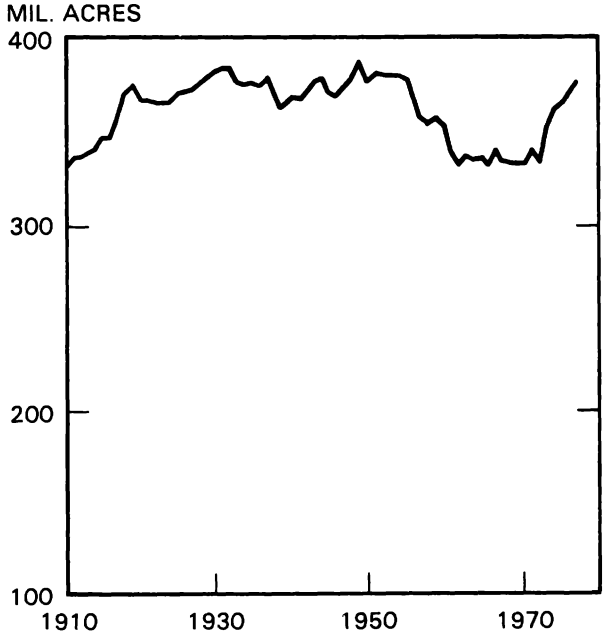


FIGURE 15
CROPLAND USED FOR CROPS



duction of livestock and livestock products and 60 percent to crop production.[2]

The number of family (operator and family members) workers has declined more rapidly since the thirties than the number of hired farm workers—both in absolute and in relative terms. Family workers in 1977, however, outnumbered hired workers by a ratio of 2 to 1 (fig. 14).

Land and Water

Farms and ranches comprise almost 60 percent of the U.S. land surface. Two-thirds of this is utilized as pasture, woodland, and rangeland. The remainder is cropland (about 460 million acres). Some of this cropland is used only for pasture and each year some is left idle. About 370 to 380 million acres of cropland are used for crops (fig. 15). Of the major resources used in farming, the quantity of land is the most stable. However, regional shifts have occurred. The Northeast has experienced a long-term decline in cropland acreage. In other regions, cropland acreage declined into the sixties but has since increased.

Agriculture is the major user of water in the United States and its use has been increasing. The total consumption of water withdrawn from streams and groundwater sources in 1977 was close to 110 million acre feet. (An acre foot is equal to the volume that would cover 1 acre to a depth of 1 foot, or 325,848 gallons.) Agriculture used 80 percent of this total to irrigate more than 40 million acres of farmland, which was an increase from about 25 million acres in the late forties. Most of the irrigation occurs in the 17 Western States, and these States accounted for most of the expansion in the amount of water used.

Capital

The decline in farm labor inputs has been offset by increases in the use of capital goods, such as fertilizer, machinery and associated fossil fuels, increased public capital, and high-yielding crops and livestock. The availability and effective use of these inputs reflect the increasing

[2] (2) was especially helpful in the preparation of this part of the article.

productivity of human capital used in labor and management.

Fertilizer use has increased more than fivefold since 1950. While the number of tractors has increased less than 30 percent in this same period, the horsepower incorporated in these tractors has increased almost 150 percent (fig. 16).

Contrasting changes in the amounts of resources used in agriculture are reflected in the shifting mix of resources. A typical example is the relationship between labor and capital (fig. 17).

In 1950, labor accounted for almost 40 percent of the value of all resources used in farming; by 1977, it had declined to 14 percent. In 1950, capital (machinery and chemicals) accounted for 25 percent of all resources used in farming; by 1977, it had increased to 43 percent. The shift in resource mix, showing a substantial substitution of capital goods for labor, reflects the changing productivity of inputs and changes in the relative prices of these inputs.

Until the seventies there was a strong price incentive for farmers to substitute capital goods for labor. Figure 18 shows *changes* in prices by time periods. For example, the price of labor went up 229 percent from 1940 to 1950. In contrast, land prices increased 103 percent.

Note that the relative increases in the prices paid for labor (wages) exceeded the price changes in other categories of inputs for each of the three decades. Price increases from 1970 through 1977 for fertilizer and land, however, have exceeded the wage increases. These changes are lessening the incentives to substitute capital inputs for labor.

The total quantity of inputs in farming has been remarkably stable since World War II (fig. 19). In contrast, the total quantity of farm output has increased over 60 percent since 1950. The index of productivity (output per unit of input) has increased about 70 percent since 1950; in the three preceding decades, it had increased only 40 percent (fig. 20).

While overall productivity has increased since 1950, there are significant contrasts in the way productivities of different inputs have changed

FIGURE 16
TRACTOR HORSEPOWER

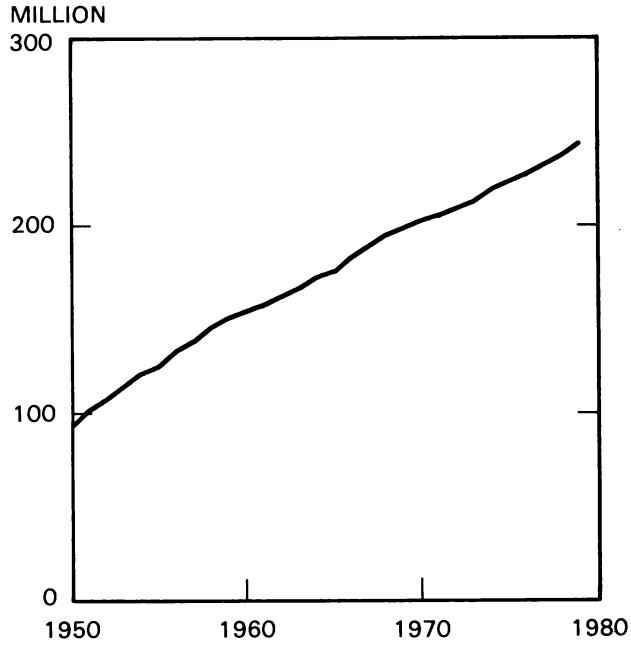


FIGURE 17
RESOURCES USED IN FARMING

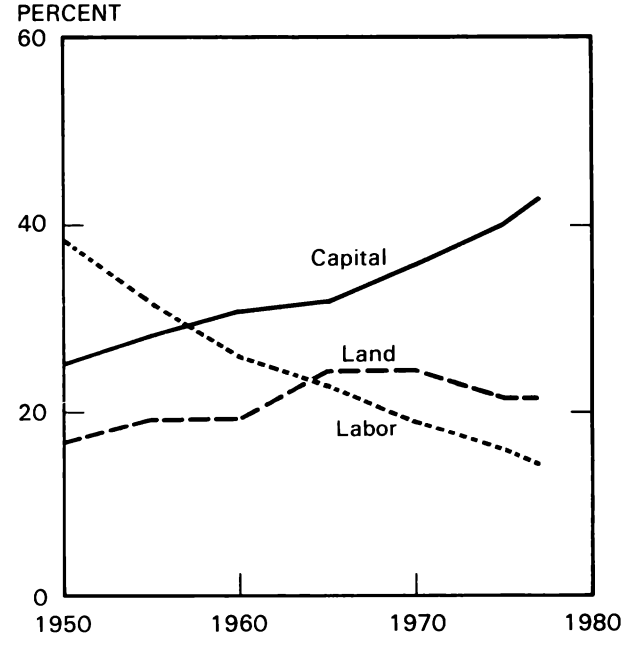
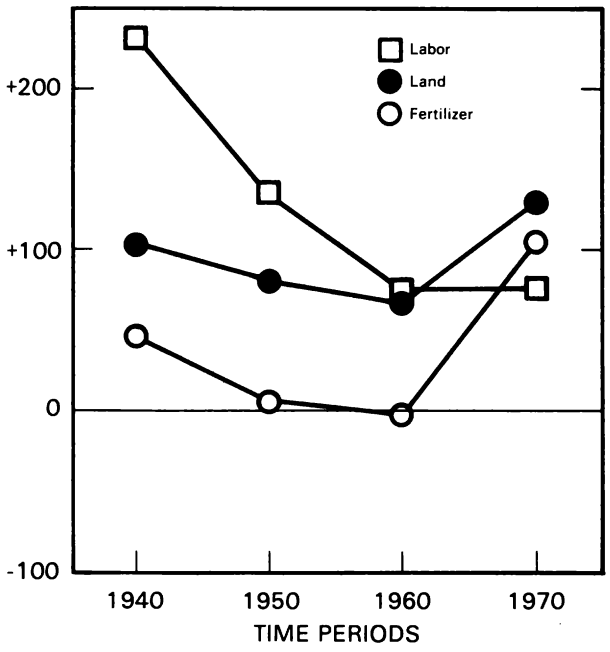
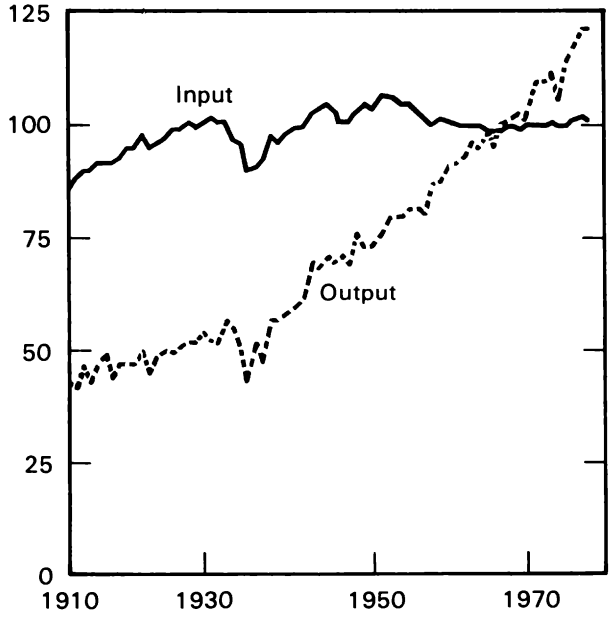


FIGURE 18
CHANGES IN PRICES PAID BY FARMERS



*CHANGES OVER TIME PERIODS — 1940's, 1950's, 1960's, AND 1970-77.

FIGURE 19
FARM INPUT AND OUTPUT



over that period (fig. 21). But ratios illustrating these changes must be carefully interpreted. For example, the ratio of crop production to land reflects both the productivity of land itself and the changing productivities and amounts of other inputs used in combination with land to grow crops. These other inputs are capital items such as drainage associated with land (*9*), technology associated with seeds and other inputs such as fertilizers and their associated technologies, and human capital embodied in labor and management.

Labor productivity comparisons between the farm and nonfarm sectors are often made. Output per man-hour in farming increased more rapidly than in nonfarm industry for many years. However, recent estimates of average output of farm labor are 20 to 30 percent *below* the output of nonfarm labor. Problems of interpretation for these kinds of ratios are analogous to those cited above for land productivity. Estimates of the proportion of production specifically attributable to each factor of production (such as labor) are not available either in terms of an average for U.S. production or in terms of how production would change if small changes were made in the amount of the individual factors of production.

DISTRIBUTIONS OF INCOMES AND WEALTH HAVE CHANGED SUBSTANTIALLY

Significant changes in the distribution of income among farm people and substantial adjustments in the distribution of wealth among Americans have accompanied the increasing concentration of farming into larger units. Financial data for farming reveal:

- Increased farm income.
- Large increases in the wealth of landowners.
- Increased returns to resources in farming.
- Greater concentration of incomes and wealth.

Increased Farm Income

The change in the distribution of incomes and wealth in farming is occurring in the context of significant changes in total incomes and wealth. Farm income of the farm population as a whole was relatively stagnant from the mid-fifties into

the early seventies (fig. 22).[3] Farm income and export sales rose dramatically and inflation influenced the prices of practically all commodity prices. Throughout the past two decades, nonfarm income of farm people increased steadily, as an increasing proportion of the farm population undertook nonfarm work while continuing to live on a farm. The nonfarm income of farm people has been greater than their farm income since the late sixties, except in 1973 and 1974. The relative increases of per capita income of farm people were larger than the relative changes in total incomes shown in figure 22. For example, the farm population dropped from 23 million in 1950 (15 percent of the U.S. population) to less than 8 million in recent years (not quite 4 percent of the U.S. population).

The average income of farm people has increased substantially in the last 25 years (fig. 23).[4] However, this increase has been so eroded by inflation that the 1978 average income in terms of purchasing power was roughly equal to what it was in 1962-64.

Measures of income to farming as an industry also show substantial increases over the years (fig. 24). For example, average 1976-78 earnings of farm production assets were $20.3 billion. This was more than three times the average for 1960-62. With adjustment for inflation, the 1976-78 average was slightly more than 50 percent above the 1960-62 average.

Farm income of farm families does not include farm-related incomes of farmers who do not live on farms; farm-related incomes of nonfarm landlords; nor farm wages of hired labor. Farm earnings used in this article represent the combined total of net income of farm operators living on farms; farm income of farm operators

FIGURE 20
FARM PRODUCTIVITY

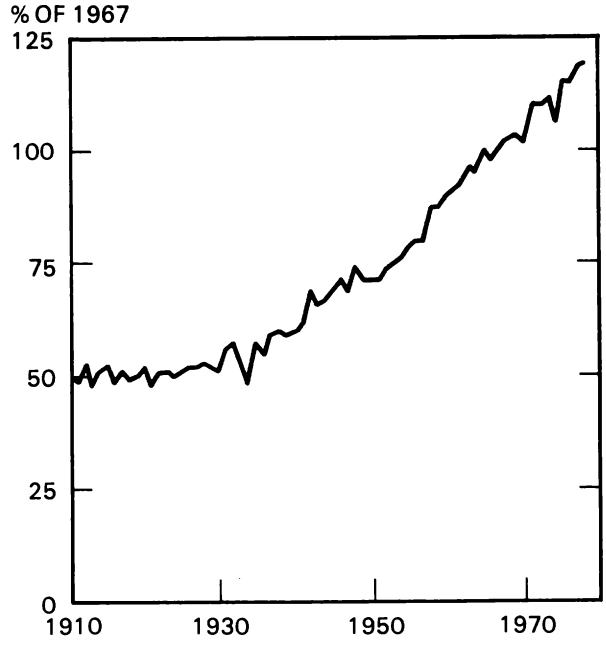
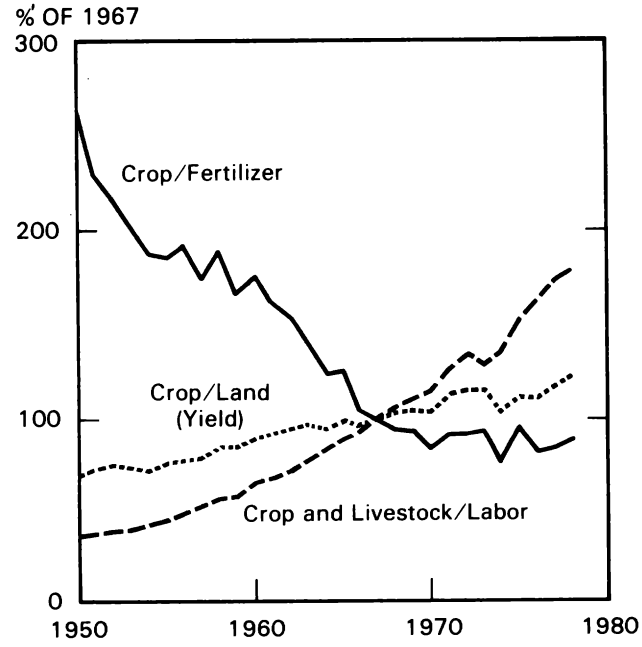


FIGURE 21
RATIOS OF FARM PRODUCTION TO SELECTED INPUTS



[3] The farm population consists of people living in rural territory or places of 10 or more acres if $50 worth of agricultural products were sold from the place in a year. People on places under 10 acres are also included if the sales from their places are much as $250.

[4] Per capita income expressed in 1978 dollars takes into account both the change in population discussed earlier and inflation of prices of products purchased with incomes. These calculations used the index of prices paid by farmers for items used in family living.

living off farms; cash wages and perquisites of hired labor; interest on real estate and non-real estate debt; and net rent received by nonfarm landlords, less imputed interest portion of the rental value of farm dwellings and less imputed returns to labor and management (*3*).

The Wealth of Landowners

Farm people have also experienced a dramatic increase in wealth as a result of the increase in farm earnings (fig. 25) (*10, 8*).

Farm physical assets (land and buildings, machinery, livestock, and crops stored on and off farms) more than tripled in value from 1960 to 1978 (fig. 25). When adjustments are made for inflation, the change in value in the same 18 years is from $400 billion to $660 billion, a 65-percent increase.

Real estate, the largest component of assets (almost 80 percent), accounts for a slightly larger proportion of capital gains (84 percent of the change in value of all farm physical assets minus net investment for the 1960-78 period as a whole).

The increase in the value of farm assets, especially farm real estate (land and buildings), has had a strong influence on the wealth and, perhaps, income of those owning the assets. Further, it has had important implications for the entry of people into farming, the exit of others, and the ownership of the physical resources devoted to farming.

The magnitude of the *increases* in farm wealth can perhaps be understood better when related to past changes in farm wealth (capital gains) as well as farm income over time (fig. 26). For example, the asset value changes in recent years are much greater than they were in the sixties. The increases in farm wealth are also large in comparison to farm earnings and income of farm people:

Value of farm physical assets:

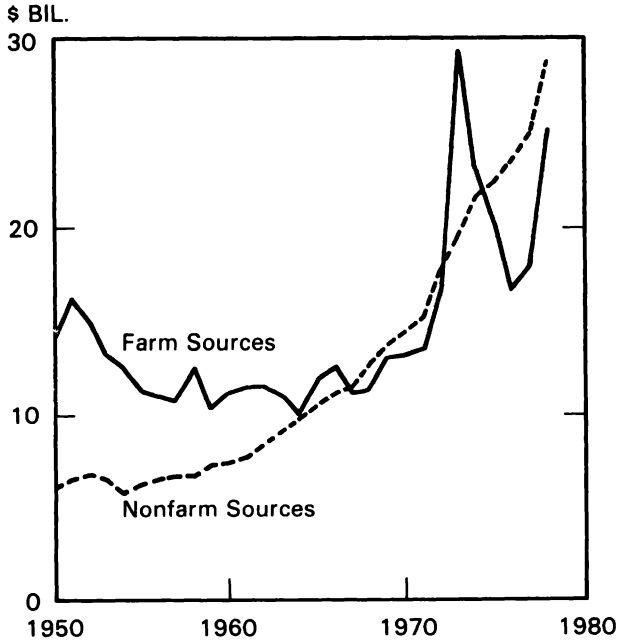
	Billion dollars
January 1, 1960	180
January 1, 1972	315
Increase from	
1960 through 1971	140
1972 through 1978	433
Farm earnings	
1960 through 1971	98
1972 through 1978	157
Farm-related income of farm population	
1934 through 1959	288
1960 through 1971	141
1972 through 1978	150

The value of U.S. farm assets more than doubled from 1972 through 1978. This *increase* of over $400 billion in wealth was nearly three times the total farm earnings of the same period and equivalent to the total of farm income of *all* the farm population from 1934 through 1971.[5]

It is useful to conceptualize the capital gains of farm physical assets in two components:

- The inflation offset—an amount of capital

FIGURE 22
TOTAL INCOME OF THE FARM POPULATION

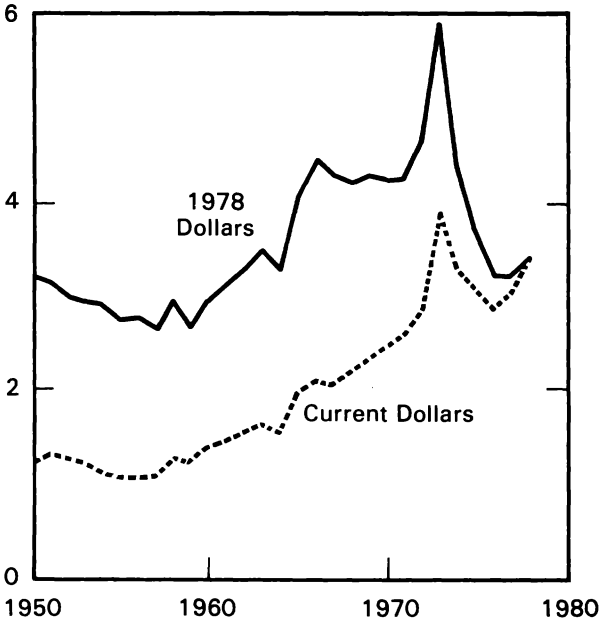


FARM SOURCES INCLUDE GOVERNMENT PAYMENTS; AFTER INVENTORY ADJUSTMENT.

[5] (*15* and *3*) were especially helpful in the preparation of this section of the article.

FIGURE 23

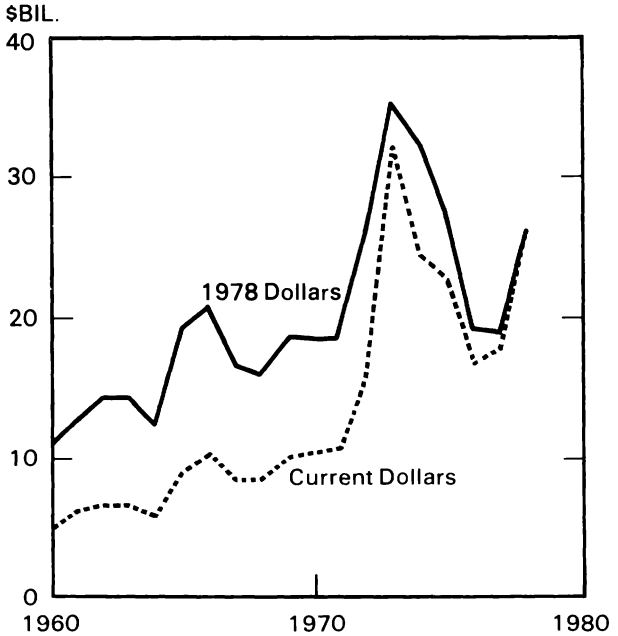
PER CAPITA INCOME OF THE FARM POPULATION



NOMINAL INCOMES FROM ALL SOURCES DEFLATED WITH INDEX OF PRICES PAID BY FARMERS FOR FAMILY LIVING, 1978 = 100.

FIGURE 24

FARM EARNINGS



gains on assets that would retain the purchasing power of the value of the assets. Annually, this would be based on the rate of inflation and the value of the assets at the beginning of the year.

- Other capital gains—the remaining portion of the capital gains on the assets (fig. 27).

In only 2 years have capital gains failed to be equivalent to inflation. Conversely, the "inflation offset" accounts for slightly over half the capital gains. Thus, the increase in farm-related wealth of farm asset holders has surpassed the effects of inflation by a wide margin and therefore their real wealth has increased substantially (table 3). Farm wealth as a proportion of total national wealth increased from 7.7 percent in 1970 to 8.7 in 1978 (7).

Increased Returns to Resources in Farming

Returns to investments in farming have increased over time and relative to investments in common stock of U.S. industry (figs. 28 and 29). These returns have undoubtedly affected the expected future returns of U.S. farming and, in turn, affected the demand for farm assets such as land. The attractiveness of the return to farm assets relative to returns on common stock helps explain why some farm people want to expand their holdings of farm real estate and why nonfarm Americans and investors from other countries seriously consider farm opportunities.

A comparison of averages of these returns for the sixties and the seventies illustrates the increased financial attractiveness of farming relative to common stock:

Years	Farming		Common stocks	
	Annual earnings	Capital gains	Annual income	Capital gains
	Percent			
1960-69 average	3.46	4.53	3.19	6.99
1970-78 average	4.69	11.59	3.92	0.72

Table 3—Capital gains, farm physical assets

Years	Inflation offset	Other	Total
		Billion dollars	
1960-64	10	26	36
1965-69	36	33	69
1970-74	112	90	192
1975-78	147	129	266
Total	305	268	573

For example, the 0.27 annual income return spread (3.46 minus 3.19) between farming and common stock in the sixties widened to 0.78 in the seventies. The capital gain return in farming was one-third less than in common stock in the sixties. It was over 11 percent in the seventies and common stock return was less than 1 percent.

FUTURE UNCERTAINTIES

The prospective size and number of farms are difficult to estimate. Many of the forces that caused the changes of the past 20 years continue to influence decisions of people interested and involved in farming and ranching. These forces include:

- Availability of capital goods incorporating new technologies.
- Continued inflation, making landownership attractive as a hedge.
- Tax provisions, giving special benefits to incomes and capital gains associated with farming.
- Commodity programs, reducing the risks of farming.
- Credit availability, facilitating consolidation of resources into larger farming units.
- Nonfarm employment opportunities, providing alternative opportunities for those giving up agricultural pursuits.
- Growing export markets affecting farm commodities, especially cereals and oilseeds prices.

FIGURE 25
FARM PHYSICAL ASSETS, JANUARY 1

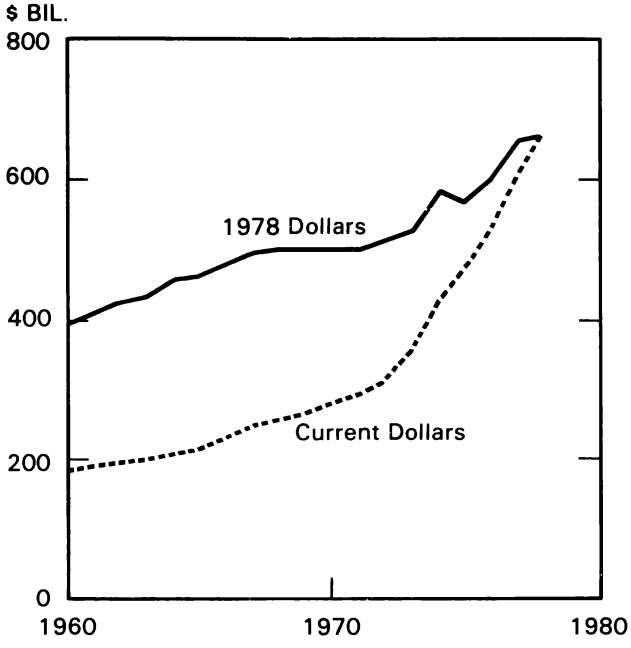
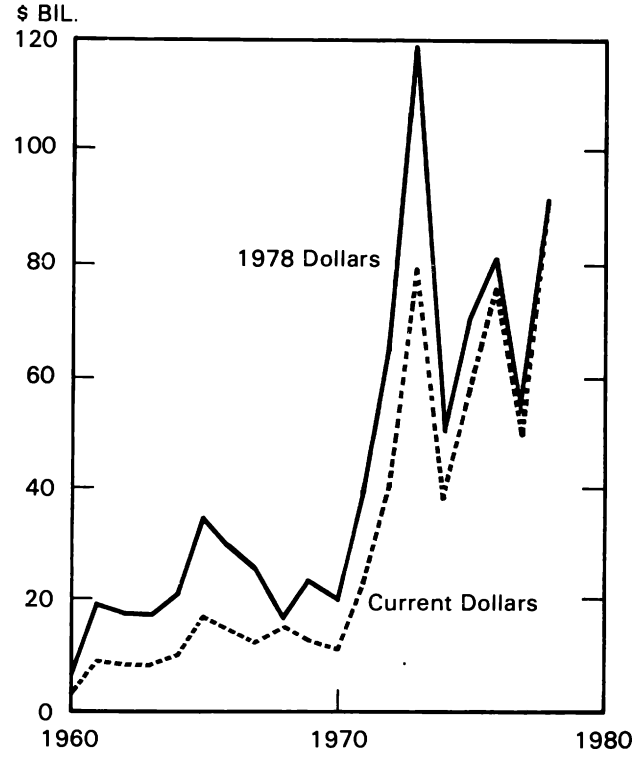


FIGURE 26
CAPITAL GAINS, FARM PHYSICAL ASSETS



These forces in concert have led to increased size of farms and ranches through consolidation of land and the associated increased utilization of resources provided by other sectors of the economy. However, the strength and character of these forces has changed somewhat in recent years. The three most important changes have been:

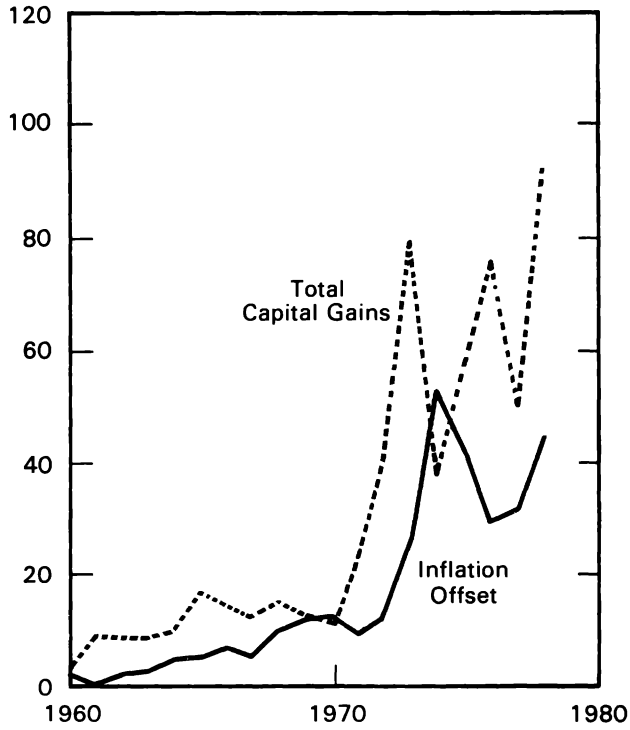
- Increased rates of inflation in the economy.
- Higher energy costs, influencing the economics of using capital goods and the costs of transporting farm products.
- Further changes in tax rules, increasing the attractiveness of farm-related incomes and farm assets.

Inflation

The higher rates of inflation reinforce the trend toward increased farm size. Most farm and nonfarm people are searching for ways to enhance their economic welfare. Capital gains associated with changes in land prices make land an attractive alternative, especially in inflationary periods. Those farm people who already own assets have a competitive advantage in making downpayments, obtaining credit, and servicing the loans associated with further acquisition of land and other assets. Such financial transactions lead to consolidation of resources by those who already have resources and, therefore, fewer but larger farms. Land obtained by nonfarm people is usually available to rent for farming. Increasingly, such lands are rented to those who already own and rent other lands, thus further contributing to larger and fewer farms.

Prospects of higher energy prices inject substantial uncertainty into the future of U.S. farming, particularly in the way that it is organized and managed. The eventual effects, however, will most likely be evident in two ways: the location of production and the mix of resources used in farming and ranching.

FIGURE 27
INFLATION OFFSET OF CAPITAL GAINS, FARM PHYSICAL ASSETS



Energy Costs

The relative competitive position of farms dependent on irrigated water will diminish to the extent that higher energy costs of society are paid by agricultural interests. This might happen in the following way. There has been an increased concentration of fruit and vegetable production with irrigated agriculture in the past 20 years. In many cases, this concentration involved a shift of production among regions of the country, especially to the irrigated areas of the Southwest. Transportation distances from producers to consumers often increased.

Higher energy prices will continue to inflate transportation and irrigation costs, which will likely encourage a shift of production from the Southwest to areas closer to the metropolitan centers of the North. Because the farms in the North have been smaller in the past than those in the Southwest, production will likely shift to farms in the North that are smaller than those in the Southwest. At the same time, new methods of irrigation that reduce water use will be adopted to mitigate the effects of higher energy costs and, in some cases, limited water supplies.

Higher relative energy prices will also stimulate farmers throughout the country to adjust the mix of resources they employ in farm production. The extent of the price changes and the energy efficiencies of available technologies will influence choices regarding their use. This, in turn, will affect farm size. In an extreme case, energy could be so expensive that the resource mix would again be characterized by a major emphasis on labor and land. This would reverse trends toward larger and fewer farms as measured by sales and by land.

Tax Rules

Changes in the Federal tax provisions have made the ownership of farm assets increasingly more attractive than other assets. The effects on farmland prices are predictable—higher than otherwise. Additionally, these tax provisions will probably accelerate the decrease in farm numbers and increase the size.

Nonfarm investors, both rural and urban, are encouraged by these tax provisions to seek farm investments. Farmers and ranchers are also encouraged by these provisions to continue to farm and to retain ownership of their assets. Nonfarm investors, possessing other assets and realizing nonfarm income, and farmers with substantial equity will be the ones who can obtain assets and take advantage of the tax provisions. Such benefits are simply worth more to them than they are to people of lesser means. Therefore, they will be the successful bidders for the assets.

TRENDS

Despite uncertainties inherent in these developments and the lack of research on the relationship of these specific variables to the way that farming is organized, it is useful to examine

FIGURE 28
FARM RETURNS
PERCENT

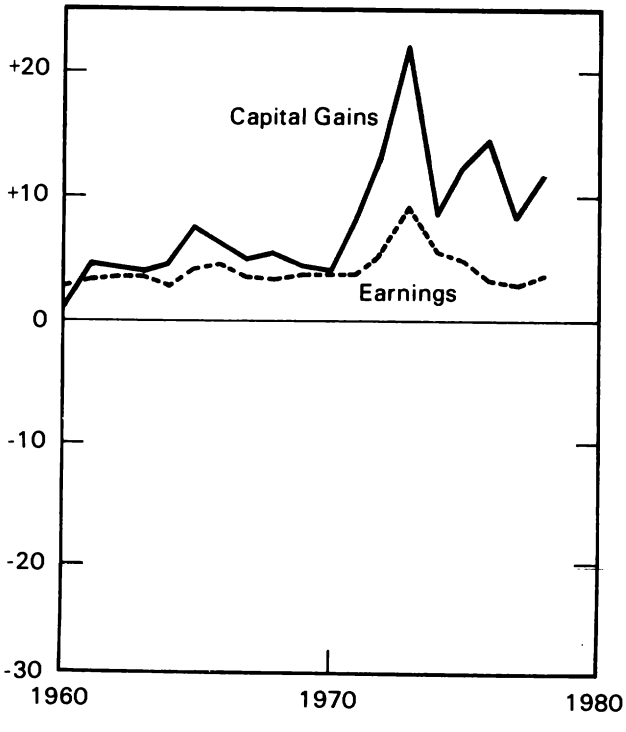
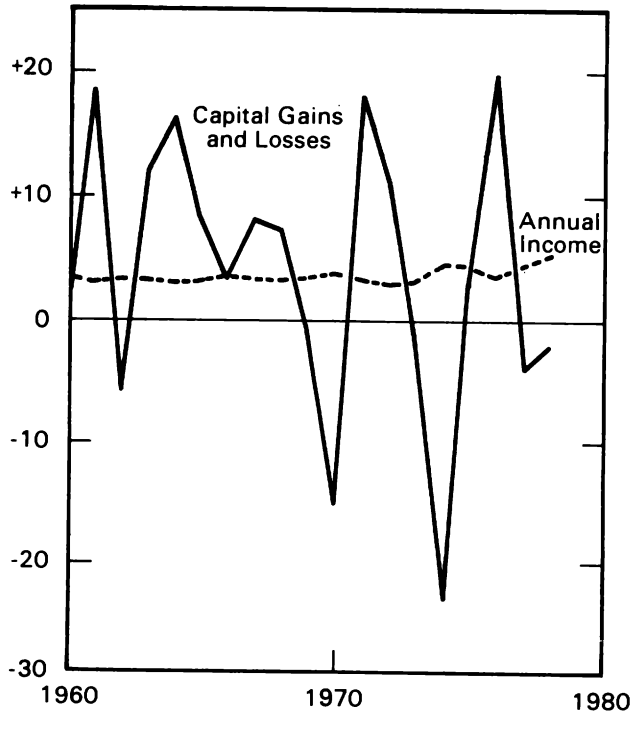


FIGURE 29
COMMON STOCK RETURNS
PERCENT



trends and projections. These trends and projections indicate that farm numbers will continue to decline, the number of larger farms will increase, and, in turn, the average size of farms (measured by acres or by sales) will increase. An indication of the possible changes in the mix of different sizes of farms is provided by figures 30 and 31. These figures depict the historical numbers of farm sizes as measured by acres and by sales. The values portrayed for the year 2000 in these figures are trend values reported by Lin (*6*).

These estimates suggest that if past trends continue, the farms at the end of the century with 500 acres or more and farms with sales of greater than $40,000 will increase in number. The biggest decreases will occur among the smaller farms. Projections included in two other research reports also suggest that farms will number between 1 to 2 million in 2000 (*11*, *13*).

Another indicator of changes in farm size change is that of estimates of the number of farmers that account for selected percentages of total farm sales and land in farms (fig. 32). For example, Coffman estimates that in 1974,

FIGURE 30
FARM NUMBERS BY SIZE (ACRES)

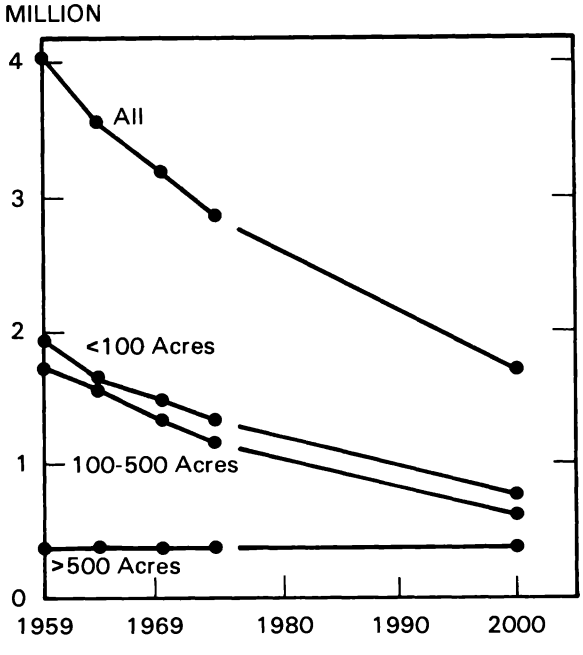


FIGURE 31
NUMBER OF FARMS BY SIZE (SALES CLASS)

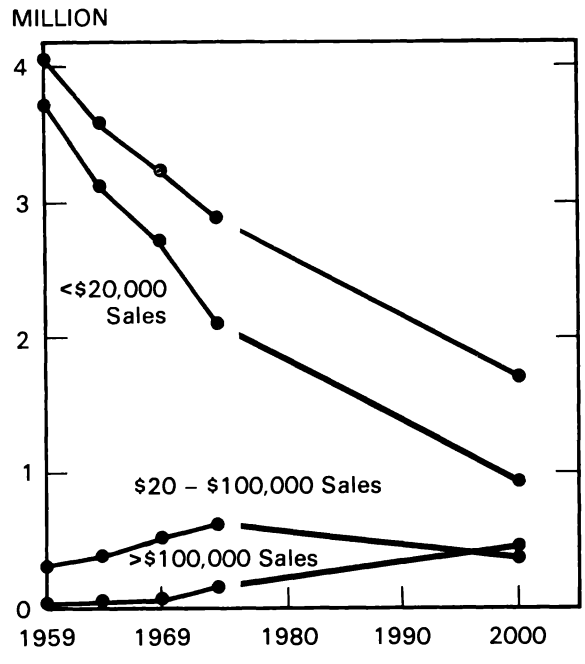
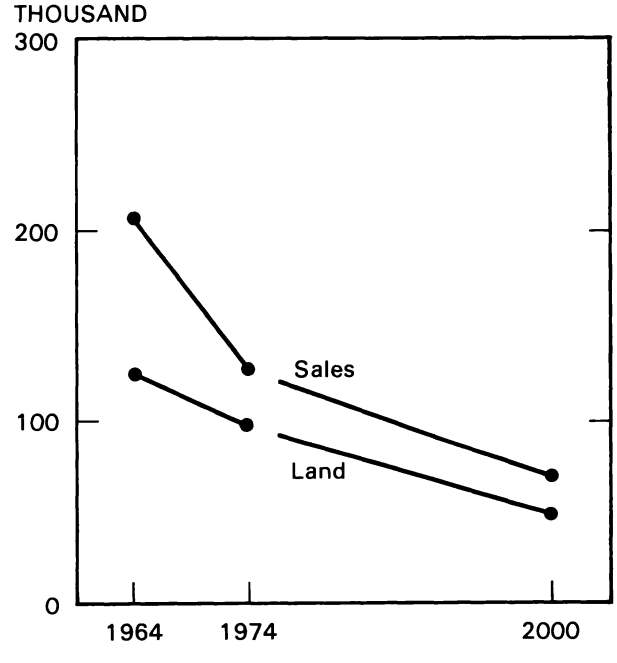


FIGURE 32
NUMBER OF LARGEST FARMS WITH 50 PERCENT OF TOTAL SALES AND LAND IN FARMS



125,000 farms out of a total of 2.8 million accounted for half of total farm sales. In 2000, if past trends continue, 70,000 are likely to provide half of total farm sales (*1*).

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Perspectives on the Economic And Structural Change In U.S. Agriculture

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ESCS Agricultural Economist

INTRODUCTION

Perhaps no single word describes U.S. agriculture as well as the word "change." Changes in farm output and productivity have been conventionally thought of as the wellsprings of increasing standards of living of consumers, the salvation of the farmer, and major contributions to the growth and vitality of the economy. But, change has also brought forth complicated issues. Survival of the family farm, agriculture's growing dependence on purchased inputs of uncertain availability, coordination or integration of production by nonagricultural firms, adverse environmental effects of production, and the decline of rural communities have become vital issues associated with change and all are related to the changing structure of agriculture.

Economics, as a science, can help measure and define the situation in which we find the farming sector. Hence, this series of articles stresses the economic foundations of structural change in the farming sector to sort out some of the conflicts inherent in the issue of structure of agriculture.

PURPOSE OF THE SERIES

This series of articles identifies questions to clarify issues involved in structural change and the appropriate public policies to influence it. These questions include:

- What changes in structure have occurred?
- What are the likely future changes to the structure of the farm sector?
- What have been the consequences of these structural changes? Are these changes causing problems?
- If there are problems, is it because the situation or process is changing, or because the viewpoint of society is changing?
- What public policies can most effectively influence the outcomes of structural changes?
- What are the implications of these policies in terms of side effects, tradeoffs among the goals of society, the costs and benefits, and the distributive impacts (who is burdened and who is benefited)?

This article relates economic theory to the phenomena associated with structural change. Ownership and control of resources, the degree of specialization of production, barriers to entry, and numbers and size distribution of farms are all major dimensions of the structure of the farming sector.

GENERAL ECONOMIC BACKGROUND

Several tenets of economics apply to structural change in agriculture. The most basic tenets are those of the perfectly competitive and purely competitive models. Agricultural production is the closest representation of the purely competitive model existing in today's economy. The existence of large numbers of farms, producing largely undifferentiated products, with relatively uncontrolled entry and exit conditions, in an uncertain or risky economic and production environment makes agriculture the classic example of a purely competitive industry. By contrast, the perfectly competitive industry—which differs only in the certainty of outcomes and the certainty of knowledge—is an abstraction economists use for analysis of the economic system. It has no close representation in reality. But it serves as an analytical tool, much as a road map serves a traveller.

Another set of basic tenets of economics is the process of structural change. Structural change is part of the process of economic advancement which has been going on since the beginning of recorded history. The process of economic advancement is a loop consisting of:

- Specialization, which leads to . . .
- Market exchange, which leads to . . .
- Capital formation, and . . .

- Technological adoption, which together, lead to . . .
- Increased output, hence to a . . .
- Reduction in the number of firms, and hence to . . .
- Increased market coordination, and finally . . .
- More specialization by firms.

There may be minor loops within the process, such as between capital formation and technological adoption, and between increased output and reduction in the number of firms. But, the overall process appears to be as stated. The institutions and policies that evolve shape the outcomes and give rise to contrasting structures between agriculture and (say) the automobile industry, or construction, or chemicals. Also, contrasting structures within the farming sector—such as poultry production *versus* fruits and vegetables *versus* grains production—may be the result of different institutions and policies in these subsectors as much as the result of product characteristics, or different stages in the evolutionary process of structural change.

The process of economic advancement as outlined above, is seen differently at different levels. From the national level, the process is seen as aggregate economic growth, with attendant increases in gross national product (GNP), employment, and trade. From the industry level, the process is seen as structural change: changing numbers and sizes of firms, increasing specialization and coordination, changes in ownership and control of resources, and the changing economic and social characteristics of participants in the industry. From the firm level, the process is seen, more dramatically, as survival by adaptation. Increased efficiency of production, competition for inputs and markets, and protection of income and wealth positions are the important factors of the process for firms.

As the structure of an industry changes from pure competition, the opportunities, strategies, and hence the organization of firms, suppliers, and handlers change, giving rise to phenomena that are not necessary or do not work under pure competition. Some of these are:

- Contractural coordination.
- Market discrimination.
- Nonprice competition.
- Product differentiation.
- Bargaining and countervailing power.
- Work stoppages, boycotts, and rationing by inconvenience (as with gasoline).
- Politicization of the economic processes.

These are not structural changes, as such, but phenomena made possible by the changes in structure toward monopolistic competition, oligopoly, and/or monopoly. An agricultural production sector which interacts as a purchaser or supplier with industries using these practices faces strong pressures to become similarly organized to effectively counteract their power.

To alter the outcomes of economic transformation requires intervention to change the operation of the economic system. Since the competitive model is, rightly or wrongly, thought of by many people as an ideal, it is useful to point out some of the questionable, or nonideal, features of the competitive model and how these relate to the performance and the changing structure of the farming sector. This will help focus the discussion of the structure of agriculture on the differences between policies to improve the operation of the competitive system and policies to supplant the operation of the competitive system.

Consumers' Sovereignty and Choice Sets

Economic theory holds consumers as the ultimate source of demand and sovereign in their tastes and preferences. These tastes and preferences are assumed to be given, and assumed to be towards goods and services of the production sectors to the exclusion of intangibles, aesthetics, or social values. A more realistic viewpoint would be that tastes and wants are interdependent, are influenced by one's income position relative to others, are influenced by past and prospective outputs of the economic system, and that intangibles are very much a part of the bundle of goods and services desired by consumers.

Producer Freedom and Choice Sets

Producers are held to be free to enter into any economic activity to satisfy the tastes and preferences of consumers, and to bear the risks thereof. In truth, many restrictions have been placed on producers, and many proposed policies would further these restrictions. In addition, many programs modify or socialize certain economic risks, such as natural disasters, low market prices, or business failure by the largest employers. As a consequence, producers want to protect the current set of rights they are perceived to have, by resisting restriction and perpetuating helpful programs.

Adequacy of the Pricing Mechanism

The market pricing mechanism is held to be the engine that assures goods will be produced and priced optimally (or in such a way that no one can be made better off without another person being made correspondingly worse off). Economics has recognized that the market does not price all things equally well. This realization has given rise to descriptions and prescriptions for the failure of the market to price and allocate all things equally well. These are such concepts as:

- Externalities (outputs not priced by the market, such as pollution).
- Public or collective goods (goods which are available whether the consumer pays or not, such as aesthetics or radio waves).
- Common property resources (resources for which many producers have equal access, such as groundwater).
- Public utilities (goods or services for which duplication of facilities in several firms is uneconomic, such as telephone systems or power distribution systems).
- Instability of prices and production due to uncertain outcomes of nature or due to imperfect knowledge and expectations (such as beef production cycles or cumulative inflation or recession due to public expectations).

Adequacy of the Distribution of Rewards

The perfectly competitive economic system is equally capable of allowing people to starve as it is capable of making certain groups inordinately wealthy. The welfare of participants in the economic system cannot be taken as ideal if society disapproves of either of these outcomes. Chronic depression for some industries and groups can result from actions that benefit society as a whole. Redress of the market distribution of incomes toward a distribution preferred by society through progressive taxation or transfer payments is generally accepted. However, even on this point potential controversy exists between those who believe society should alter the distribution of benefits and those who believe that society has no right to do so.

The Process of Technological Change

Changes in the technology of production create benefits either for the producer, the consumer, or both. In a purely competitive industry, with inelastic demands, the consumer, in general, gets most of the benefits through increased production and lower prices. Hence, there is little incentive for firms in purely competitive industries to invest in research and development of new technologies. Government, therefore, has accepted this task for the benefit of society. In an oligopolistic industry, the level of production can be controlled to keep demand in an elastic range, and the rate of technological change can be controlled to reap most of the benefits for the producer or developer of the technological change. Four key questions are:

- Will technological change continue, and at what rate under differing structures of agriculture?
- Who will bear the costs and get the benefits from technological changes?
- How will the international competitive position of the United States be affected by the rate of technological adoption?
- How will an adequate rate of technological change be assured?

Mobility, Fixity, and Adjustment of Resources

Resources and economic assets may be immobile (such as land with favorable climate and rainfall) or may tend to become fixed over wide price ranges (such as building and equipment investments, once made, or human resources, once engaged in farming). The implications of immobility and fixity of resources and assets are that economic adjustments to them occur slowly, and generally at great individual or social costs. Indeed, the immobility of resources provides one of the major reasons for international comparative advantage and its resulting impacts on trade and development. Resource mobility and asset fixity issues are:

- What are the acceptable rates of adjustment of human resources and fixed capital resources, to prevent unacceptable capital losses or human dislocations?
- Who should bear the costs of required adjustments in resources and fixed assets?
- How can required adjustments of resources be distinguished from temporary economic imbalances?
- How do resource adjustments in the farming sector affect the international trade, aid, and development positions of the United States?

Bargaining Power of Participants

Disparities in market power and bargaining power abound between the farm sector and its suppliers of inputs and purchasers of products. Market orders, cooperatives, and bargaining agencies, aided by public authority, have established a balance of countervailing power. But, disparities may still exist to the economic detriment of the farm sector. Several key questions related to market and bargaining power are:

- Do disparities of power remain?
- What are the price and risk impacts on the direct participants in the economic system?
- What are the impacts on bystanders and indirect participants?
- Are some of the costs of bargaining battles among protagonists shifted to other segments of society through strikes, boycotts, and rationing methods?

Market Coordination and Exchange Processes

Market coordination by contractural linkage, ownership, or active markets has evolved to improve the transmission of price and production signals through the economic system and to eliminate or shed some of the risks of production and marketing. The current concerns are with: the appropriateness of the coordination mechanism in terms of cost and efficiency, the competitiveness among coordination mechanisms in terms of equity to participants or ability to be manipulated, and the resulting concentration of market power or decisionmaking control in the hands of a few firms.

Adequacy of Economic Growth

Economic advancement results in economic growth at the aggregate level. Questions of the adequacy of economic growth, for its own sake, arise in public concerns about the level of GNP, unemployment, real growth, and inflation. Indeed, these are taken as measures of the performance of the general economy. The structure of agriculture has an impact on these measures through both production and consumption. An emerging question concerns the adequacy of the goal of economic growth: can or should the economy continue to grow at its current pace? Are we impoverishing, or providing for future generations through our present economic policies? This concern merges with concerns of environmental degradation, growing dependence on limited stock (non-renewable) resources and inputs of uncertain supply, and concern for the values, aesthetics, and social structures of society.

Adequacy of Public Decisionmaking

The adequacy of the process of public decisionmaking is increasingly being questioned. There are six facets of public decisionmaking relating to this issue:

- The cost of making and administering decisions in the public sector.

- The institutionalization of programs or policies once enacted (such as tax loopholes and commodity programs).

- The responsiveness of the decision process (how fast can a change in the situation be perceived and a decision made in response to the changed situation?).

- The equity and protection afforded by public decisions taken through the political process.

- The tendency of public decisions to generate private benefits and socialize the costs of these actions.

- The non-neutrality or disincentive burdens of taxation and expenditure by the public sector.

RATIONALE FOR PUBLIC POLICY

To the extent that the preceding 10 departures from the ideal exist in the economy, results of the competitive economic system depart from the ideal. These represent opportunities to improve economic outcomes. The departures of the competitive model form the rationale for public policies. Public policies toward agriculture, as with most industries, have attempted to improve the performance of the system by moving toward the ideal of a competitive market. Such instruments as antitrust legislation and market information are examples. Or, where the competitive outcome is undesirable, public policy has tried to develop substitute mechanisms or additional mechanisms to alter the outcome of the competitive system. Progressive taxation, transfer payments, and market orders are examples of this.

The majority of policies instituted for the control and improvement of the economic system have recognized a strong, underlying belief in private property rights, superiority of the capitalist system, and superiority of market-determined prices, production, and incomes. These underlying beliefs and values condition policies to incorporate the broadest possible scope for decisionmaking by private firms and individuals and to foster the broadest possible reliance on incentives as opposed to prohibitions or demands. Policies not incorporating these values tend to be accepted only in cases of dire emergency or threat to national welfare or security.

GOALS AND ECONOMIC TENETS UNDERLYING THE DEVELOPMENT OF FARM POLICY

U.S. farm policy and its resulting influence on the farm sector and rural communities have been shaped by two dominant goals of society. These have been *production* (the size of the pie) and *welfare* (how it is distributed). Production was stressed because it was recognized that, in general, only through increasing production could society improve the welfare of one group without correspondingly reducing the welfare of another group. The goal of production implied improving farm productivity and freeing resources for productive use in the rest of the economy. The goal of welfare redistribution was stressed because it was recognized that the levels of income and wealth that the economy could generate were not necessarily desirable in human terms. The welfare goal resulted in favoring policies of abundant food and fiber at a declining real price, and concurrent income protection for the agricultural sector.

The Original Situation

Farm policy largely evolved from the situation existing in the thirties. At that time, the farm sector had been in a depressed state for approximately 10 years. Production was largely oriented toward domestic markets following the emergence of the United States as a creditor Nation following World War I. International markets had largely dried up. There was chronic excess capacity and a pervasive welfare problem due to low returns to all resources. To cap it all, the Nation was in the throes of its severest de-

pression and there was insufficient demand in the rest of the economy to absorb the people and resources released from agriculture. The result was that large numbers of farms (6.5 million) and large numbers of farm residents (over 30 million) were living in near poverty and were uncertain of the survival of their farms or their livelihoods.

The policy prescription that evolved from this dramatic situation combined:

- Price supports based on volume of output.
- Supply management to enhance commodity prices.
- Redress of bargaining power through cooperatives and market orders.
- Credit access policies to preserve ownership in the hands of operators.
- Continued technological change to improve the productivity of labor and land in an attempt to reduce farm production costs.

The Evolving Situation

The forties and World War II brought a high level of demand to all sectors of the economy. This demand was sustained throughout the period of U.S. industrial dominance, continuing through the sixties. Agriculture responded with continued rapid technological change, freeing factors for use in the rest of the economy. There was chronic excess capacity as the rate of technological change outstripped the adjustment of resources out of agriculture. This era saw the emergence of the agricultural treadmill of technological change, as follows. The primary benefits of technological change went to consumers and early-adopting farmers as the expanding output depressed commodity prices, forcing adoption of new technologies by farmers for their own survival. There was thus a rapid migration of people out of agriculture and a mixed welfare problem with large and/or innovative farmers faring well and small or more traditional farmers faring poorly.

The evolving policy prescription recognized the disparity of large versus small but maintained the system of price and income supports based on each farm's historic volume of production. This, unfortunately, contributed to the disparity of income and wealth between large and small farmers. Supply management programs using quotas, allotments, and resource diversion were keystones to limit the exposure of the Federal Government to storage costs and support payments. Programs to accelerate the adjustment of resources out of agriculture and to facilitate commercialization of the remaining farms (adoption of the modern technology) were major parts of rural development, extension, and credit programs. The redress of bargaining power continued through cooperatives and market orders.

Today's Situation

The success of the adjustment policies of the forties through the sixties has resulted in striking changes in the farming sector. The former problems of resource imbalances and low incomes have largely been overcome, yet some new problems have surfaced. The agriculture of the seventies has the following characteristics:

- Fewer than 2.7 million farms.
- Increasing world market orientation for U.S. production, primarily in grains and oilseeds.
- Growing uncertainty of input availabilities, primarily energy and petroleum-based inputs.
- Continuing existence of the agricultural treadmill fired as much by privately developed technology as by publicly developed.
- Increasing coordination and integration between agricultural production and markets.
- Excess capacity that appears to be transitory and concentrated in internationally traded goods.
- Emerging and recurring adverse environmental impacts of production.
- Intractable welfare problems localized to specific groups, areas, and commodities. These are generally concentrated among small farmers with few alternative opportunities for their resources, labor, and skills.

The current policy prescription remains much as it has evolved over the past 30 years. Marginal changes were made in the 1973 and 1977 farm bills: for example, separating the income sup-

port mechanism (target prices and deficiency payments) from the price stabilization mechanism (commodity loan rate, farmer-owned reserve, and release price triggers). In general, commodity programs continue to be based upon production, thereby continuing to mix the societal goals of welfare and economic adjustment. This continued reliance on volume of production as the basis for price and income support policies has accentuated the gap between small and large farms. Technological development and adoption continue with a larger portion of new technology being developed by the private sector for sale to the farm sector. Redress of bargaining power through cooperatives and market orders is continuing, although the relative effectiveness of these institutions may be declining.

GOALS FOR THE ECONOMIC SYSTEM

The goals of production and welfare are no longer the only relevant considerations for the economic system. The complex interrelationships of the economic system with the environment and the social system are forcing awareness of a much wider set of impacts of production, and hence have resulted in increasing recognition of a wider set of goals. Some relevant goals for the farming sector of today and the future might include:

- Production (as before).
- Welfare (as before).
- Economic and social efficiency of production and growth.
- Protection of the economy from external events (such as weather or actions of foreign nations).
- Environmental, ecological, and conservation goals.
- Values, beliefs, and social order goals.
- Structure of rural America goals.
- Nonintervention and/or budget limitations by the public sector.

Recognizing these goals for an economic system quite naturally results in "inappropriate" technology, "inappropriate" rates or directions of change, "inappropriate" social and institutional organizations, and "inappropriate" incomes, prices, costs, and wealth distributions. Through analysis, these problems could be foreseen, prevented, or overcome.

The Future

The emerging situation, the policy prescription, and hence the economic outcomes are subject to public choice, within certain limits. It will not be possible, nor is it desirable, to undo the changes of the past, but conscious policies can alter the direction of change. Continuation of past policies, or the taking of no action can be conscious policies, if, in the collective judgment of society, these are warranted.

The likely issues will include the following as a result of the wider set of goals for the economic system and the farm sector:

- The proportion of the public who perceive they are better off and likely to remain so.
- The resilience of the food system (lack of vulnerability of producers and consumers to shocks to the food production system).
- The proportion of consumer income necessary to purchase food and fiber.
- The stability and security of supplies of food and fiber to consumers.
- The stability and adequacy of farm income.
- The organization and structure of the farming sector.
- The future course of agricultural technology.
- International market reliance and international trade.
- Environmental and conservation issues.
- Intangibles such as values, aesthetics, and the social fabric.

The list does not imply any ordering of importance of the issues. They arise because of perceptions of the severity of the departures of the economic system from the ideal. The improved functioning of the system requires trading off improvements in some features of the system for possible degradation in others. Improving any set of the 10 departures, or features of the economic system, can be made an *imperative* and the remaining departures will then become the *adjustment variables.* In dealing with these issues, the collective judgment of society has to be relied upon. It is for us to choose our

future within the limits of democratic process and the possibilities we face.

Tradeoffs Among Goals

Two important inputs into the tradeoffs among goals for the economic system and the farming sector are: (1) the economic linkages which set the limits of possibilities and the nature of conflict among goals and (2) the viewpoints or weights that society attaches to the various goals.

The economic processes and linkages, as outlined above, may be imperfectly known or may be unanticipated, because of the pragmatic tendency of man not to study systems that have previously presented no problems. Their reality in limiting possible outcomes can hardly be doubted. Innovative policies and technologies can lessen conflicts and expand possibilities on specific goals. Thus, though policies and technology may have contributed to the present situation, they also may provide the solutions to our present problems.

The viewpoints, or weights, that society attaches to the various goals are major unknowns and are a primary reason for embarking on a national dialogue on agricultural structure. Society is no more monolithic than is the farming sector. In addition, society, like consumers, does not exhibit sovereignty. Goals change and emerge in response to felt needs, problems, and media-inspired problems.

The democratic process and the rule of law mandate the protection of the rights of consumers, producers, landowners, laborers, taxpayers, and other identifiable groups in the economic and social system. Also, because of prohibitions against overt discrimination among these groups, the outcomes of an impersonal market mechanism are sometimes thought more just, equitable, or justifiable. Rightly or wrongly, the impact of this set of constraints upon public decisions is pervasive and frequently works toward preservation of the status quo, and against anticipating and resolving specific problems, such as setting consistent goals and policies toward the farming sector.

The economic questions set the limits of possible outcomes and identify the internal economic forces that shape these outcomes. The general economic questions that will arise in a national dialogue on agricultural structure are likely to be:

- What is known and what is unknown about the structure of agriculture and structural changes that are occurring?
- What is the connection between the structure of agriculture and its performance in terms of security of supply, levels of costs and prices, and returns to participants?
- What are the possible outcomes of economic forces in conjunction with each other?
- What are the likely outcomes of alternative economic scenarios and policy prescriptions?
- What are the likely economic reactions of other sectors of the economy and of competing sectors in other countries?
- What will we need to know to minimize unwanted side effects of policies?
- How can an outcome be judged "good" or "bad?"

Values and goals questions deal with the desires and constraints imposed by society on opportunities, rights, and privileges, as well as on costs, returns, and budgets. The general values and goals questions will likely center around:

- What are the costs and benefits of specific policies to society and to affected groups?
- How are these costs and benefits distributed by groups and over time?
- What are the gains and losses in broad categories such as values, aesthetics, and the social structure?
- What are the viewpoints of various groups in society regarding these tradeoffs?
- What is society, by consensus, willing to trade for what?
- How stable is the perceived consensus of society?

This series of articles is structured around issues or points of potential disagreement on fact or values. They are intended to describe what is currently known and what we will need to know to have a positive impact on the policy setting and the farming sector.

Some Causes Of Structural Change In U.S. Agriculture

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INTRODUCTION

The major forces described in this article have shaped and will continue to shape the structure of the U.S. farm sector. Many of these forces are influenced by public policies. Changes in such policies thus can modify farm structure[1] which, in turn, can change performance of the food and fiber system (fig. 1). The public policies examined here can be modified to bring performance of the system closer to societal objectives. There are, however, legal, political, and equity constraints which reduce the Government's flexibility and latitude in influencing the shape of farm structure.

Let us view farm structure in the context of the entire food and fiber system (fig. 2). Attention will be focused on the farm (agricultural production) sector, but in many cases it would be difficult and misleading to analyze this sector in isolation from other parts of the system.[2] All sectors are related to one another, and the structure of one may affect the structure of another.[3] For some commodities, the linkage among sectors may be such that control by one firm (decisionmaker) extends across several sectors. An example is broiler production; often, one firm exercises control across the inputs, production, and processing sectors. Many supermarket chains have integrated vertically and operate processing plants which, in turn, contract for the production of farm commodities. In short, our focus on the farm sector must not divert attention from the interdependencies among sectors and the fact that, for some commodities, there may be no separation of sectors in terms of exchange points and decisionmaking.

These dimensions of farm structure are viewed as most important for our purposes:[4]

I. The number and size distribution of farms by commodity/type of farm and geographic region.

II. The degree of specialization in production and the related organization of the farm firm (organization of productive resources and the technology employed).

III. The ownership and control of productive resources, including form of business organization, tenure, and arrangements used to coordinate activities in the farm sector with other sectors.

[1] The term farm structure, as used here, refers to the structure of the farm sector, not to the structural characteristics of individual farms.

[2] The term sector, as used here, corresponds to the term stage as used in literature on vertical coordination.

[3] For example, increased concentration in the processor sector may precipitate organization or actions in the farm sector to obtain more equal market power.

[4] Roman numerals are used to designate dimensions of farm structure and capital letters are used to designate factors affecting structure. These correspond between text and table.

FIGURE 1
DYNAMICS OF FARM STRUCTURE

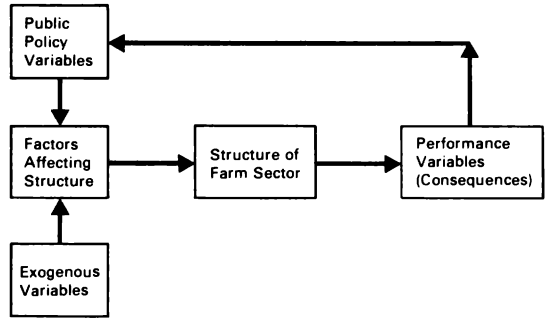
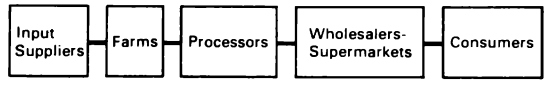


FIGURE 2
SECTORS OF THE FOOD AND FIBER SYSTEM



IV. Barriers to entry into and exit from the farm sector.[5]

V. Socioeconomic characteristics of farm operators and resource owners.

FACTORS AFFECTING STRUCTURE[6]

Some factors affect farm structure rather quickly while others may involve long periods of adjustment. For example, over a long time period, technology has changed farm structure dramatically. The importance of factors affecting farm structure thus depends on the time frame of reference; 10 years—an intermediate time frame—is used here.

One can easily identify factors which have affected farm structure, but little empirical evidence exists as to their impacts. It will be difficult to measure precisely the change in some dimension of structure as a function of changes in specified factors. The relative importance of factors as determinants of structure is largely a matter of judgment (*5*).[7] Some judgments made about the relative importance of factors affecting structures appear in the table. Their effects and public policies which could modify these effects are described.

A. Variation in Input Prices[8]

Several dimensions of farm structure may be affected by the extent to which per unit input prices vary among farmers according to the vol-

[5] Barriers to entry may affect the numbers and size distribution of farms and, in turn, be affected by degree of specialization and ownership and control of productive resources. Thus, dimensions of structure may be interrelated.

[6] Other issue papers describe many of the factors affecting farm structure in greater detail, including the relevant literature.

[7] Italicized numbers in parentheses refer to items in References at the end of this article.

[8] One reason for interest in these differences is that different policy implications are associated with technical and pecuniary economies. It would be desirable to measure economies of size which were related to technical and pecuniary sources.

Importance of factors affecting farm structure[1]

Factors affecting structure	Dimensions of structure				
	No. and size of farm I	Specialization II	Owner-control III	Entry barriers IV	Socio-economic V
A. Variation in input prices	2	2	3	4	4
B. Technology	1	1	4	2	3
C. Economies of size	1	2	3	1	3
D. Variation in commodity prices	2	2	3	4	4
E. Risk and expectations	2	2	3	3	4
F. Price-cost margin	2	3	3	3	4
G. Exchange arrangements	3	3	1	2	3
H. Capital requirements	2	4	2	1	2
I. Taxes	3	4	2	2	2
J. Goals of the farmer	2	4	3	4	2
K. Managerial ability	2	2	3	3	3
L. Alternative opportunities	3	4	3	2	1
M. Macroeconomic policies[2]					

[1] The number of each combination of factors and dimensions of structure indicates the relative importance of the factor in influencing structure; 1 means great importance and 4 means little importance.

[2] These policies and their impacts are so diverse that no attempt was made to rank their importance.

ume purchased (volume discounts).[9] Some evidence, although not current, suggests that large farmers pay less for inputs than small farmers do (*7, 8, 12*). Based on earlier studies, lower input prices for larger farmers could be a major reason for declining unit cost as size of farm increases; that is, economies of size as measured by the longrun average cost curve (LRAC). For example, Krause and Kyle found that input prices may vary as much as 25 percent among grain farms of different size (*8*). Volume discounts on inputs may thus be as important as technical efficiency in reducing production costs of larger farms, which then provides an incentive for growth of farm size.

Volume discounts on inputs could affect not only the number and size distribution of farms, but also the degree of specialization in production. Given a farm size, greater specialization increases purchases of specified inputs and thus the potential to obtain greater volume discounts. For example, a specialized cash grain farm may purchase more fertilizer and no feed, compared with a farm with similar sales volume which produces grain and livestock. Volume discounts on inputs may therefore be an incentive for greater specialization.

As will be discussed later, various types of contracting and vertical integration may affect both the price and availability of inputs, and price and availability may affect contracting and integration. The quality and price of inputs under these exchange arrangements may be better than those purchased directly. Little is known about how price and quality of inputs purchased directly compare to exchange arrangements such as advance contracting for feed, sow leasing, and the like. Price differences imbedded in different exchange arrangements could influence their use and thus affect ownership and control in the farm sector.

If the public wants to retard the trend of greater concentration in the farm sector, policy could be directed at equalizing input costs among different sizes of farms through input subsidies including subsidies for high-cost services; for example, custom application of fertilizer on small farms. Subsidies could also be paid to small agribusiness firms to keep them in business so that products and services remain available to small farms at a cost comparable to that for large farms. Cooperatives might be induced to focus on serving small farmers (through subsidy). Farm structure could also be affected by negative subsidies (taxes) on inputs above some specified level of usage (for example, fertilizer usage above certain amounts is now taxed in New Zealand; in the United States, a tax could be placed on tractors above a certain size, and the like).

B. Technology

Technological developments in agriculture have occurred at a fast pace and the impacts on all dimensions of farm structure have been dramatic. Some developments have increased output from the same bundle of resources; hybrid corn is an example. Other developments, such as tractors, herbicides, and mechanical harvesting, have resulted in major shifts in the resources used in farming. These developments change the relative productivity of factors and cause substitution of, for example, capital for labor. Technological developments outside the farm sector have also affected structure. For example, input prices may be reduced by technology adopted by input suppliers; such as bulk handling of fertilizer.

Most of the technology which has been adopted in the farm sector has increased the optimal (least-cost) farm size. This impact is due partly to the lumpiness of capital inputs which need to be spread over larger outputs to achieve lower unit cost. Beyond this, technology has

[9] This first factor—varying input prices—exemplifies well the complex relations imbedded in the farm structure issue. While discounts on inputs could affect farm structure, discounts may also be a function of farm size. Cost of supplying inputs to large farms may be less per unit than for small farms; that is, discounts may be cost justified. Thus, the relation between relative input prices and size distribution of farms is probably a two-way relation. Further, agribusiness firms may offer premiums or discounts to increase their volume and thus lower their unit costs. In this way, the structure of sectors for input suppliers and processors could also be affected by this factor.

produced economies of scale (output increases relative to inputs used in fixed proportions) which lowers the LRAC curve. Over time, technology has had major impacts on the number and size distribution of farms. Quance and Tweeten show unit cost of producing wheat, corn and cotton on farms of different size during 1930-70 (*14*). The farm size which achieved minimum cost increased dramatically during this 40-year period; 500 percent for wheat farms, alone. Much of this change was due to technology.

Technology has also had significant impacts on the degree of specialization. Technology which involves major capital investments stimulates specialization in the production of the commodity which uses that investment. Some of this capital has only specialized uses. For example, bulk handling of milk on farms has resulted in greater specialization on dairy farms. Technology may alter the profitability of commodities so that shifts occur among enterprises on the farm and changes are made in the relative amounts of commodities purchased in the aggregate.

Some technology may shift the location of production among regions. For example, irrigation has caused some shift in the location of grain, and fruit and vegetable production. It can alter the comparative advantage among regions. For example, larger tank trucks and the interstate highway system have reduced the advantage of dairy farmers close to metropolitan centers compared with those located farther away.

Larger capital investments inherent in much new technology do pose added barriers to entry into farming. The larger farm size required to achieve minimum cost, partly the result of technology, also acts as an entry barrier.

Much of the technology developed for agriculture is the product of public investments in research. Its diffusion is influenced through funding of the extension service. Thus, public decisions have greatly affected the development and dissemination of technology.

C. Economies of Size

Economies of size are measured by the LRAC curve. One would expect farm size to move toward the minimum point on this curve over time (*11*). As indicated above, this point has shifted to larger farm sizes as a result of technological developments. Pecuniary economies (volume discounts on inputs) may have also reduced unit cost for larger farms.

There are additional reasons for a decline in cost as size of farm increases. Given a set of available technologies, there may be a shift in the relative amounts of inputs used as the size of farm increases and the associated technology changes. That is, economies of size may be generated by changes in the relative input use. For example, small differences in minimum cost were found for irrigated cotton farms which used six different technologies and varying amounts of resources (*10*). The size of farm which achieves minimum costs may also be influenced by the quality of resources (such as management), although qualitative differences should be reflected in economic rents.

Economies of size as measured by the LRAC curve thus capture a variety of technical, pecuniary, and external economies. The sum of these forces, as reflected in the LRAC curve, affects dimensions of farm structure and is influenced by public policy, as described earlier.

D. Variation in Commodity Prices

Dimensions of farm structure may be affected by the extent to which commodity prices vary among farmers according to the volume sold (volume premiums). If large farmers receive higher prices than small farmers, this factor could stimulate growth in farm size. Krause and Kyle estimated that corn prices received by farmers of different size may vary by as much as 5 cents per bushel (*8*).

For several reasons, large farmers may receive higher prices. First, they may do a superior job

in marketing; their search for outlets with higher prices may be more intense. Second, more buyers may seek out and compete for the production of large farms. Third, there may be cost-justified economies of purchasing large volumes, such as lower per unit assembly cost. Fourth, there may be qualitative differences in the commodities produced on large versus small farms; such as more uniformity and better carcass yields which may result from specification buying by processors.

Higher prices for larger farmers would have the same impacts on the number and size distribution of farms and on the degree of specialization as would lower input prices. The impacts of varying prices under different exchange arrangements on ownership and control would likewise be similar. In addition, the widespread use of an exchange arrangement such as vertical integration might have several impacts on farmers who would prefer to continue selling through traditional markets:

- First, traditional markets may be foreclosed; broilers are an example.
- Second, the quality of price and marketing information may be diminished, this is the thin market problem.
- Third, due to lower volume and higher costs, prices in traditional markets may be less favorable.
- Fourth, the farmer may receive a lower net farm price due to shipping the commodity to a more distant outlet.
- Fifth, fewer traditional markets could reduce competition among remaining buyers; that is, increase spatial monopsony.
- Sixth, selling in traditional markets may become risky as prices in such markets become essentially spot market prices which can vary widely. Grapes in California and vegetables for processing are examples.

Many of the public policies discussed for input prices would apply to commodity prices. In addition, public policies could be directed at strengthening direct marketing. As noted in another of these articles, Federal orders and cooperative pooling practices tend to equalize prices received by dairy farmers of varying size. These mechanisms might be useful in more nearly equalizing prices for other commodities.

E. Risk and Expectations

The degree of risk primarily affects degree of specialization, but it also affects other dimensions of structure (*1*). If high risk (crop failure and price instability) is associated with the production of commodities, farmers may diversify to protect their income and investments and to avoid business failure. If risks are reduced, they will specialize to achieve the technical, pecuniary, and external economies previously discussed.

If risks are reduced, farm size will be increased because farmers can leverage their equity more. Lenders will be willing to provide more debt capital relative to equity capital. Higher risk also acts as a barrier to entry.

Many agricultural programs have the direct effect of reducing risk (socializing risk) in the farm sector. These include deficiency payments, price supports, disaster payments, crop insurance, grain reserve and other storage programs, and Federal orders. These programs have had major impacts on the risk borne by farmers which has, in turn, affected dimensions of structure described above.

Some of the contractual and other exchange arrangements which affect ownership and control may have been used to reduce risk, especially price instability. Various types of risk are often shared among parties to a production contract, as in tomatoes for processing, hog finishing, and turkeys. Public policies toward various exchange arrangements could affect risk and thus alter the prevalence of their use; a marketing order for turkeys could be issued, for example.

Closely associated with risk are expectations for prices and the outlook for profitability. Many investment decisions involve assets which are highly specialized, have a long life, and entail considerable asset fixity; examples are milking parlors, grain combines, and fruit orchards. Thus, expectations about price and income in future periods affect entry decisions, as well as other dimensions of structure.

Agricultural programs directly influence the commodity price expectations formed by farmers, for both the short and long run. They are also influenced by exogenous variables such as weather, changes in export demand, and the like. Input price expectations are influenced by the more macroeconomic policies such as those designed to reduce inflation and conserve energy. Past price behavior, of course, influences price expectations for both commodities and inputs. Price expectations are also influenced by the availability and quality of market information. The Government plays an important part in providing such information, but access to and use of information may vary among farmers of different size and among farmers producing different commodities. The general economic outlook for commodities is also affected by agricultural programs which supplement income, reduce supply, and stimulate demand (both domestic and export).

F. Price-Cost Margin

The margin between commodity price and production cost (*1*) determines how large a farm must be to generate the income needed for family living and debt service. The margin's stability influences the range of farm size which will insure that living expenses and debt service can be met; it also affects the degree of specialization.

Even if the LRAC curve and commodity prices were constant, farmers' income needs may dictate farm sizes that are considered large. Farm size beyond the point of minimum cost on the LRAC curve provides no economic gains to society, and it may not provide adequate income to the farm family. Inflation of cost of living expenses, desire for levels of living more comparable to those of nonfarm people, and higher debt service costs (size of loans and interest rate) have all expanded farm size. The level and stability of the margin has also affected tenure (number of full owners, part owners, and tenants). A lower and more unstable margin may be associated with a decline in landownership by farm operators.

It should not be inferred from the above analysis that wider and more stable margins between price and production costs would result in smaller farm size. Farm size might increase beyond the point of minimum cost on the LRAC curve if farmers have growth objectives, attempt to maximize net income, and use the higher income to acquire more land in seeking to maximize net worth. Wider margins due to higher commodity prices may be temporary, if profits become capitalized in land values. Higher land values may cause the LRAC curve to increase so that margins are reduced to the original level. In short, the margin between price and production costs can affect farm structure through complex processes.

Public policy obviously affects the level and stability of the margin between commodity prices and production costs, especially commodity prices. As previously discussed, many agricultural programs affect the level and stability of price. Programs which supplement income can reduce the size of farm needed to generate adequate income. If the public wants to reduce farm size to that associated with the minimum point on the LRAC curve, income payments may be required. But they would not necessarily result in smaller farm size. If the public wants to increase landownership by farm operators, policies may be required that affect land prices, interest rates, and commodity prices or that supplement income.

G. Exchange Arrangements

Exchange arrangements include not only methods used to determine prices and terms of trade for inputs and commodities at the farm sector level, but also the arrangements used to coordinate the farm sector's activities with those in other sectors of the food and fiber systems; such as forward contracting, specification buying, vertical integration, and producer organization for bargaining. Exchange arrangements for inputs and outputs, including functions performed by cooperative and proprietary firms, primarily affect ownership and control. But, as previously indicated, they can affect the level

and variation in input and commodity prices and therefore modify the number and size distribution of farms and the degree of specialization.

Exchange arrangements can ease as well as create entry barriers. For example, a contractor might provide capital which could not be obtained by the farm operator. The farm operator might also receive technical and managerial assistance needed for a viable business or obtain better breeding stock. Contractual arrangements usually reduce the operator's risks because others assume them. Contractual arrangements and forms of vertical integration may appeal to part-time and full-time farmers.

There are many ways that exchange arrangements could be influenced by public policy. Specific exchange mechanisms could be prohibited or encouraged. For example, price reporting could be made mandatory, certain contract terms could be mandated, electronic marketing could be encouraged, organization of producers to negotiate contract terms could be encouraged (bargaining legislation), and others. The Government has been active in facilitating traditional exchange mechanisms (crop and livestock reports, reports on market prices and volumes, grades and standards, situation and outlook reports, packer and stockyard activities, commodity exchange regulation, marketing orders, and the like). The Government has been relatively passive regarding the newer exchange arrangements which coordinate activities across sectors of the food and fiber system. It is these newer arrangements which are altering ownership and control in the farm sector.

H. Capital Requirements

Greatly increased capital requirements act primarily as a barrier to entry. They also affect tenure status. High land costs mean more farmers rent at least part of the land they farm. Even operators who own none of the land they farm may have high capital requirements for machinery and facilities, which can result in high debt service. The size distribution of farms is thus affected by capital requirements. More specialized production may have higher capital requirements, although this does not seem to have diminished the number of specialized farms.

Capital requirements are determined by the level of assets controlled (and which need to be controlled to generate adequate income for family living), commodities produced, exchange arrangements, tenure, prices of land and capital goods, and other such factors. Government credit policy can affect interest rates on loans for real estate or other purposes and could subsidize loans to smaller farmers and disadvantaged groups. Repayment schedules could be set to increase rather than remain constant or decrease. Land leasing policy for Government-owned land could also affect capital requirements and thus barriers to entry. Innovations such as leasing and sharing machinery could reduce capital requirements.

I. Taxes

Progressive income taxes tend to discourage growth in farm size. However, large farm operators derive a greater advantage from the use of cash accounting procedures and investment tax credits than do small operators (*15*). Tax treatment of capital gains makes land more attractive to persons who do not own farms. Estate taxes affect the intergenerational transfer of property, and income taxes influence decisions concerning form of business organization.

Tax policy (laws), being controllable, can be used to influence structure in the farm sector. Property tax rates on land could be higher if not farmed by the owner. An income tax credit could be given which was inversely related to either acres owned or to acres farmed. A tax credit could be given which was inversely related to farm income (for income maintenance). Taxes on land owned by publicly held corporations, foreign investors, or other groups could be at a higher rate. Estate taxes encourage entry through tax forgiveness during the early years. Can a comparable mechanism be developed to reduce barriers to entry for those who are not descendants of farm owners? Investment tax credits could be limited to farms below a specified size.

J. Goals of the Farmer

There are many business goals possible for farmers—maximizing current income, maximizing net worth, maximizing sales, and others (*16*). The choice of goals can, obviously, influence size of farm and tenure (*1*, *13*). The choice may be a more significant determinant of farm size for an individual operator than in the aggregate, because goals vary among farmers. Public policy does not directly influence business and personal goals, but it does affect their achievement.

K. Managerial Ability

Costs differ widely among farms of a given size. Some of these differences may be caused by different levels of input prices, which reflect a greater search by some farmers for low prices. Differences may also be due to technical efficiency (maximum output from given resources used) and price efficiency (using the right combination of resources, given factor prices). Increases in managerial ability have probably resulted in farm growth over time, and greater specialization in production (*13*). Extension education and availability of services from agribusiness firms also influence managerial ability.

L. Alternative Opportunities

Opportunities for people and resources are affected by age and training of people and degree of asset fixity of investments. Poor opportunities create high barriers to exit from the farm sector. The availability of nonfarm jobs in rural areas affects the extent to which part-time farming is feasible and the extent to which farm income can be supplemented. Macroeconomic policies and rural development programs also influence opportunities.

M. Macroeconomic Policies

Economic conditions in the rest of the economy affect farm structure. For example, high rates of inflation make land a more attractive investment and cause land prices to rise. Land prices may rise relative to commodity prices or to the margin between price and production costs. Nonfarm income levels influence farmers' aspirations and desired levels of living. The level of unemployment affects the availability of off-farm employment for part-time farmers and members of the farm household. It also may act as a barrier to exit from the farm sector. The level and changes in aggregate demand (domestic and export) can influence the degree of specialization, farm size (by changing the margin between price and cost), resources used in production, and the regional location of production.

The quality and availability of services in rural communities provide another example. Values and goals influence peoples' decisions about rural living. Beyond this, the cost, quality, and availability of services influence the decision. Young families may be less satisfied with services that are inferior to those in larger communities (health, education, recreation). They may not want to live in a place with an aging population (such as a retirement village for farmers) and a place that is deteriorating economically. Government grants can affect the status of rural communities and supplement the tax base available for services.

Government policy, including energy policy, can also influence the availability and cost of modes of transportation. Such policy may influence degree of specialization, but mainly produces regional impacts on farm structure.

Many policies and regulations designed to protect the environment affect the use of resources such as water and land and may have impacts on farm structure. For example, requiring a license to apply chemicals may disadvantage the smaller farmer. Acreage limitations for eligibility to use public irrigation projects would affect farm size.

POLICY VARIABLES

There is no national farm structure policy in the sense that it directly controls any of the

dimensions of farm structure (fig. 1). In contrast to some centralized economies which do directly control farm structure, U.S. farm structure is influenced indirectly by economic incentives and disincentives.

It would be useful to know the cost effectiveness of government actions aimed at changing the structure of the food and fiber system. No studies exist that provide this type of information and precise estimates could probably not be made. As with the factors affecting structure, the effectiveness of public policies is a matter of judgment. Based on views in other articles in this publication, the importance of public policies as to impacts on farm structure during an intermediate time period would be ranked as follows: (1) agricultural programs, (2) funding of public research and extension, (3) macroeconomic policies, (4) tax policies, and (5) credit policies. Technology has had the greatest effect on farm structure over the long run; thus, funding of public research and extension has been the most important policy variable.

Another major unknown is how farm structure changes affect performance of the food and fiber system. Performance measures are easy to develop; for example, level and stability of farm income, total returns to assets and to net worth, average cost or other measures of efficiency for farmers, input suppliers and processors, level and stability of food prices, level and stability of Government costs, level and quality of services in rural communities, conservation of natural resources, and quality of the environment. If performance variables such as these could be measured for alternative farm structures and likely consequences described, policymakers and affected groups could express their preferences among alternative structures based on the weights they assign to these consequences.

PROJECTIONS OF FUTURE STRUCTURE

Several economists have attempted to project farm structure under various assumptions (*2, 3, 4, 9, 16, 17*). Generally, the assumptions about exogenous factors and policy changes would accelerate or decelerate concentration in the farm sector, compared with continuation of current policies. With current policies, the trend toward greater farm concentration will continue, but somewhat slower than during the past decade. Policies to accelerate farm concentration might result in 40 percent fewer farms by the year 2000 compared with no change in policy. Policies to decelerate concentration might result in 20 percent more farms compared with continuation of current policies. Thus, the choice of public policies can influence significantly the future structure of American agriculture.

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Consequences Of Structural Change In U.S. Agriculture

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INTRODUCTION

The performance of the food and fiber system has been influenced greatly by the structure of that system. Future performance will be influenced by the changes in structure which will evolve. We need to develop performance measures (consequences) which can be used to compare and assess alternatives as we consider public policy relating to farm structure.

A change in structure may produce consequences more favorable to one group of farmers (based on size, region, or commodity) than to another. The consequences of a change in structure may also affect groups differently, such as farmers, processors, or consumers. One group may benefit (or be disadvantaged) more than another by a change in structure.

Many consequences flow from any change in structure. Each consequence may be viewed as favorable or unfavorable by persons in the same group and by persons in different groups. There are, thus, important tradeoffs among the consequences of changes in farm structure to be evaluated and reconciled.

Research can measure the consequences of farm structures, identify tradeoffs, and assess relative magnitudes of such tradeoffs. Research cannot identify the best farm structure, but it can provide information which should lead to more informed decisions. Research might also identify individual preferences in various groups as to the consequences of alternative farm structures. This information might be useful in revealing tradeoffs among various groups, in sharpening the discussion about farm structure, and as input for decisionmakers.

MEASURES OF PERFORMANCE

Performance of the food and fiber system may not be the only criterion by which alternative farm structures will be evaluated. People may attach values to farm structure *per se*. An individual may obtain a psychic value from a farm structure characterized by many small farms. Such a structure may conform to values related to norms of the competitive model, wealth distribution goals, or social order goals. While psychic values may influence the choice of farm structure, this article focuses on performance emanating from structure.[1]

The performance measures listed below for each group reflect consequences (results) flowing from alternative farm structures. Some of these measures reflect economic performance, some relate to the quality of life in rural communities, and others relate to the use of natural resources and environmental impacts.[2] These performance measures provide a basis for making an informed choice among alternative structures.[3] Of course, various groups affected by farm structure (and policy decisions which would alter structure) will not all prefer the

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[1] It may be possible to measure the intensity of people's feelings about farm structures or the value they attach to alternatives. But, such measures may be misleading because of differences in perceptions of structure (for example, most people would not think of a family farm as one having gross sales in excess of $100,000). Further, the value attached to a particular structure is conditioned by the person's perception of the corresponding economic performance and social environment.

[2] Economic performance is judged as the ability of the sector to provide goods and services corresponding to consumer tastes and preferences as reflected by the market and in the most efficient manner. Quality of life in rural areas is related to access to social services such as health, education, recreation, transportation, and other services consistent with the American standard of living. It is also related to the social organization of the community. Use of natural resources concerns their conservation, the efficiency of their allocation to various uses, and the protection of environmental quality.

[3] Tradeoffs are often expressed in terms of competing goals. There are broad goals of agricultural policy, but a discussion of tradeoffs among them would necessarily be vague. The consequences listed here might be thought of as highly specific objectives which bring tradeoffs into sharper focus.

same structure since they would assign different weights to the performance variables.

Farm Operators

- The level and stability of farm income (nominal and real).
- Total return on assets and net worth (income plus capital gains, which would also permit a better comparison of the well-being of farm and nonfarm persons).
- Annual percentage change in net worth.
- Production costs as a percentage of price.
- Average costs, as a measure of efficiency.
- Probability of survival (bankruptcy) measured in part by debt-to-equity ratio.
- Sources of income (farming, nonfarming, Government payments).
- Composition of assets and liabilities.
- Percentage of land farmed which is owned.
- Cost of entry (what are capital requirements for a representative farm?).

Resource (Land) Owners

- Income (cash or share rent).
- Annual percentage change in land value.
- Total return on assets and net worth in land.

Farmer Cooperatives

- Market share of commodities bought or inputs sold.
- Number of patrons (cooperative members) by type of farm.
- Cost as a percentage of price (a measure of profitability).
- Number and size distribution of cooperatives.
- Average cost as a measure of efficiency.
- Return on assets and net worth.

Proprietary Processors (and Other Middlemen)

- Market share of commodities bought or inputs sold.
- Number and size distribution of firms.
- Cost as a percentage of price.
- Average cost.
- Return on assets and net worth.

Consumers

- Level of food prices.
- Stability of prices and quantity.
- Implied nutritional content of product mix.
- Product quality, variety, and uniformity.
- Probability of prolonged supply interruption.

Government

- Level and stability of Treasury costs for farm programs (potential budget exposure).
- Distribution of agricultural program costs for income maintenance, stabilizing prices, and insurance against disasters.
- Adequacy of reserve supplies for donations and emergency uses and for price stabilization.
- Potential costs of nonviable structure. Suppose a structure which evolved was not viable or otherwise resulted in unacceptable consequences. How much would it cost to restructure the system? For example, what would it cost to purchase large holdings and partition them into smaller units, including the cost of reequipping smaller units with appropriate machinery and facilities and obtaining manager-owners for the smaller units?
- Tax revenue from income tax, property tax, and estate tax.
- Export earnings from agricultural trade.
- Transfer payments of various sorts including grants to maintain rural communities.

Rural Communities

- Tax base.
- Employment and geographic distribution.
- Level and quality of public services.
- Number and size distribution of rural communities.

- Social or other indicators of satisfaction from living in rural communities.

General Public

Resources

- Land and water use.
- Energy use.
- Environmental effects.
- Measures of efficient use of resources (productivity of resources, resource payment, and comparative advantage).

People

- Labor force in agriculture and related industries.
- Labor returns.
- Tenure.
- Freedom of choice.
- Equity among various groups as measured by consequences of alternative farm structures (do those who bear the costs of changes in structure receive comparable benefits?).
- Political impacts (do the consequences of structure result in a more responsive and effective political system?).
- Social indicators.

STRUCTURE-PERFORMANCE RELATIONSHIPS

There is little empirical basis for quantifying relationships between structure and performance. In many cases, there is not even a basis for expecting relationships to be positive or negative. Nevertheless, some tentative hypotheses are suggested as to whether a change in each dimension of structure would have a positive or negative impact on the performance variables listed above (see table).[4] For example, it is hypothesized if the farm sector becomes more concentrated, farm income would increase and the market share of commodities bought and inputs sold by cooperatives would decline. Likewise, increased specialization in the farm sector would result in higher farm incomes and would reduce consumer food prices. Two-way relations may exist between structure and performance variables. For example, higher farm income could affect the size distribution of farms, increases in land prices could affect ownership and control, and so on.

It is painfully evident, from an examination of the table, that much research will be needed to quantify the relations between structure and performance. For many relations, it may be possible only to specify the direction of the relationship. Even this may be useful in guiding the discussion about farm structure and in making choices among alternative structures.

Expected relationships among dimensions of farm structure and consequences of structure[1]

Consequences of structure	Dimensions of structure[2]			
	No. and size of farms	Special-ization	Owner control	Entry barriers
Farm operators:				
Farm income	+	+		–
Return on assets	+	+		
Net worth change	+	+		+
Cost as percentage of price	+	+	–	
Average cost	–	–		+
Survival	–	–	–	
Sources of income				
Asset composition				
Landownership	–		–	–
Entry costs	+	+	+	+
Resource owners:				
Income	+	+		+
Land value	+	+		+
Return on land	+	+		+
Cooperatives:				
Market share	–	–	+	–
Number of patrons	–	–	+	–
Cost as percentage of price	+		–	
Number and size	–	–	+	–
Average cost	+	–	–	
Return on assets	–		+	

See footnotes at end of table

Continued

[4] The dimensions of structure listed in the table are the same as those defined in another article (E. M. Babb, "Some Causes of Structural Change in U.S. Agriculture"). Many of the expected relations cannot be properly called hypotheses, but are simply guesses. We may need to do some "data dredging" to reach the stage of being able to state testable hypotheses. There are not even guesses about many relations.

Expected relationships among dimensions of farm structure and consequences of structure—Continued[1]

Consequences of structure	Dimensions of structure[2]			
	No. and size of farms	Special-ization	Owner control	Entry barriers
Processors:				
Market share	+	+	–	+
Number and size	+	+	–	+
Cost as percentage of price	–		+	
Average cost	–	–	+	
Return on assets	+		–	
Consumers:				
Level of price	–	–		+
Price stability	–	–		
Nutrition				
Product quality	+	+		
Supply disruption	+	+	–	
Government:				
Level of cost	+	+		
Distribution of cost				
Reserve supplies	+			
Restructure cost	+	+	–	
Tax revenue	+			+
Export earnings	+	+		–
Transfer payments	+		–	+
Rural towns:				
Tax base	–			+
Employment	–	–		
Services	–			
Number and size	–			
Social indicators	–			–
Resources:				
Land and water	+	+		–
Energy use	+	+		
Environment	–	–		
Resource efficiency	+	+		–
People:				
Labor force	–	–		
Labor returns	+	+		
Tenure	–		+	–
Freedom of choice			+	–
Equity	–	–	+	–
Political				
Social indicators				

[1] Expected relationships among dimensions of farm structure and consequences are expressed as positive (+) or negative (–). No relation is expressed for many pairs. The socioeconomic dimension of farm structure is omitted as no relations with consequences could be expressed.

[2] Consequences of a change in structure are expressed in terms of an increase in the farm structure dimension; that is, increased concentration in the farm sector, increased specialization, increased ownership and control by farm operators, and increased barriers to entry and exit.

Historical Notes On Agricultural Structure

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INTRODUCTION

Interest in agriculture's structure has been nurtured since World War II by a profound technological revolution that has transformed farming as a business and as a way of life. The disappearance of 3 million farms since 1940, the continuing concentration of production capacity in fewer and fewer hands—these and other consequences of the agricultural revolution have been commented upon so often that they have almost lost their impact. The very notion of what constitutes a big farm has changed remarkably since the forties. When the Census Bureau first experimented with an economic classification of farms in the mid-forties, the top class was made up of places that produced $20,000 worth of goods or more annually. Today, our biggest farms are classified as operations that sell—not simply produce—at least $500,000 worth of goods a year.[1]

Secretary of Agriculture Bob Bergland has expressed his concern about a number of structural issues that confront agriculture today: the decline in farm numbers, the increasing concentration of farm resources in fewer hands, the regressive distribution of many program benefits, the difficulties that young operators have getting started in farming.[2] The Secretary called for a national discussion about the future of American agriculture. With the benefit of that dialogue he plans to begin molding a structure policy.

SOME STRUCTURAL CONCERNS BEFORE WORLD WAR II

Discussions about agriculture's structure have been common, especially in the past two decades. But national debates on the subject leading directly to policy decisions have been rare. One took place before the Civil War when land policy and farm organization became embroiled in the growing controversy over slavery. The question at the time was this: should legislation be passed encouraging settlement of the public domain by small owner-operated farms, a move which, it was thought, would expand the free population in the territories? Or should impediments be allowed to hinder distribution of the western lands, giving plantations based on slavery a better chance to grow outside the South? Since the territories in question would become States with full Congressional representation, the controversy was seen as a battle for control of the Federal Government. The Homestead Act, which resolved the land issue, at least symbolically, was enacted only after the South had seceded from the Union.

In this and other matters concerning the public domain, the United States made decisions about the kind of agriculture it wanted. Yet during much of its history, the Nation has allowed farm structure to take care of itself, although unusual developments—the rise of huge bonanza farms in the Red River Valley of the North and foreign investment in the range cattle industry, for example—have attracted attention.

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[1] In its first attempt at an economic classification system, the Census Bureau relied on value of production, but also gave secondary consideration to the value of land and buildings. The latter criterion was meant to correct for any unusual conditions that might temporarily depress the value of production and thus put a farm into the wrong class. The highest major sales classification used in the 1974 Agricultural Census was $500,000 and over, although for some purposes the Census divided places with annual sales of $100,000 or more into 8 subclassifications ranging up to $10 million and over. U.S. Bureau of the Census, *United States Census of Agriculture: 1945, Special Report on the 1945 Sample Census of Agriculture* (Washington, 1947), 15-16; U.S. Bureau of the Census, *United States Census of Agriculture: 1974*, vol. 2, *Statistics by Subject*, part 7, *Value of Products, Value of Sales Group, Other Income* (Washington, D.C., 1978), 15-16.

[2] Remarks prepared for delivery by Secretary of Agriculture Bob Bergland, before the National Farmers Union Convention, Kansas City, Missouri, March 12, 1979, U.S. Department of Agriculture press release 571-79.

It seemed during the 1920's, however, that an especially significant structural change might be overtaking U.S. agriculture. The World War I economic boom ended with a jolt in 1920. Net farm income plunged from $7.8 billion one year to $3.4 billion the next, and it stayed low for most of the decade.[3] Banks, insurance companies, and other creditors acquired considerable chunks of land through foreclosure. Coincidentally, an assortment of new machines became available: improved tractors, mechanical corn-pickers, combines, and high-capacity tillage equipment.

These circumstances appeared to clear the way in the twenties for large-scale, mechanized agriculture. Interest grew in the potentials and liabilities of new forms of structural organization. References began appearing to such possibilities as corporate farming, factory farming, and chain farming.

But, the situation produced no structure policy. And what structural innovation actually occurred in farming was limited and relatively short-lived. At the close of the twenties, Sigmund von Frauendorfer, a European observer of U.S. agriculture, summed up the American situation that still prevailed: "The family farm so far predominates in the United States that everybody who uses the general term 'farmer' thinks almost automatically of the *operator of a family farm.*"[4]

Agriculture did, however, change during those years. Thanks to a new emphasis on farm management, many units in the twenties grew bigger, more mechanized, and more productive. Some depended so much on high levels of capitalization that one writer called them "capitalistic family farms." Two USDA economists noted in 1929: "One of the most remarkable changes that has come to American agriculture in this post-war period is the increase in the normal size of the family unit, both in terms of total investment and in total acreages in certain of our farming areas."[5]

But not all farms followed this pattern. As early as 1909, Theodore Roosevelt's Country Life Commission had commented on the separation evident even then between farms that were run actively as businesses and those that were the homes of powerless, low-income families. "In applying corrective measures," said the Commission, "we must recognize these two classes of people."[6]

Programs aimed at the powerless did not emerge quickly. But when they did appear, as a result of the Depression of the thirties, they included several Federal measures designed specifically to affect agricultural structure. These programs, some of which dated from the New Deal's early days, became the responsibility of the Farm Security Administration (FSA) when it was established in 1937. FSA's principal goal was to integrate small farms, particularly tenant farms, into the mainstream of American agriculture. Through the use of rehabilitation loans, farm purchase loans, and technical assistance, the FSA hoped to equip small operations with the resources to survive independently. Had it achieved this objective on a large scale, the Agency would have altered the basic pattern of agriculture in the Cotton South where cropping and tenancy were deeply entrenched. Yet it would have done so with a conservative approach, by turning tenant farms into more conventional family units.

Two additional FSA activities were more unusual. One, the cooperative farming program, joined participants together in associations to work the land communally. The associations paid wages and a share of the profits to their

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[3] U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*, Bicentennial Edition, Washington, D.C. 1975, part 1: 483.

[4] Sigmund von Frauendorfer, "American Farmers and European Peasantry," *Journal of Farm Economics*, 11, Oct. 1929, 634 (italics in original).

[5] H. R. Tolley and C. L. Holmes, "Large-Scale Farming in the United States," USDA, Bureau of Agricultural Economics, 2-3. Copy in files of Agricultural History Branch, Econ. Stat. Coop. Serv., USDA. Part of this discussion was presented at the Annual Extension Conference, Lexington, Kentucky, Oct. 1929.

[6] Country Life Commission, *Report*, Senate Document No. 705, 60th Cong., 2nd sess., 1909, 39.

members. Another feature of the FSA was its long-term leasing program under which the Government rented land to community organizations. Some of these were cooperative farms of the sort just described. Others subleased the acreage in small parcels to individual operators.

The cooperative farming program and long-term leasing program were not substantial in the United States. They were attacked savagely and were partly responsible for the FSA's abolition of 1946. Congress replaced it with the Farmers Home Administration, which concentrated on farm operating and ownership loans and avoided anything smacking of radicalism.

THE POST-WAR POLICY DIALOGUE

U.S. agriculture stood uniquely poised in the mid-forties when the FSA was eliminated. Ahead was an awesome technological revolution. Behind was a recent history of Government intervention, first through the New Deal programs and then in connection with World War II measures that protected producers of vital farm goods against low prices during the war and for a period after.[7]

The implications of this historical positioning were not entirely appreciated in the forties. They could not have been. Congress, the Administration, most farm organizations, and others realized the direction post-war agriculture would take. They expected farms to become fewer, bigger, more mechanized, and more productive. But they had no reason to anticipate the speed of the change or the degree to which it would extend. Many also thought that the Government's past intervention in agriculture had probably been a temporary experience, brought on by the Depression and the war. They knew an adjustment period would be necessary, but they did not comprehend its duration, its severity, or the demands it would place on the Federal Government.

Not realizing fully what lay before them, Americans in the 1940's engaged in an important dialogue about the future of agricultural policy. War-time measures had encouraged all-out production. Congress in 1941 passed legislation pegging many farm prices at high levels until 2 years after the close of hostilities. Truman declared hostilities at an end on December 31, 1946, which meant that alternatives had to be found by December 1948. This need provided the initial rationale for the policy discussion of the forties.

While structural issues arose in the course of the dialogue, the major concern at the time was how to ease agriculture back into a peacetime economy and how to protect farm incomes. Bitter memories remained of the drop in farm income that had followed World War I, and it was widely agreed that the experience of those years should not be repeated.

Several groups turned their attention to post-war agricultural policy soon after American troops entered combat. Among them were the U.S. Department of Agriculture, a committee of the Association of Land-Grant Colleges and Universities, and a congressional committee under the leadership of Rep. William Colmer of Mississippi. These three issued separate reports that were in substantial agreement.[8]

All concurred that agriculture's critical need after the war would be for a full-employment economy creating jobs for people who left farming and adding to the demand for food and

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[7] The New Deal agricultural agenda amounted to much more than the FSA programs. It included production adjustment and income support programs, conservation and credit legislation, as well as the rural electrification program. Much modern agricultural policy traces back to this period.

[8] USDA, *What Peace Can Mean to American Farmers* (Washington, D.C. 1945) published in four parts: *Post-War Agriculture and Employment*, Miscellaneous Publication 562, *Maintenance of Full Employment*, Miscellaneous Publication 570, *Expansion of Foreign Trade*, Miscellaneous Publication 582, *Agricultural Policy*, Miscellaneous Publication 589; Association of Land-Grant Colleges and Universities, *Postwar Agricultural Policy: Report of the Committee on Postwar Agricultural Policy*, 1944; U.S. Congress, House, Special Committee on Postwar Economic Policy and Planning, *Postwar Agricultural Policies*, House Report No. 2728, 79th Cong., 2nd sess., 1946.

fiber. All three recognized the necessity of international markets. All envisioned an agriculture with prices responsive to world trade conditions. For that reason, none of the reports favored high, rigid price supports.

There was unanimous agreement also that the pressing structure problem facing agriculture was the great number of marginal farms. This had been an important theme in land use planning during the thirties, and it surfaced now again in the forties. The reports all stressed the need to equip families living on these marginal farms with the resources to improve their operations or with skills that would allow them to move to other jobs.

At the end of the war, professional analysts—as well as USDA representatives and many members of Congress—envisioned the kinds of programs for commercial agriculture that we are only now achieving in the mid-seventies. When the American Farm Economic Association-sponsored an essay contest in 1945 on price policy, prize-winning papers came from both public and private contributors. In reviewing the leading entries, the Association's president noted:

"The general trend of thought was toward markets accompanied by measures to support some minimum level of farm income. Although not specifically developed in all of the papers the justifications for this procedure are (1) it would permit the price structure to perform its normal functions of guiding production and distribution of commodities and (2) it would provide a minimum level of income to farmers in depression periods for continuing production of needed goods (foods and fibers) at a time when the industrial sector of the economy is shrinking. If properly worked out, assurance of such minimum income would tend to satisfy the desire for security against extreme price (and income) declines. . . .

How were income supports to be provided? The author of the competition's highest ranked paper suggested a method that has since been adopted: direct payments to producers making up the difference between the market price and a previously agreed upon level."[9]

Many of the points developed in the three planning reports and in the Farm Economic Association's essay contest were repeated in congressional hearings on long-range agricultural policy that began in April 1947. In his opening remarks to the 1947 Hearing Committee, Secretary of Agriculture Clinton Anderson proposed a policy of abundant farm production. "What our studies and experience boil down to is one simple fact," he declared. "By supplying only the reasonable needs of our own people and reasonably expected export and industrial markets, we cannot only market as much agricultural production as we have now, but can actually expand.

The belief among analysts and many policymakers was that agriculture in the post-war years should be tough, competitive, and readily responsive to market signals. Farm programs, it was felt, should level out erratic fluctuations and provide the degree of security necessary to foster an economically advanced farming sector.

Some people were not entirely of this opinion, of course. Edward O'Neil, president of the Farm Bureau until 1947, basically favored high supports, as did James Patton, head of the Farmers Union. Many Southern legislators, fearing the threat of overproduction and low incomes, also advocated high support levels.

Whatever their convictions on this specific issue, most of those who engaged in the policy debate believed that U.S. agriculture would continue to be organized around family farms. Having said that, one must add that family farms were defined at the time as viable operations, able to support their residents adequately and offer full employment. Family farms were not the smallest units: they were not part-time, marginal, or subsistence operations. Given this defi-

[9] L. J. Norton, "The Price Policy for Agriculture Contest," *Journal of Farm Economics*, 27, Nov. 1945, 740; William H. Nicholls, "A Price Policy for Agriculture, Consistent with Economic Progress, That Will Promote Adequate and More Stable Income From Farming," *Journal of Farm Economics*, 27, Nov. 1945, 745.

[10] U.S. Congress, House, Committee on Agriculture, *Hearings on Long-Range Agricultural Policy*, part 1, 80th Cong., 1st sess., Apr. 21, 22, and 23, 1947, 4.

nition, consolidation of small farms into larger ones was part and parcel of a family farm policy.

A USDA report in the mid-forties also recommended breaking up unusually large farms into the family places.[11] But the principal concern about size adjustments in the forties did not center on big farms. It focused on the several million small farms whose residents lived on the margin of poverty or below it. The purpose of a family farm policy was to consolidate these places into viable units or to find nonfarm incomes for their operators.

Yet there was a point beyond which further consolidation was not desired. Presenting Congress with his famous Brannan Plan in 1949, Secretary of Agriculture Charles Brannan addressed a central policy problem: how to create a production and income program that would encourage maximum agricultural efficiency without being attractive enough to cause the growth of what the secretary called "extremely large-scale industrialized farming."[12] His solution combined nonrecourse loans and income supplements—plus a limit on payments to any one operator. Farms that produced beyond a certain level would receive no support on their surpluses.

Brannan hoped in this way to discourage the growth of larger-than-family farms. But he also wanted to be as sure as he could that big, well-run family operations were fully protected. "Such a large family farm," he said, "would be a modern, mechanized, efficiently-operated farm with some hired labor, particularly during peak work periods, but still a farm on which the farmer accepted full responsibility for the management and on which the farmer and his family did a great deal, if not the bulk, of the farm work." [13]

Brannan estimated that his guidelines would adversely affect about 2 percent of the Nation's farms. That amounted to all operations selling over $25,000 worth of agricultural goods in 1950. The corresponding dollar figure today would be about $200,000.[14]

The Brannan Plan, had it been enacted, would have encouraged an increase in average farm size, since an operator's payments would have risen with his production until the limit was reached. The Plan's chief beneficiaries would have been the sort of aggressive, innovative farmers who brought a mall of tractors to Washington, D.C., in the winter of 1979. The small operator in the hills of West Virginia or the Bootheel of Missouri would have ended up exactly where he did anyway—at the bottom of the pile. Producing little, he would have had scant opportunity to benefit from a program premised on production.

Brannan realized that a price policy was not answer enough to the problems facing many farm families. He told the Senators and Congressmen that even with good markets and fair prices, farmers as a group would still be disadvantaged. "What I am saying," he explained," is that the present structure of American agriculture is such that millions of farmers are condemned to seeking a living on farms that are highly inadequate in number and quality of acres, equipment, buildings and livestock.

"I am saying futher that in some areas of the country far too many farmers are crowded upon far too few acres. The result is pretty much the same as you would get if you put a hundred workers on an assembly line that was geared for 25, or too many families in a house or too many boys around a fishing hold. Everybody tries to get into the act; everybody gets in the other fellow's way. Nobody is efficient; nobody is happy. That is one reason why even abundant production at fair prices will not give farmers, as

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[11] USDA, Interbureau Committee on Post-War Agricultural Programs, *Farm Opportunities: Outlook, Problems and Policies*, 99-100.

[12] U.S. Congress, House, Committee on Agriculture, *Hearings on the General Farm Program*, part 2, 81st Cong., 1st sess., Apr. 7, 11, 12, 25, and 26, 1949, 151.

[13] *Ibid.*, 152.

[14] *Ibid.*, 152; U.S. Bureau of the Census, *U.S. Census of Agriculture: 1950*, vol. 2, *General Report*, Washington, D.C. 1952, 1116; USDA, Economics, Statistics, and Cooperatives Service, *Farm Income Statistics*, Statistical Bulletin No. 609, Washington, D.C. 1978, 53.

a group, parity in living standards."[15] Though Brannan worried about larger-than-family farms when he presented his Plan in 1949, he clearly had a prior concern with the more immediate structural problem of the day: the sprawling number of small operations that were home to a poor and dispirited people.

Rural development programs, when they appeared in the mid-fifties, were designed for this group. These programs concentrated on finding nonagricultural solutions to the problems concentrated on finding nonagricultural solutions to the problems facing small farmers. Indeed, as the number of farmers shrank to a minority of the nonmetropolitan population, rural development increasingly treated the small operator simply as another one of rural America's impoverished.

Partly because of the rural development effort, changes occurred in the conceptual framework that many people used to understand agricultural structure. With a set of programs in place that lumped the small farmer together with the nonfarm rural poor, it was easy to stop regarding small farms as part of agriculture's structure at all. The small operator's problems appeared to be human problems, not problems of the food and fiber system. Thus, the small farm issue, which had been a main structural concern in the forties, came to be seen as a welfare matter that really had nothing to do with agriculture.

This conceptual change was doubtlessly a relief to many policymakers and scholars who knew the frustration of trying to find a single set of programs to accommodate America's bewildering variety of farms. But the alteration was viewed with suspicion in other circles, especially among urban audiences that had little personal experience with modern agriculture. Skepticism was pronounced in the early seventies when USDA seemed to begin stressing farm efficiency to the exclusion of nearly everything else. Angry criticisms welled up out of a conviction that USDA, by treating the small farm simply as a poverty-level operation, had thrown a valued institution on the scrap heap of rural America.

Whatever the merits of that belief, it made meaningful discussions about structural issues extremely difficult in the early seventies. Agricultural economists, farm State representatives, and members of USDA could ponder the matter among themselves. But no bridges were built to the nonfarm people who made up well over 90 percent of the population and whose representatives controlled the major branches of Government.

As for the Brannan Plan, its income transfers were too generous and its total cost too uncertain to be acceptable in 1949. Following the Plan's defeat, America's attention turned to war in Korea and the agricultural policy dialogue of the forties ended. The enormous implications of the modern agricultural revolution were becoming apparent by the close of the Korean conflict. Families flooded from the Nation's farms, farm numbers dropped rapidly, commodities swamped Government warehouses, and the cost of Federal programs rose alarmingly. As agriculture confronted the problems of abundance, long-range policy considerations took second place to getting the farm sector through the immediate crisis. The ideas that came out of the post-war policy discussion produced no immediate legislation. Programs during the fifties for the most part followed an older pattern and linked income to price supports, relying on nonrecourse loans and acreage allotments to stabilize markets and provide a degree of economic security to producers.

Since the mid-sixties, however, agricultural legislation has moved progressively closer to the model presented in the post-war dialogue. Federal policy today tries to adjust domestic prices to world levels and to supplement incomes with direct payments. International demand for food is rising and increases in farm productivity are slowing. These developments offer a possibility that U.S. agriculture might eventually achieve

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[15] U.S. Congress, Senate and House, *Hearings Before a Subcommittee of the Committee on Agriculture and Forestry, U.S. Senate, and the Committe on Agriculture, House of Representatives, on Long-Range Agricultural Policy*, 80th Cong., 1st sess., Oct. 6, 7, and 8, 1947, 74-75.

equilibrium with its markets. Thus, the time may be right to resume the broad dialogue on policy.

THE POST-WAR LEGACY

Such a discussion should begin with the realization that agricultural policy during the past 30 years has done essentially what the post-war planners hoped it would, though often in ways they did not propose. The farm programs have offered a degree of stability to the industry and fostered the growth of larger, more efficient operations. Agriculture since the war has provided abundant quantities of food and fiber at modest cost to consumers; hunger in America has been virtually eliminated. The basic production unit today in most cases is the family farm that Charles Brannan and his contemporaries envisioned—aggressive, innovative, and technologically up-to-date. Thanks to off-farm jobs, small farmers, as a group, are not longer poor. If the Nation chooses now to reexamine its agricultural policy, it will be dealing mainly with the consequences of that policy's success—but not entirely.

Production resources are a continuing concern. The major structural problem of the forties—the overabundance of resources, especially labor—was solved by events of the fifties and sixties. Yet the solution was ironic and incomplete, and it has led to one of today's foremost structural issues: the control of agriculture's resources.

Conventional wisdom in the forties held that people should leave farming and, in that sense, resources should flow out of agriculture. People did leave. They left much more dramatically than the planners had ever anticipated, thanks to the agricultural revolution.

But thanks to the same revolution, total resource commitment did not lessen, even though labor dropped precipitously. Measured by USDA's input index, the amount of resources devoted to farm production has been almost unchanged since 1940.[16]

The stability provided by the post-war programs allowed operators to expand and take full advantage of the machinery and technologies made available by the agricultural revolution. Diversified farming, a traditional hedge against uncertainty, became less common. Land prices rose. Capital was widely substituted for labor. The resource available to every man and woman—the toil of their bodies—became dramatically less important to agriculture. Money grew correspondingly more significant. An elite resource replaced a democratic one, so to speak. And farming, once considered the very foundation of American democracy, increasingly became an occupation for the few.

This change has been a matter of some consequence. It explains why agricultural structure today is an emotional issue and also why certain concerns surface repeatedly in discussions about the subject.

Throughout our history, people have looked upon farming not just as a business, but also as a source of hope and refuge. As recently as the 1930's, significant numbers of Americans fled from the cities to the countryside. During the past 30 years, however, farming's growing capital and managerial demands have substantially reduced that option. Individuals who want to become established in commercial farming confront greater obstacles today than ever before, unless they inherit a place among the full-time family operators who are now the industry's mainstay.

It is not surprising, therefore, that attention has turned to the problems facing beginning farmers with limited resources, or that proposals have been recommended at several levels to ease entry into agriculture for these people.

Nor is it surprising that we have also seen a sharp increase in concern about the flow of capi-

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[16]USDA, Economics, Statistics, and Cooperatives Service, *Changes in Farm Production and Efficiency, 1977*, Statistical Bulletin No. 612, Washington, D.C. 1978, 69.

tal into agriculture. Consider four subjects that have attracted much attention recently: foreign landownership, vertical integration tax-loss farming, and corporate farming. Interest in all four reflects a basic worry about whose money it is that fuels agriculture and who controls the industry.

There is another dimension as well for the nonfarm population. It is the fear that if resource concentration continues, society will lose its reliable sources of food and fiber. While this may be unlikely in the foreseeable future, a speaker in 1976 pointed out to the American Agricultural Economics Association that some concern may be justified:

"In concentrating, those who make decisions are removed from the resources and are likely to be motivated by the economic forces that influence firm behavior—product prices, profits, internal rates of return, and payoff periods. If agriculture is organized on these lines, the great loss will not be the loss of moral and cultural virtues of family farms but the loss of the capacity of the small-holder system to maintain production in a time of economic adversity. An agriculture in which resource control is centralized may be more efficient, more productive, and more responsive to the demands of food consumers and may provide higher incomes to persons involved in the ownership of resources used in the production process. However, it does not have that most desirable of all characteristics: guaranteed stability in output." [17]

CONCLUSION

We lack precise knowledge about how programs and events have combined in the post-war decades to transform agriculture. And this deficiency inevitably compounds the difficulty of planning for the future. Several studies during the past 10 years have examined the impact of measures that directly affect agriculture: extension and credit programs, tax laws, price and income guarantees, and others.[18] According to these investigations, Federal policy, on the whole, has promoted growth in farm size—basically in three ways:

- Aggressive operators tend to seek out assistance. Thus, they benefit more than others from measures that might be useful to all farmers.
- Some programs were designed to be most helpful to larger producers, either by requiring loan collateral or by offering benefits that rise with production, as in the case of price supports.
- By stabilizing the industry—above all by guaranteeing minimum prices—several of the most visible programs have encouraged operators to expand, borrow, buy out their neighbors, and expand again.

One might conclude from this list that the Government could most effectively counter the concentration of agricultural resources by doing away with Federal programs, particularly by eliminating price guarantees and thus introducing a higher degree of risk to farming. Land values would probably drop. Conservative operators would tighten their belts. Some would disappear, but many would likely survive. Highly capitalized producers, on the other hand, would almost surely go under in greater numbers, especially if they had unfavorable debt ratios.

And yet we cannot be sure how much of this would actually happen. We have no modern point of reference, no lessons from the recent past to guide us. The Federal Government has

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[17] Paul W. Barkley, "A Contemporary Political Economy of Family Farming," *American Journal of Agricultural Economics*, 58, Dec. 1976, 817.

[18] Among the studies are James T. Bonnen, "The Distribution of Benefits From Selected U.S. Farm Programs" in President's National Advisory Commission on Rural Poverty, *Rural Poverty in the United States*, Washington, D.C., 1968, 461-505; Willard W. Cochrane and Mary E. Ryan, *American Farm Policy, 1948-1973*, Minneapolis, 1976; Leroy Quance and Luther G. Tweeten, "Policies, 1930-1970" in A. Gordon Ball and Earl O. Heady (eds.), *Size, Structure, and Future of Farms*, Ames, 1972, 19-39; Charles L. Schultze, *The Distribution of Farm Subsidies: Who Gets the Benefits?* Washington, D.C., 1971; U.S. Congress, Congressional Budget Office, *Public Policy and the Changing Structure of American Agriculture*, Washington, D.C., 1978.

been directly involved in agriculture's economy since 1929 when the Federal Farm Board was established. There has been no free market for the industry in half a century except during brief periods, and even then backup legislation was in place.

Part of the change in agriculture during recent times has been due undoubtedly to Government research and educational efforts and to the stability provided by Federal programs. But part also has come about because of major events beyond the Government's control—the invention of the cottonpicker, for instance, the economic boost delivered by World War II, the advent of the 4-wheel-drive tractor.

Because of the convergence of Government and nongovernment influences, we do not have a clear idea today of the role that Federal policy plays in deciding agriculture's structure. How likely is it that the current structure would have developed without past programs? How likely is it that structure will evolve henceforth, regardless of actions at the Federal level? What tradeoffs might be necessary to alter current trends? Opinion is divided over each of these basic issues. Thus, much of our future policy will have to be formulated under burdens of uncertainty that can be relieved only when we better understand the present agricultural structure and the factors that have determined it.

The Family Farm: A Changing Concept

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ESCS Historian

INTRODUCTION

U.S. policy seeks to encourage an agricultural structure based on family farms. But the notion of what constitutes a family farm has not been constant throughout our Nation's history. What follows is a brief account of some of the major alterations in the family farm concept that have occurred over the years and the reasons for them.

THE JEFFERSONIAN MODEL

Three factors explained the popularity of family-size farms in 18th and 19th century America: such farms were familiar, they made economic sense, and they fitted in nicely with a strongly held belief about the nature of political power.

In an age when most of our population farmed, most people lived on family farms. Even in the antebellum South, the family farm predominated.

Economically, land settlement meant prosperity to 19th century America, particularly to speculators and others who had an interest in developing the frontier. Settlement by small family operators meant denser communities and more economic activity.

Equally important, Americans one and two centuries ago carried with them an old European belief that a relationship exists between landed property and political power. So strong was this conviction that landownership was a factor in deciding who could vote well into the 19th century. The traditional attitude held that people who possessed property had an unmistakable stake in society. Their holdings demanded protection and freed them from the threat of economic coercion, thus making them the most desirable citizens.

From this premise derived an obvious conclusion: the way to guarantee a republican form of government and a reliable electorate was by wide distribution of property. Daniel Webster echoed that belief when he noted: "With property so divided as we have it, no other government than that of a republic could be maintained, even were we foolish enough to desire it."[1]

Together, these three elements—familiarity, economics, and political philosophy—encouraged a policy favoring family farms. Interestingly enough, however, the phrase "family farm" does not seem to have been part of the 19th century's vocabulary. Thomas Jefferson, sometimes considered the philosophical spokesman of the American family farm idea, apparently never referred to the institution by name. Nor did the expression appear in the 1862 debates on the Homestead Act.

Yet evidence indicates that Americans of the period had a reasonably precise notion of what ought to characterize the ideal family operation. Jefferson himself provided some of the best clues in a passage that has been widely quoted. Moral corruption, he said in *Notes on Virginia*,

> is the mark set on those, who, not looking up to heaven, to their own soil and industry, as does the husbandman, for their subsistence, depend for it on the casualties and caprice of customers. Dependence begets subservience and venality, suffocates the germ of virtue, and prepares fit tools for the designs of ambition.[2]

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[1] Daniel Webster, "First Settlement of New England" as reprinted in Francis W. Coker (ed.), *Democracy, Liberty, and Property: Readings in the American Political Tradition*, New York, 1948, 508.

[2] Thomas Jefferson, *Notes on Virginia* as reprinted in Adrienne Koch and William Peden (eds.), *The Life and Selected Writing of Thomas Jefferson*, New York, 1944, 280.

Independent of the marketplace and free from an employer's power, Jefferson's ideal farmer provided for his family from his own land, by his own efforts. Thus, he had these characteristics:

- His was a self-sufficient agriculture; he bought and sold as little as possible.
- He did not rent his land but owned it in fee simple.
- He did his own work.
- As an independent, self-supporting member of society, he was his own boss, responsible for his own managerial decisions.

As a physical reality and an intellectual concept, the family farm has never been static, and it evolved away from the Jeffersonian model during the 19th and 20th centuries. Early on, for example, the belief that a family operator ought not to buy or sell goods went by the boards. American farmers had produced for the market almost since the first leaf of tobacco was harvested at Jamestown. They did so in every region of the country, except perhaps on the absolute margin of the frontier, and the number of commercial operators grew as the 19th century progressed.

Changes in American farming around the time of the Civil War encouraged even more of a market orientation, especially in the North. The 1860's and 1870's saw horsepower replace human muscle in the fields. That, together with expanding foreign and domestic demand, created opportunities for sales that farmers exploited eagerly. Increasingly, they were drawn into the orbit of the new technology and thus into the marketplace that Jefferson had railed against, or they were abandoned to an impoverished backwater existence.

Nevertheless, Jefferson's contention that the most desirable farms were self-contained, noncommercial operations did have an offshoot that would prove important in the 20th century. It was the belief that a family farm, while not necessarily self-sufficient, ought to be able to support a family and fully employ its labor. If a farm, through sales and home consumption, could not offer a satisfactory livelihood and a full-time job, then it was not a family farm. Family operations might be small, therefore, but they were not the smallest farms of all.

Another modification in the Jeffersonian model came with the concession that a family operator might hire outside labor. This view was so widely accepted by the turn of the century that George Warren, an early farm management expert, included it offhandedly in a textbook he published in 1913. On family farms, he wrote, "the family does most of the farm work, with some hired labor."[3]

A third, more significant shift in assumptions about family farms concerned fee simple ownership of land. U.S. land policy during the 19th century aimed at encouraging the spread of owner-operated farms. Yet, it was not until 1880 that the Census tried to determine the success of this policy by counting the number of farm owners and tenants. Although the ratio favored owners by almost three to one, succeeding censuses showed a steady rise in tenancy.[4] By 1930, there were almost as many tenants as full owners. As the proportions shifted, concern predictably increased.

Some observers were wondering by the late twenties if the worry was not misplaced, however. Henry C. Taylor, one of the major figures in the history of agricultural economics, published an article in 1929 questioning the emphasis on landownership."Now that agriculture has become largely commercial," he wrote, "the basis of the farmer's welfare and independence is no longer landownership but *income.*" Seven years later, Murry R. Benedict, then at the Giannini Foundation, sounded a variation on Taylor's theme when he criticized Roosevelt's Resettlement Administration for the importance it attached to owner-operations as ends in themselves. Better, he asserted, to stress the develop-

[3] George F. Warren, *Farm Management*, New York, 1913, 259.

[4] U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*, Bicentennial Edition, Washington, D.C., 1975, part 1: 465.

ment of "desirable and constructive" forms of tenancy such as existed in Britain.[5]

The most widely publicized tenancy study before World War II was the 1937 Report of the President's Committee on Farm Tenancy. It attacked directly the idea that fee simple ownership was an unalloyed good. Like Taylor, the committee's members found that ownership alone was not a shield against insecurity and want. Like Benedict, they urged development of improved tenure arrangements as well as promotion of owner-operated farms. The committee also charged that the unfettered rights accompanying fee simple ownership of agricultural land had nurtured some of farming's worst abuses.[6]

Clearly, by this time, on the eve of World War II, the notion of what constituted a family farm had shifted considerably from the Jeffersonian ideal. Landownership was no longer considered decisively important. Most people also conceded that family operations could employ outside labor and produce commercially without losing their essential characteristics. But it was still widely believed that a family farm should support a family and that the family should control the operation's resources. All these assumptions lasted through World War II.

FAMILY FARM DEFINITION OF FORTIES

Long before the war ended, Administration officials, members of Congress, farm organizations, and agricultural analysts began a wide-ranging discussion about the direction agricultural policy should take after the close of hostilities. The Department of Agriculture formulated an official family farm definition that captured the consensus of the period. USDA described a family farm as "a farm on which the operator, devoting substantially full time to operations, with the help of other members of his family and without employing more than a moderate amount of outside labor, can make a satisfactory living and maintain the farm plant."[7]

This definition should be noted well. It included operations that might be quite large in terms of capital investment and land. It excluded part-time farms, farms that failed to utilize the family's resources fully, farms that could not provide adequate incomes to their residents. It also excluded farms that could not generate sufficient returns to remain viable. Above all, it described the kind of production unit that nearly all the participants in the post-war policy debate hoped to foster.

Yet the criteria did not last long as an official definition. The Department estimated in the mid-forties that about 56 percent of the Nation's farms were family operations according to the guidelines. It estimated also that nearly 70 percent of all farms would qualify by 1955. But, in 1957, a researcher analyzing data from the last agricultural census concluded that the percentage of commercial operations that were family farms had remained largely unchanged. Overall, farm numbers were dropping rapidly. Only part-time and residential farms—places too small to be called family operations under the forties definition—were increasing in absolute terms.[8] Such findings posed a potential political problem, especially considering the climate of the times.

Family farms had become a popular issue by the mid-fifties. Columbia University had sponsored studies on the subject; the president of

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[5] H. C. Taylor, "The New Farm Economics," *Journal of Farm Economics*, 11, July 1929, 358-359 (italics in original); M. R. Benedict, "An Appraisal of Aspects of the Transition Program for Agriculture," *Journal of Farm Economics*, 19, Feb. 1937, 39-40.

[6] National Resources Committee, *Farm Tenancy: Report of the President's Committee*, Washington, D.C., 1937, 3-4, 17-18, 39-40.

[7] USDA, Interbureau and Regional Committees on Post-War Programs, *What Post-War Policies for Agriculture?* Washington, D.C., 1944, 5.

[8] USDA, Interbureau Committee on Post-War Agricultural Programs, Land Settlement Working Group, *Farm Opportunities: Outlook, Problems and Policies*, review copy, Dec. 1944, in files of the Agricultural History Branch, Econ. Stat. Coop. Serv., USDA,40; Jackson V. McElveen, *Family Farms in a Changing Economy*, USDA, Agriculture Information Bulletin No. 171, Washington, D.C., 1957, 1-4.

Yale had written a book about it. The Country Life Association devoted its annual meeting in 1952 to the topic; church groups had become involved.[9] In 1950, Secretary of Agriculture Brannan appointed a Family Farm Policy Review Committee to examine all the Department's programs from the family farm's standpoint. Thereafter, the Chairman of the House Agriculture Committee established a family farm subcommittee. And, as the Eisenhower years unfolded, congressional Democrats enthusiastically accused Brannan's successor, Ezra Taft Benson, of destroying the family farm.

Probably nothing that Benson or any other Secretary could have done would have reversed the trend in farm numbers. But Benson took a beating, and it became evident to anyone who gave the subject much thought that the old family farm definition spelled trouble for whichever political party happened to be in power.

The definition excluded the only kinds of places that were becoming more numerous: part-time and residential units. All other farms were dwindling in number. It was only a matter of time, under the circumstances, until family operations began falling not only numerically but also as a percentage of the total. If the Government continued to use the post-war criteria, Benson or one of his successors would be convicted by USDA's own statistics of presiding over the demise of the American family farm.

In addition, the guidelines were proving unfortunate as an analytical concept. The forties definition was well stated but difficult to measure. Usually when the number of family farms had to be calculated, researchers simply excluded economic class I operations (the largest) from the tally along with a percentage of places deemed too small to support a family. As the fifties progressed, however, farmers increasingly substituted capital for labor and in that way were able to work larger places without hired help. Analysts knew full well that a portion of class I farms must be family operations. But the guidelines included no measurable indicator that could be used to discover how many.

BEYOND THE FORTIES DEFINITION

The political and analytical liabilities of the old definition had mounted by the late fifties to the point that the post-war criteria were bound to be replaced. What emerged in their place was a family farm definition still frequently used today. A fully developed statement of the new definition reads as follows:

> The essential characteristics of a family farm are not to be found in the kind of tenure, or in the size of sales, acreage or capital investment, but in the degree to which productive effort and its reward are vested in the family.
>
> The family farm is a primary agricultural business in which the operator is a risk-taking manager, who with his family does most of the farmwork and performs most of the managerial activities.[10]

The new definition, like the old one, allowed inclusion of large operations. Unlike the old, it also encompassed places at the bottom of the size spectrum. Part-time farms, poor farms, and marginal farms could all meet the new family farm requirements. The new definition disposed of the idea that family farms had to be economically viable and capable of supporting

[9] The results of 50 family farm studies conducted in 1947 and 1948 under Columbia University's auspices were summarized in Columbia University Seminar on Rural Life, *Case Studies of Family Farms*, prepared by Edmund deS. Brunner, New York, n.d. Yale University's president, A. Whitney Griswold, examined family farms as the so-called backbone of democracy in *Farming and Democracy*, New Haven, 1948. For a record of the Country Life Association's conference, see American Country Life Association, *The Family Farm, Its Contributions and Its Problems: Proceedings of the Thirty-First Conference*, Madison, Sept. 15-18, 1952.

[10] Radoje Nikolitch, *Family-Size Farms in U.S. Agriculture*, USDA, ERS-499, Washington, D.C., 1972, 1. This is one of the most articulate statements of the new definition, but by no means the earliest. Essentially the same definition was in use by the late fifties. For example, see John M. Brewster, "Technological Advance and the Future of the Family Farm," *Journal of Farm Economics*, 40, Dec. 1958, 1596, and another work by Nikolitch, *Family and Larger-Than-Family Farms: Their Relative Position in American Agriculture*, Agricultural Economic Report No. 4, Washington, D.C., 1962, 2-3.

families. Gone was the notion that the smallest farms were not family operations.

The new definition reduced the family farm to three elements: management, risk, and labor. Not much data was available on the first two of these, but the Census Bureau collected figures on labor. Whereas the forties definition had stipulated that family operators could not hire more than a "moderate" amount of outside help, the new definition stated flatly that the family must supply more than half the total work force. Analysts estimated that the average family could provide 1.5 man-years of labor. Therefore, a family farm became one that hired less than that amount.

Management, entrepreneurship and labor were equally important to the new definition—theoretically. But the fact that only labor could be measured meant that for statistical purposes, *any* farm, not run by a hired manager, was counted as a family operation no matter what its other characteristics. The proportion of family farms rose from 56 percent to all farms under the old definition to about 95 percent under the new.

The new definition has been politically useful. It has allowed policymakers in recent years to claim that, whatever problems beset the agricultural sector, the family farm is holding its own as a percentage of the total. The conclusion follows inevitably from the criteria. As Orville Freeman once said, some family farms "have adequate capital, some do not. Some are well managed and adequately financed, some are not. But they are all family farms—and we classify them as such as long as they hire less than 1.5 man-years of labor."[11]

There are indications now that the family farm concept is undergoing further change, but the direction of the shift is unclear. One group of analysts, interested in treating agriculture for some purposes like any other industrial sector, wants to reduce the family farm criteria still more. Two such economists suggested several years ago that we regard the family farm henceforth simply as a "family controlled proprietary business." Labor would thus be eliminated as a consideration in the definition.[12]

Yet, we have also recently seen an opposite tendency in some quarters to revert to the old notion that a family farm ought to be capable of supporting a family. Harold Breimyer, for instance, holds that a family-size farm should be able to provide an acceptable living to its operators.[13] And, the practice of distinguishing between small farms and family farms has again appeared in the Department of Agriculture. The resurrection of this custom in USDA is due partly to practical considerations: it is easier, for policy purposes, to think of low income farms separately from commercial operations. The 1977 Food and Agriculture Act is also probably somewhat responsible for reviving the distinction, since the act requires separate annual reports on family farms and small farms, thus implying that there is a difference between the two.

Whatever direction the definition eventually takes, the standard that emerged in the late fifties and early sixties is still widely used today, especially in Government: a family farm, for practical purposes, is an operation that hires less than 1.5 man-years of labor annually.

CONCLUSION

Gradually, over the past 200 years, the family farm concept has shed its components. Jefferson saw the institution as one combining land, management, sustenance, and labor plus a host of elements that were harder to pin down: poli-

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[11] U.S. Congress, House, Committee on Agriculture, *The Family Farm: Hearings before the Subcommittee on Family Farms*, 88th Cong., 1st sess., June 3, 4, 5, and July [illegible]

[12] Thomas A. Carlin and Charles R. Handy, "Concepts of the Agricultural Economy and Economic Accounting," *American Journal of Agricultural Economics*, 56, Dec. 1974, 973.

[13] Harold F. Breimyer, "Can the Family Farm Survive?—The Problem and the Issues," *Can the Family Farm Survive?: Report of Seminar Sponsored by M. G. and Johnnye D. Perry Foundation and University of Missouri*, Nov. 9-10, 1978, Univ. of Missouri-Columbia, [illegible] Sta., Special Report 2[illegible]

tical probity, moral soundness, economic stability and the like. By the forties, the family farm was perceived more narrowly as a family-controlled business that provided a living and full-time employment. Today, it is commonly regarded, in practice, simply as a farm that hires less than a designated amount of labor.

These definitions have not neatly succeeded one another. They have overlapped, butted against each other, merged, and, in general, muddied a great deal of water. Much confusion about agricultural policy has arisen in recent years because people using the same expressions have had very different meanings in mind. To take just one example, critics in the early seventies noted the emphasis that U.S. policy placed on commercial agriculture and claimed that the Federal Government was ignoring the needs of family farmers—only to discover that some people believed the family farm had never been more the center of attention. What went unremarked was that the two groups were not talking about the same thing, even though they used the same language. One faction had in mind a version of the Jeffersonian family farm; the other was thinking of a highly capitalized place where the family did most of the work.

Also worth remembering is that we have never had an exact way of measuring the number and characteristics of our family farms. Analysts in the forties did not try to express the definition of their times in quantifiable terms. Instead of counting family farms, they relied on numbers contained in the economic classification of farms and considered family operations to be everything except class I places and units too small to support families. Working with the more recent criteria, researchers of our own time have had to rely on only one factor in estimating the extent of family farming—labor. Data limitations have forced them largely to ignore management and risk, even though both are theoretically part of the current definition.

Given the uncertainties of definition and measurement, there is today no national consensus about the specific sorts of farming units that a family farm policy ought to foster. This would not have been particularly troublesome before the New Deal. Apart from land legislation, the Government up to that time had not attempted to influence the shape of agriculture in any major way. The Federal Government since then has adopted a more ambitious, interventionist attitude toward policy. With that has come a need to define more clearly the institutions that Government hopes to promote. The old objective of nurturing family farms will probably continue to be stated. But if it is to have any substance, a contemporary understanding will have to be reached about the meaning of the family farm concept itself.

Demographic Aspects Of Agricultural Structure

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INTRODUCTION

Several important demographic issues—that is, those that relate to population—affect the structure of agriculture or are brought about by changes in it. These include the potential supply of future farmers, the number and characteristics of people on farms, and the outcome of movement from farms when small farms are abandoned or consolidated. This article will focus on such demographic aspects of farm structure.

Until the end of the first century of American independence, a majority of all people employed in this country worked directly in farming. Thus, the demography of the farm population was the major factor that shaped the demography of the Nation as a whole. But, as an urban industrialized society developed and as the land available for additional farms became scarce, farmpeople became a smaller proportion of the total population. By World War I the maximum number of farms had been reached. Thereafter, as mechanization led to the consolidation of farms and as agriculture was abandoned in many marginal areas, a large-scale outmigration of people from farms began.

OUTMIGRATION FROM AGRICULTURE

In the twenties, the average annual net outmovement from farms was over 600,000 people. This movement slowed during the depth of the Depression in the early thirties, but resumed in the latter half of the decade. In the forties and fifties, the prolonged surge of urban industrial and commercial activity, coupled with rapid farm mechanization and farm income problems, encouraged millions of people to leave farms. From 1940 to 1960, 21.5 million farmpeople moved to the cities or to rural nonfarm residences, an average of more than 1 million annually. This number was far greater than the excess of births over deaths among farmpeople, and thus the farm population rapidly declined. The farm population dropped from 30.5 million in 1940 to 15.6 million in 1960, which greatly reduced the base. Nonetheless, the annual rate of net outmigration remained high and peaked during the early sixties when on the average a net of 5.7 percent of the farm population moved away each year. By the beginning of the seventies, farmpeople were less than a third their number just 30 years earlier. This movement has rightly been termed one of the largest voluntary migratory movements in human history.

Outmovement from the farm did not occur evenly across the agricultural spectrum. For example, there was an extremely heavy loss of tenant families. In the South, cotton, tobacco, and peanut farms were reorganized from a predominantly tenant system with extensive hand labor to larger scale mechanized operations with chemical control of weeds and pests. These farms were run by owners with some hired help. This shift released hundreds of thousands of families over the course of two decades. Elsewhere, the growing necessity for farmers to make a profit from high volume operations rather than from high profit margins greatly increased the competition for land. Part-owners/part-renters became the most advanced class of farmers, and opportunities for full-tenant farmers dwindled—whether as a permanent way of operation or as a mode of entry into farming. In general, small farms were unlikely to survive, whatever their form of tenure—at least without supplemental off-farm employment by operators and their families. After careful consideration, the heirs of small-scale farmers typically chose nonfarm careers. Millions of acres of land in small farms reverted to forest or were added to the operations of other farmers.

The double vulnerability of farms that were both small and rented led to a high rate of exodus from farming in the South and by blacks in particular. The South's share of the U.S. farm population dropped from 53 percent in 1920 to 34 percent by 1977, and the proportion con-

tinues to fall. The 926,000 black-operated farms in 1920 dwindled to only 46,000 in 1974—a loss of about 95 percent.

Modernization of American agriculture led to the departure of those with the least prospects for success had they remained in farming. However, millions of other migrants also left who might have done well, had opportunities existed. As farm families were typically large, even in the most prosperous farm areas many young people found no jobs in the local economy and thus had no alternative to outmigration. For example, in 1950, Minnesota farmwomen who were 50-59 years old—and who thus had borne most of their children from 1915 to 1935—averaged 3.4 children per family. That is, they averaged more than one child per family than was needed for parental replacement; therefore, most farm families ended up with one or more children living and working in town.

EDUCATION OF FARMERS

In no other occupational group is there such a wide educational gap between generations as among farm operators. In 1970, 72 percent of farmers who were 55-64 years old had not finished high school. (Indeed 25 percent had not been to high school at all.) However, only 12 percent of young farm operators 20-24 years of age had failed to finish high school, and more than 25 percent had some college training. This represents a revolution in the amount of formal education obtained by farm operators. To some extent, this phenomenon mirrors the general rise in educational levels in U.S. society, but it seems also to reflect a radical change among farmpeople in their accepted notions of how much education is required for a life in farming.

In practice, educational levels of farmers are associated with scale of farming. This is partly related to the fact that many late middle-aged and older farmers taper off their operations, and these farmers (with the low education of their generation) thus represent a disproportionately large element in the small-farm group. But, even if one considers farms where the number of older farmers is not disproportionately high, the same effect is found. In 1964, when the education of farmers was last recorded in the Census of Agriculture, 61 percent of farmers who had sold $40,000 worth or more of products in that year were high school graduates. By comparison, only 39 percent of those who had sold $2,500-$4,999 worth of products were high school graduates. Although there are many farmers who have succeeded in modern times without a high school education, the majority of poorly educated farmers do not have self-supporting operations. Therefore, any program designed to assist limited-resource farmers must be able to help people with below-average amounts of formal education.

Failure to remain in school—at least through high school—is no longer a characteristic of the farm population. Enrollment rates among farm youth 15-17 years of age are slightly higher than among nonfarm youth (92.1 percent versus 91.6 percent in 1970), although as late as 1950 the proportion of farm youth in school was only 70.7 percent versus 82.9 percent for nonfarm youth. There are still some young farmers with limited education, and there may well be more whose schooling was not high quality; however, this problem is no more serious today among young farmers than it is among urban youth. College education is an area in which young nonfarm adults are still superior to farmpeople. This difference is likely to continue indefinitely, because many professional occupations requiring college degrees are concentrated in cities. If one excludes professional and technical occupations from consideration, there is not much difference at ages 25-44 years in the level of college education between farm operators and people in all other occupations.

As already indicated, people reared on farms who have moved to cities have slightly higher rates of poverty-level incomes than other city residents, but the difference is not a substantial one. The migrants appear to have suffered comparatively little average economic disadvantage from their urban migration, despite lower education, and they may not have experienced any disadvantage in farm to rural-nonfarm moves

(which have also been common). It appears comparatively easy for former farm operators to use their acquired vocational skills as craftsmen or operatives, and the data suggest that a number of them have become proprietors of businesses.

Nonetheless, one should remember that the decrease in number of farmers cannot be interpreted as the number who are displaced to other jobs. In any industry of declining employment, much of the decline is the result of lack of entry of younger workers as the older ones die or retire. Between 1964 and 1974, not more than a net of one-fifth of the decrease in farms run by operators who were 35-54 years old in 1964 can be linked to withdrawal from farming. The rest stemmed from death or retirement from the labor force, without replacement.

Most farmpeople who moved to cities did reasonably well economically. Employers seem to view rural people in general as work-oriented and thus desirable as employees. During the period of rapid outmovement of farmpeople in the forties and fifties, a shortage of young adults in the labor force also occurred in urban areas. In 1950-60, the number of nonfarm people 15 to 34 years old would have declined by 2.5 million because of the low birth rates during the thirties had not an offsetting inmovement of farmpeople occurred. In a decade of general full employment, the availability of former farm youths was a great boon to industries needing young workers.

A national survey in 1967 showed that 15 percent of urban adults brought up on farms had poverty-level incomes. This compared with 11 percent of urban residents of rural-nonfarm background and with 9 percent among those of urban background. Thus farmpeople had a somewhat higher incidence of very low income than did other urban residents, but not radically so. Blacks who migrated from farms to the cities encountered the major difficulty; they showed a poverty rate of 30 percent. However, this rate was only slightly above that of blacks of urban origin (27 percent), indicating that their disadvantaged condition was not largely attributable to their farm background.

In general, the great exodus of farmpeople from 1940 to the mid-sixties drew most heavily from people who had small farms, who lived in areas of marginal agricultural quality, who were tenants, who had specialized in products affected by radical changes in production technology, and/or who were black. This radical pruning of the farm population removed millions of low-income, poorly educated people from the farming areas. Doubtless, much of the dramatic gain in housing, income, and other quality-of-life measures in farm areas has resulted from outmovement of the disadvantaged rather than solely from improvement of conditions among those who have remained. In a period of plentiful urban and other nonfarm employment opportunities, the farmers who remained in farming or who entered it during the phase of rapid adjustment were a highly motivated class, whose very drive and aggressiveness may be part of the current problem of farm and equipment enlargement accompanied by ever-dwindling numbers of farms.

Since 1970, the population on farms has declined by 18 percent to a level of 8.0 million in 1978.[1] This reduction has meant a net off-farm movement of about 240,000 people a year and an annual rate of net offmovement of 2.7 percent, which is only half that of the sixties. Thus the exodus has slowed considerably but has not ended. Losses continue to be heavier in the South than elsewhere. Compared with the rest of the U.S. population, the farm population is disproportionately white and non-Hispanic (92 percent) and has become increasingly so. The hired farmworker population—which generally no longer resides on farms—has a higher proportion of blacks, Hispanics, and other minority groups, than does either the United States, or the general farm population; however, fully comparable figures are not available.

[1] All farm population numbers in this article are based on the old definition that depends primarily on possession of at least 10 acres of land with sales of at least $50 of farm products in the course of a year or of under 10 acres with sales of at least $250. A new and more restrictive definition is now in effect, one based on sales of at least $1,000 of farm products regardless of acreage. In 1978, the farm population under this definition was 6.5 million. No comparisons with the past are available.

POTENTIAL SUPPLY OF FARMERS IN THE FUTURE

There is one way in which farm operation differs from all other major occupations in the United States. It is the only large-scale occupation in which the majority of people practicing it are sons of fathers who had the same occupation. A national survey in 1962 showed that 82 percent of all men 20 to 64 years of age engaged in farming were the sons of farmers. (Inasmuch as only 5 percent of farmers are women, restriction of the data to men does not materially affect the conclusion.) In no other major occupational group were more than 16 percent of the practitioners following in their fathers' path. (Sixteen percent of male proprietors of businesses other than farming were sons of proprietors.)

Thus farming has been overwhelmingly dependent on farmers' sons for its supply of future farmers. An additional 3 percent have been drawn from the sons of farm laborers. The rest are of highly diverse social origins. Both the complexity of farming (which gives an advantage to people brought up in it) and the advantage of inheritance (in an occupation of increasingly heavy land and capital requirements) contribute to the likelihood of farming's being dominated by farmers' sons. The fact that farming has been a numerically declining occupation almost certainly accounts for the minor degree of entry by outsiders as well.

Note that, although most farmers are farmers' sons, the proportion of all farm-reared men who were farming in 1962 was small—only 16 percent. The rest had gone into nonfarm work. By contrast, 48 percent of the sons of self-employed professionals had themselves become self-employed professionals. However, professional occupations of a self-employed type have generally been growing occupations requiring recruitment from outside, even when a substantial number of the sons of such professionals enter the field.

In the past, the supply of farmers' sons from which new farmers were drawn was ample because of the comparatively high birth rate among farm families. The proportion of middle-aged farmers without sons or with only one is currently low in comparison with that in the recent past. During the years of high birth rates from approximately the end of World War II until the early sixties, there was a reduction in childlessness and in one-child families among farmers. The frequency of childless and one-child families among farm couples in which the wife was 35-44 years old in 1977 was less than half what it had been among farm couples in 1950. In 1977, an estimated 18 percent of such couples had no son and another 30 percent had only one. To this can be added the 7 percent of farmers who had never married.

Additionally, birth rates decreased steadily from the early sixties into the middle seventies. This trend has substantially reduced the number of young children in today's farm population and will lead to a larger proportion of farm families who will have no son or only one and to a substantial reduction in the proportion who have three or more. A national survey in 1978 on childbearing and expected future births revealed that farm wives 25-34 years old expected childbearing patterns that would leave about 20 percent of them without sons, about 39 percent with only one son, and only 8 percent with three or more sons. By contrast, among farm wives of 10 years older, about 24 percent already have three or more sons, and (as noted earlier) about 18 percent have none and 30 would be to increase farm families with just one son and to greatly reduce to proportion with three or more sons.

In the farm population as a whole, the decline in childbearing reduced the ratio of children to adults from 83 farm children under the age of 14 for every 100 adults 20-54 years old in 1960 to a ratio of 70 to 100 in 1970. In just 8 years (from 1970 to 1978), the child-adult ratio plummeted to 48 to 100. In absolute terms, the number of farm children under 14 has fallen from 2.5 million in 1970 to 1.6 million in 1978. Many counties have no more than half as many farm children 7 years old as 17 years old. This represents an extraordinarily rapid change. Farm families are replacing themselves, but not at the

high rates that were formerly the norm.[2] Therefore, whether one considers data on the overall presence of children in the farm population or the likelihood of individual farm families having no sons or fewer sons than formerly, the conclusion is inescapable that the supply of farm-reared youth from which to recruit future farmers has shrunk dramatically in recent years.

Lack of sons does not preclude a farm from being transferred to another family member, but it probably makes such a transfer less likely. No systematic data on the subject are available. Given the propensity of many farmers' sons to go into other occupations, the presence of only one son in a family increases the probability of a farm's being sold or rented out by the heirs rather than operated by them.

A reduction in the number of farm families with *large* numbers of children is not necessarily a disadvantage in retaining the stock of family farms, because the larger the number of heirs, the smaller the typical percentage of equity in the farm will be for an heir who takes it over. But on the premise that the absence or near absence of male heirs disproportionately leads to the sale of farms and that farm sales lead disproportionately to consolidations with existing farms, the low level of childbearing expected by young farm families today is likely to contribute to a future increase in frequency of farm sales and enlargements unless the percentage of farm youth who enter farming increases greatly.

In some cases, inheritance of farms by daughters leads to the retention of farms within families, particularly if the son-in-law takes over. We do not know how frequently this happens. It is likely some increase in the number of women who are farming is occurring, just as the number of women has increased in other occupations that have been male-oriented in the past. National employment surveys show an increase in women farm operators from 4.5 percent of all farmers in 1970 to 6.4 percent in 1977. However, in the same period, the number of women listed as unpaid farm family workers dropped by a larger number. Some of the increase in the farm operator category is thought to represent only a change in reported status from that of unpaid worker to operator as the role of women on farms changes together with an increased consciousness of their roles. In addition, employment of farmwomen in fulltime off-farm work has grown rapidly. For the foreseeable future, the retention of family farms through intergenerational succession depends primarily on the supply of sons and on the desire and ability of those sons to farm.

MOVEMENT INTO AGRICULTURE

The number of people of nonfarm background who want to enter farming may be increasing. The acknowledged but unmeasured presence of "homesteaders" or "back-to-the-landers" in various parts of the United States would seem to confirm this. Frequently the movement of nonfarm people into rural areas for either full-time or part-time agricultural activity is ideologically based, with an emphasis on organic or "natural" techniques of farming and on antimaterialistic modes of living. The contribution of this phenomenon to farm output is unknown, but it is not thought to be large. Areas where such activity is most widely reported are areas of relatively low productivity where farms and farmland are comparatively low in value—such as the Ozarks, northern New England, the Blue Ridge Mountains, the Upper Great Lakes cutover margin, or scattered parts of the West. The "back-to-the-land" movement is almost certainly much larger than in the sixties, and it illustrates that, with determination, many people of limited prior experience can gain entry into farming, at least at a modest scale. However, failure and turnover rates are reportedly high.

As of 1975, 4 percent of farm operators in nonmetropolitan counties of the United States had moved in from metropolitan areas since 1970. This percentage cannot be regarded as a precise count of outside entry into farming for various reasons. Some of these people consist of

[2] Certain ethnic or cultural minorities are exceptions to this statement, such as farmers of Indian, Hispanic, Mormon, Amish, or Hutterite background.

farm youth returning from college, military service, or urban employment. Other new people in farming may have come from nonmetropolitan small city backgrounds but would not be included in the statistics. However, the percentage probably defines an upper limit of the extent of outside entry into farming that has taken place.

STATUS OF KNOWLEDGE

Demographic knowledge of the farm population is generally complete. Regular surveys by the Bureau of the Census provide an annual update on the number, age, race, sex, employment, and income status of farmpeople. The decennial censuses of population provide considerable material on the characteristics of farmpeople, much of it available by county. We can no longer, however, collate data from the Census of Agriculture with the Census of Population, as they are not taken simultaneously. Thus we lack data on farmpeople by tenure, type and size of farm, and economic scale of farming, except to the limited extent that the U.S. Department of Agriculture can obtain such information from its own sample surveys, and financial considerations have reduced the frequency of such work.

We also lack information on who goes into farming, on the extent to which farms are transmitted from one generation to another, and on the demographic circumstances of such transfers. Such information is not amenable to census-type surveys. Further work is needed to learn the potential future supply of farmers, including the consequences of historically low birth rates among farm families. We do not currently know how many farm youth want to enter farming but feel effectively barred from doing so by financial limitations or lack of access to land. We do not understand differences in farming aspirations among people of varying ethnic and cultural backgrounds. Nor do we have data on the extent to which people of nonfarm background are entering agriculture or on their contribution to agricultural production and their comparative rates of success and failure. In a period when the subject of entry into farming and intergenerational transfers of farmland seem to be of increasing interest and significance, we should encourage such research.

Farm Production

Impact of Rising Land Values On Agricultural Structure

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INTRODUCTION

Farm real estate values have climbed steadily for the last four decades. Since 1970 the rise in prices has been dramatic (fig. 1). Farm real estate, now valued at nearly $526 billion, accounts for nearly three-fourths of all farm sector assets ($708.3 billion). The value of real estate on the average farm in 1978 was nearly $200,000 and 88 percent of that was debt free. That is nearly a 40-fold increase since 1945 ($5,297 compared to $196,202) and reflects both the substantial increase in farm size and rising land values over the period.

Many people want to know the implications of continually rising land prices for future landownership, production costs, and regional and production patterns. Will increases in land prices pose entry barriers for beginning farmers? And are land prices increasing beyond the land's agricultural earning capacity?

These concerns can be posed as two basic questions:

- Do rising land values affect structure (or, conversely, does changing structure affect price)?

- Are rising land values a problem, and if so why?

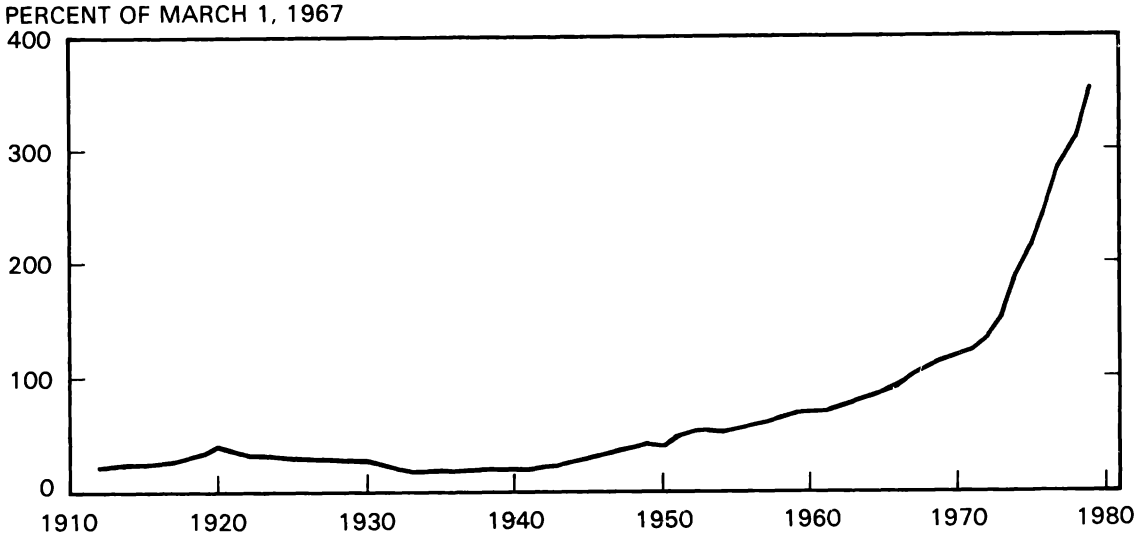
The answer to the first question is clearly "*yes.*" Land is a major form of wealth among farm operators and landlords and a change in wealth usually causes a change in behavior. Since landownership is distributed unevenly, a general rise in land prices can be expected to cause different landowners to react differently, with eventual consequences for structure. Conversely, a change in structure—such as might arise from the development of a new farming technology—is almost sure to change either the relative position of some landowners within agriculture or the terms of trade between agriculture and the rest of the economy. Either change will affect land prices. One purpose of this article is to trace some of the interrelationships between land price and farm structure.

The second question is more difficult. The answer must nearly always be "*it depends.*" It depends, for example, on the perspective of the person affected by rising land values. High land prices may be a burden to a young family attempting to get established in farming but a godsend to an older farm family facing retirement. For a policymaker, it depends on the decision criteria. High land prices may be necessary to ration efficiently a limited supply of land among competing users but at the same time may create hardship for the less wealthy participants in the market. Many policy choices involve weighing acceptable tradeoffs between efficiency and equity in cases where there can be no unequivocal basis for choice.

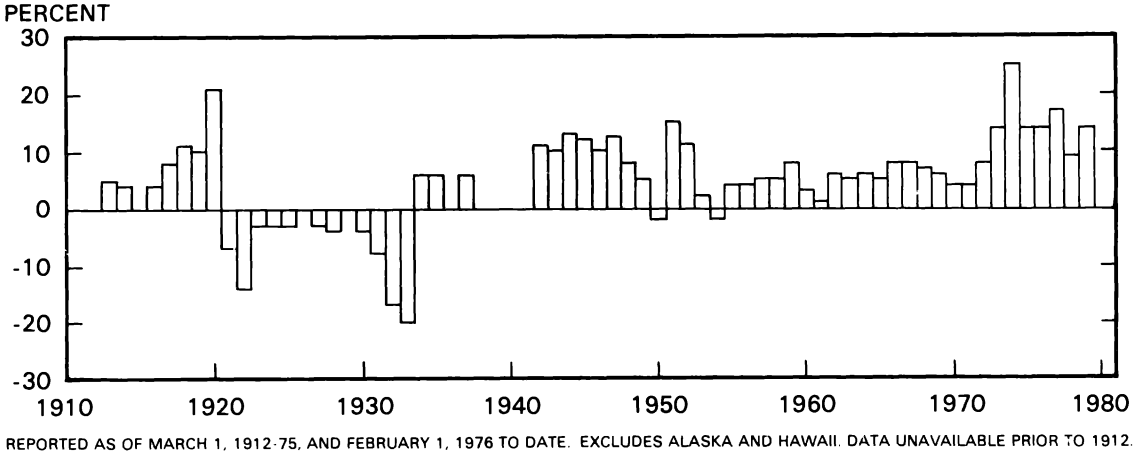
Another reason that the second question can not be answered unequivocally is that, in a market economy, prices function as signals and cannot be judged as good or bad, *per se.* A change in prices signals that there has been a change elsewhere in the economy and the price change normally can be expected to cause other adjustments in reaction. Thus, prices can simultaneously be both causes and results and are not easily controlled. Rather than attempting to answer the second question posed above, therefore, we will examine the workings of the land market in some detail to identify some of the potential tradeoffs or conflicts between equity and efficiency considerations in land price policy.

FIGURE 1

INDEX OF U.S. FARM REAL ESTATE VALUE PER ACRE



CHANGE IN PER ACRE VALUE FROM PREVIOUS YEAR



REPORTED AS OF MARCH 1, 1912-75, AND FEBRUARY 1, 1976 TO DATE. EXCLUDES ALASKA AND HAWAII. DATA UNAVAILABLE PRIOR TO 1912.

THE ECONOMICS OF LAND PRICES

As a businessman, the farmer attempts to bring together factors of production—land, labor, seed, machinery, and other capital items—in the correct proportions to produce products for the market. In a competitive market, the returns from product sales must be sufficient to cover the cost of the production factors, including payments to farm operators for their managerial skills as well as for their labor. In the long run, if returns from production are not sufficient to pay the cost of the factors, then either some farm operators will go out of business or the price of some factor of production must fall. If the returns are greater than costs in the long run, then the sector will be generating economic profit and either new operators will be attracted to farming or the price of scarce or most limited factors will be bid up as farmers compete for them.

In this simple economic model, factor prices are one important equilibrating mechanism (there are others, such as product prices, of course). Most factor prices are determined by their opportunity costs—what the factor could earn in alternative employment—or by the cost of producing the factor.

Land, however, has neither an opportunity cost nor a cost of production comparable to other factors. In most cases and in most places agricultural land has no good alternative use, so that it may earn no return at all if it is not farmed. Single parcels of land with potential for changing from agricultural to nonagricultural use may assume an opportunity cost equal to their alternative use; but in general these demands are small in relation to the supply of agricultural land. Also, land is a free gift of nature; it exists whether it is used or not and has no cost of production in the sense that manufactured factors have. Thus, land is referred to as a residual claimant—since it does not have to be paid anything in the sense that other factors must. When economic times are bad in agriculture, returns to land fall simply because there is less residual to claim after all other inputs are paid. Conversely, since the stock of land is essentially fixed and cannot be increased to meet new demands, the returns to land increase when times are good.

There is one additional element. Most agricultural activities are annual or cyclical processes which yield a stream of income (residual returns) to the land. Since land has no manufacturing costs, it is bought and sold based on *expected* income flows. These are "capitalized" into market values. When buyers and sellers of land expect future farm returns to be low, land prices should fall. Conversely, when favorable farm returns are expected, buyers (and renters) tend to bid against each other to gain control over the land they need to increase production, and land prices rise.

For many years, land prices behaved exactly as economic theory suggested that they should. Throughout the 19th and the first half of the 20th centuries, the Nation was buffeted by large swings in business cycles. When returns within the agricultural sector were good, land prices rose and when returns were poor, prices fell. Of course, farmers or landlords who bought during agricultural boom periods tried to protect their investments when times turned bad, so that the operator might absorb the initial shock of a farm depression from his labor income (which was fixed too, in the short run), but eventually land prices would fall. The last major land market cycle can be seen in the bottom panel of figure 1. Land prices escalated more than 20 percent in 1920 as a consequence of the boom agricultural years following World War I. They fell during the agricultural depression beginning in the early twenties. Land prices did not fully recover until World War II.

Land Prices Since World War II

Many analysts, mindful of the World War I experience, expected a crash in the land market following World War II. Indeed, land prices in 1940-47 seemed to be following the World War I pattern but they did not collapse when the war ended. Instead, land prices rose successively, except in 1950 and 1954, resulting in a price level today six times higher than that of 1950.

Through most of the postwar period, net farm income was relatively steady or rose only slowly. Rising land values with relatively stagnant farm income appeared to contradict economic logic and led several analysts to label the relationship as a paradox. Attempts to explain the paradox, and to understand better the workings of the land market, occupied the attention of a number of analysts and elicited a number of explanations.

Some of the major factors that analysts identified as contributing to the rise in land values are discussed below. They are classified as those originating within the farm sector (endogenous) and those originating in the general economy (exogenous).

Endogenous Factors

The passage of the Full-Employment Act of 1946 and the relative success of the Government in managing the Nation's economy provided a high degree of postwar economic stability. Also, the agricultural price support programs of the period helped to insulate the agricultural economy from fluctuations in the general economy, providing an additional degree of stability. Other things equal, economic stability increases confidence in expectations of future conditions and should result in higher land prices. In addition, several farm programs involved acreage allotments or restrictions on the land base so that entry by new farmers or expansion by existing farmers was limited. This set the stage for direct capitalization of the program benefits into land values. Generally favorable prices for nonallotment crops and livestock helped to maintain values on land not directly involved in the price support programs so that the net effect of farm programs on land values was positive.

In the decades following World War II, the number of farm operations declined and the size of the remaining operations increased. One driving force behind the expansion in farm size was that some farmers were operating along the decreasing or horizontal portion of their longrun cost curves and thus could expand their operations without encountering cost diseconomies. In such situations, farmers can reduce per acre production costs by spreading fixed capital and labor costs over more acres. By using the competitive advantage resulting from their relatively more efficient operations, they can afford to pay premium prices for additional tracts of land. In 1954, the majority of farms were traded as complete operating units. By 1978, however, 58 percent of all farm purchases were for farm enlargement. In that environment, farmers bidding against other farmers were a primary cause of rising land prices.

The farm and nonfarm economies have also become more closely integrated since the war. An increasing number of farm operators combined farming with off-farm employment; other family members sometimes earned significant off-farm income. Analysts have speculated that some farmers may be subsidizing their farm operations (and land investment) with their off-farm income. This practice may be especially important for beginning farmers because it allows them to bid for more land or to acquire larger operations that they could not otherwise afford.

Exogenous Factors

The population of the United States increased 43 percent between 1950 and 1978. During that period there have been great changes in housing patterns and lifestyles. The areas around central cities became suburban in the fifties and sixties and large areas were acquired by speculators in anticipation of eventual development. Most agricultural land sales on urban fringes reflect the value of the land for nonagricultural development purposes (such as residential or industrial uses) and the speculative demands may extend outward for considerable distances. In fact, 48 States now have some form of preferential property taxation that permits taxation of farmland on its agricultural use value rather than on its market price. The presumption behind such tax treatment is that the market price for land exceeds its agricultural use value even in areas distant from urban centers. The recent reversals of

earlier migration trends have caused the population around smaller cities and in rural areas to grow, creating additional demands for land for housing and, inevitably, influencing agricultural land prices.

The Internal Revenue Code traditionally has contained a number of tax provisions tailored to the characteristics of farming thought to separate it from most other businesses. Those provisions attracted nonfarm investors, particularly in orchards, ranching, and livestock feeding. The tax reforms of 1976 removed or sharply curtailed many of the income tax incentives for nonfarmers to invest in farmland. Even without special tax considerations, however, land remains an attractive investment because of favored capital gains treatments, interest deductions to reduce tax liabilities, and increased leverage opportunities. For example, in 1976, a major investment brokerage firm and a bank proposed to create a land investment trust to purchase and manage 50,000 acres of agricultural land; returns were expected to be realized from both farm operations and land value appreciation. Investors were to be limited to tax-free pension and profit-sharing programs so that income to the fund would be tax-deferred. The proposal was abandoned after it encountered a storm of protest because it was perceived as unfairly capitalizing on tax advantages.

Since the early seventies, a new class of absentee investors—foreigners, primarily from Canada, Western Europe, Japan, and the Middle East—has become a factor in domestic land markets. To date, the extent of their presence or influence on land prices has not been established but they have received considerable political attention.

Another investment motive for farmer and nonfarmer alike is the perception that land has been a superior inflation hedge. As previously noted, land prices have tripled since 1970, increasing 14 percent in 1978 and far exceeding previous record rates of increase. This increase occurred during a period of erratic stock market prices and during a period in which inflation seriously diminished the attractiveness of many traditional investments. The lack of competitive alternative investments also causes current owners to be less willing to sell land. A number of people foresee the possibility of greatly increased demand for agricultural lands for the production of biomass (crops grown for conversion to energy) and other alternative energy forms; others foresee global shortages of natural resources causing continued inflation in natural resource pricing. Short of a drastic change in these and similar expectations, inflation hedging motives will continue as significant forces in the farmland market.

The Market Adjustment Process

As has been shown, a number of factors affect the market prices of land. Some factors affect current profitability of land investments directly; others affect expectations of future profitability. Expectations are particularly difficult for the analysts to deal with since they usually can only be inferred. Occasionally expectations are self-fulfilling—if enough people enter the land market because they expect land prices to rise they may succeed in driving up prices. This tends to confirm the original expectations and may generate a second round of price increases. If the initial expectations were not warranted, then the higher land prices will not be sustainable indefinitely, but in a dynamic market it may be difficult for the analyst to sort out cause and effect. This is especially true in a rising land market like that in the United States since World War II.

One characteristic of much of the postwar research on land values discussed above is that it tended to ignore, or at least take for granted, the underlying value basis for agricultural lands. Land as a productive asset was viewed as a basic, but incomplete, factor in explaining market prices, and analysts looked for the other factors to complete the explanation. Not all analysts agreed, however, that there was an "income paradox." Several noted a high degree of stability in land rent to value ratios, which suggests that land values might not be out of line with

economic rent, assuming that contract rent is responsive to economic rent.

Emanuel Melichar described a more basic challenge to the concept of an income paradox.[1] He pointed out a fallacy in comparing an index of aggregate return (farm income) to an index of unit prices (real estate value per acre). Such a comparison takes into account neither the distribution of net farm income among the factors of production nor the changes in the aggregate quality or quantity of land over time. Melichar argues that, in fact, the amount of capital used in production has substantially increased in the last several decades and the amount of labor used has declined. Melichar analyzed the consequence of this substitution for factor shares. His analysis indicates that the relative returns to productive assets other than labor increased even faster than asset prices in 1954-71. He suggests that land prices would have risen even faster had there not been a companion rise in the capitalization rates used by purchasers in computing land values.

Walker has recently examined rent-to-value ratios over a 59-year period in 13 North Central States (7). By comparing gross and net cash rents to the value of the land rented, Walker computed the profitability of investing in farmland versus alternative investments. Walker concluded:

- Land income (as measured by contract rent) and land value tend to move together.
- Land has been a competitive investment based solely on net rental income streams during much of the survey period; including consideration of capital gains as part of the income stream greatly increases the return on farmland investment.
- There has been a high degree of stability in rent-to-value ratios averaging slightly higher and more stable during 1950-79 than during 1921-49.

Melichar's analysis is based on an imputed (residual) return to productive assets after deducting labor returns and a charge for management. Walker's analysis is based on an implied causal relationship between land market prices, contract rent, and economic rent. The two studies suggest that land prices do follow land returns, which denies the existence of an income paradox.

Both the Melichar and Walker studies are too new to have been widely debated but if they are correct, their findings have implications for structural policy. The most important is the question of how much weight to give to the various factors affecting land prices. The answer determines, in turn, the choice of appropriate policy responses. For example, a number of the factors identified above as explaining the postwar rise in farmland values were factors that shifted the demand curve for agricultural land. This rather easily leads to a view that the price of all farmland in the United States is determined by—or at least strongly influenced by—the highest prices paid for land by nonfarmers. If this is true, then the presence of a few well-financed foreign investors or large-scale land developers may be a matter of considerable import, and programs to protect farmers from competition from these sources (such as preferential real property assessment or prohibitions on corporate landownership) may be appropriate. The Melichar-Walker argument, on the other hand, suggests that agriculture is still the highest value use for most farmland and that farm returns are still the major determinant of the level of farmland prices.

LAND VALUE AND POLICY DILEMMAS

Because land constitutes such a major portion of the capital assets of the average farm, high land prices are frequently singled out by farmers

[1] Emanuel Melichar, "The Relationship Between Farm Income and Asset Values, 1950-77," paper presented to a Seminar on Food and Agricultural Policy Issues, Spring Hill Center, Wayzota, Minnesota, March 27, 1978. Also see "Capital Gains Versus Current Income in the Farming Sector," paper presented at the joint meeting of the American Agricultural Economics Association and the Western Agricultural Economics Association, Pullman, Washington, August 7, 1979.

and policymakers as a structural issue. However, land is not only a factor of production but is also a store of value. Hence, it is difficult to devise landownership or land market programs to help a target group of farmers (or would-be farmers) without simultaneously harming some other group or causing price and value distortions elsewhere in the economic system. Some of these dilemmas are discussed below.

Entering Versus Existing Farmers

High land values (and high capital requirements generally) make it difficult for would-be farmers to gain entry into the business. This is especially true if they attempt to buy land. On the other hand, equity in land is the major asset of most established farmers or landowners and they have a vested interest in maintaining land values. Therefore, what is a problem to one group is not a problem to another and any program designed to manipulate land values will encounter some opposition. The conflict in goals or perceived self-interest is not confined to entering and existing farmers, of course.

It is frequently difficult to design land policies to reach specific groups. A major difficulty is the tendency of program benefits to accrue to fixed factors which, for agriculture, is usually land. Given a perceived problem of high land values acting as a barrier to entering farmers, for example, one superficially attractive program alternative is to provide the entering farmers with favorable loans to acquire land. But, given the competitiveness and restricted scope of most land markets, the availability of such assistance may succeed only in driving up local land prices. In that case, the ultimate beneficiary may be the land seller, who will receive a higher price than otherwise, and other landowners; the buyer, however, is saddled with higher interest and amortization costs that may tend to negate the original loan subsidy. Markets do not always operate with this degree of precision or directness but the tendency toward capitalization of program benefits into the value of the fixed factor is strong.

Vested Interests

In the perfect markets of economic theory, land prices should vary as the residual returns to land vary (or are expected to vary). In the everyday world, however, strong forces tend to institutionalize prices. Once a farmer acquires a mortgage for the farm purchase price and perhaps secures other loans against the land, amortization charges and interest costs become part of his costs of production. If economic conditions change, owners may perceive themselves locked into long-term contractual obligations which cannot be easily or cheaply voided. Instead, they may choose to sacrifice managerial or family labor income, take supplemental off-farm employment, or make other adjustments. In the decades after World War II, rising land values (and returns) helped ameliorate many shortrun mistakes in land investment decisions. In 1973-74, however, a number of farmers made land purchases at then record high land prices. With the subsequent agricultural cost-price squeeze, some farmers found that they had overextended their financial obligations. This was undoubtedly a factor in the farmers' protests of the last two winters. At current land price levels, many farmers may be unable to survive major instability in farm returns and may opt for political actions to maintain their wealth position.

Although landowners may have a vested interest in maintaining land prices, there are limits to the actions they can take as individuals. Through Government actions, by design or by inadvertence, spiraling land prices may become institutionalized. This possibility has been most recently recognized in the target price concept in agricultural legislation. In the legislation, target prices and loan rates for some agricultural commodities are linked to their costs of production. The potential problem is to avoid including land charges as a production cost, lest a land cost "spiral" be built in. A spiral can exist when the loan rate or target price is high enough to cause an increase in land prices. If the rise in land prices gets counted as a production cost, the computed cost of production increases, raising further the target price. The high target price

levels further boost land prices, in a potentially endless cycle.

Equity Versus Efficiency

As noted earlier, one of the difficulties in designing a structural policy is the conflict between efficiency and equity as policy goals. *If* landownership and wealth considerations can be divorced from firm or market efficiency considerations and *if* one goal or the other (equity or efficiency) can be determined as paramount, then deciding on a policy will be relatively easy. In our economic system, however, the two goals are inextricably interrelated, beginning at the firm level. Structural policies that seek to redistribute resources to achieve greater efficiency may be opposed by current resource owners afraid that their equity will not be respected; the policies may even be opposed by intended beneficiaries who fear that their *future* opportunities for wealth gains will be curtailed. Conversely, resource redistribution (either actual redistribution or redistribution of future opportunities) to meet equity objectives may be opposed because the perceived efficiency losses are too great. Frequently the tradeoffs between efficiency and equity are not too clear or well quantified.

Further, wealth compounds itself. Among other reasons, land is a good investment because of favorable financing arrangements, tax advantages, and leverage opportunities that are available to land purchasers. The ability to exploit these advantages is probably a direct function of current wealth, so that large farmers or landowners may continue to grow—not necessarily because they are superior farm managers but because of their investment positions. This leads inevitably to greater concentration of landholdings and wealth.

CONCLUSION

Writing in England in 1771, David Ricardo observed that the price of land was high because the price of corn was high, and not vice versa. In examining relationships between land values and farm structure, it is important to determine whether land prices are a cause or whether they are an effect of economic forces affecting both land prices and structure.

A popular perception in structural policy debate seems to be that land prices are too high relative to desired structural goals. Part of the perception probably stems from general uneasiness with land prices that appear only to go up and part of it stems from the questions that analysts have raised about the income paradox. Melichar suggests that we are *not* observing just the rising portion of a prolonged land value cycle but rather the consequences of prolonged structural shifts within the agricultural sector. If this is true, our meanings of high and low land prices may need to be reexamined.

The second point is that market prices can be fair or economically justified without being neutral in their effects. For example, land prices that are reasonable in terms of expected returns to established farmers may appear high to someone seeking to get started in farming But this is an acceptable economic function of markets—to set prices at levels that restrict entry opportunities only to the best qualified or most persevering. If the price barriers are judged to be too high to achieve a desired entry rate, the preferred course of action may be to work directly with the entrants rather than to attempt to lower all land prices. Any existing biases in the land market institutions probably favor holdings and wealth. To that extent, a number of Government actions—such as special income tax provisions, mortgage lending policies, or commodity price support programs—although available to all farmers, tend to favor large landholders or absentee investors. This can give some a comparative advantage, which leads to greater concentrations of wealth.

Short of direct market intervention through price controls or legislative fiat, policymakers cannot manipulate land prices. If land prices are perceived as being too high or if land markets are perceived as favoring certain classes of landowners, policymakers have two courses of action: (1) alter the market conditions or (2) treat the consequences.

Alter Market Conditions

A large number of Federal programs affect the demand and supply for land, and hence price. Provisions of the Internal Revenue Code make farmland ownership attractive to nonfarm investors. Other provisions encourage conservation or development of new farmland while inheritance tax laws frequently affect decisions about when or if farms are placed on the market. If such proposals are believed to affect land markets unduly, then they may be candidates for change. What one should remember, however, is that there may be other land use or income distribution considerations that may outweigh their effects on land price.

Governments can also regulate or restrict land sales. Some States already restrict corporate landowners, and similar restrictions of foreign or other absentee investors have been suggested. Such restrictions pose a basic conflict with our landownership policies—as discussed in another article ("Ownership and Land Use Policy")—and should not be implemented without an accurate understanding of the impact such investors have on land prices.

Treat Consequences

The choice between the policy options of altering the market or treating the consequences of that market probably hinges on the policymakers' perceptions of how well the land market is working. This involves consideration of both efficiency and equity. The information presented by Melichar and Walker suggests that the market is performing its basic functions of allocating resources among competing uses efficiently. As noted before, however, efficiency does not necessarily assure equity and land market results may be inconsistent with structural equity goals because high land prices are barriers to entry or because the market conveys competitive advantages to large farms over small farms. In these cases the choice may be between intervening in the land market (and reducing efficiency) or treating the equity issues directly.

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Tenure and Equity Influences On the Incomes of Farmers

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INTRODUCTION

Land tenure encompasses the ownership, use, and control of the land and the claims on services and incomes that flow from it (*14*).[1] Farmers are generally classified by ownership as full owners, part owners, or tenants. A full owner may have full equity or little equity in the land he owns, but he operates only land that he owns. A part owner may have full or little equity in the land he owns, and the portion he rents may be a small or larger proportion of his total farm size. A tenant rents all the land he operates, and his equity varies with his ownership of the machinery and livestock associated with the farm.

This article addresses the factors determining land tenure and its relationship to the economic welfare of individual farmers and to the total farm sector. These issues are broadly stated as:

- The relationship of tenure and equity to farm size.
- The relationship of tenure and equity to the economic welfare of farmers, considering their current incomes, wealth positions, and risks.
- The factors associated with a farmer's decisions to own or to rent land.
- The implications for the farm sector of separation of ownership and operation of farmland.
- The potential avenues to entry of new farmers and the concommitant concern that a "landed aristocracy" is being formed unwittingly by barriers to entry of new farmers.
- The public policy alternatives or reforms that can alter the advantage of various tenure arrangements.

The issues are complex and have interrelationships and linkages with other subjects treated in this collection. Such relationships will be pointed out but left for further development in the other articles.

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

TENURE, EQUITY, AND FARM SIZE

Measured by any financial or physical standard, the average size of farm units has grown each year for the past several decades. This has occurred even though the total acreage farmed has decreased slightly since 1950 (table 1). Many operators ceased farming and their units were largely absorbed by remaining farmers. The decline in farm numbers from their 1935 peak of 6.8 million to 2.7 million in 1974 was not uniform among tenure groups (table 2). Tenant operations declined the most in numbers and proportion of total—from 2.8 million to 300,000—a 91-percent decrease. Full owners increased in proportion from 46 percent to 62 percent (table 3). Part owners—those who both own and rent farmland—have dominated the changes in the tenure pattern since the thirties. This group nearly tripled its proportion of farm numbers and more than doubled its proportion of land operated since 1935.

Table 1—Distribution of U.S. land in farms owned and rented by farm operators, 1950-74

Year	Total land	Owned by farm operators	Land rented from nonfarmers[2]	Land managed for others[3]
	Million acres	------- *Percent of total acres* ------		
1950[1]	1,161.4	62	29	9
1954	1,160.0	62	29	9
1959	1,123.4	60	30	10
1964	1,110.2	58	31	11
1969	1,062.9	68	32	NA
1974	1,017.0	68	32	NA

NA = Not available.

[1] Distribution of land owned and rented from nonfarmers not estimated by the census before 1950.

[2] The total amount of land rented by farm operators is normally from 5 to 7 percent greater than these estimates which represents acreage rented from other farm operators.

[3] After 1964, land managed for others was not reported separately from land owned and rented.

Source: *Census of Agriculture.*

Striking changes in the average size of units operated have occurred. The sizes of owners' farms and tenants' farms were approximately equal in 1935; by 1974, the average size of tenants' farms had grown to almost double that of full owners (468 acres versus 252 acres, table 4). Part owners have both the largest average size of farm (852 acres) and the second-largest average amount of owned land (443 acres).

The factors underlying the changes in tenure groups are partly explained by the fact that:

- Part-time and part-retirement farms are most common in the full-owner category, thus reducing the average size for this group (table 5).
- The part-owner category is composed mainly of commercial farms but includes all farms that both own and rent land—regardless of their size or proportions of owned and rented land.
- The rapid decline in the number of tenants was chiefly among low-income farmers in the South.

In summary, note that the proportion of land farmed by operators other than the owner has remained at approximately 44 percent since 1950. In addition, the trends in tenure have been away from full ownership and tenancy and toward part ownership.

Table 2—U.S. farm numbers by tenure of farm operators, 1935-74

Year	Total farms	Tenure groups		
		Full owners	Part owners	Tenants
	Million farms			
1935	6.81	3.21	0.69	2.87
1940	6.10	3.09	.62	2.36
1945	5.86	3.30	.66	1.86
1950	5.39	3.09	.83	1.45
1954	4.78	2.74	.87	1.15
1959	3.71	2.12	.83	.74
1964	3.16	1.82	.78	.54
1969	2.73	1.71	.67	.35
1974	2.31	1.42	.63	.26
	Percent			
Percent change, 1935-74	–66	–56	–9	–91

Source: *Census of Agriculture.*

TENURE, EQUITY, AND ECONOMIC WELFARE

Tenure and equity statistics convey little information on economic welfare of farmers. They

Table 3—Distribution of U.S. farm numbers and land in farms by tenure of farm operators, 1935-74

Year	Farms by tenure[1]			Operated land by tenure				Tenants	Managers
	Full owners	Part owners	Tenants	Full owners[2]	Part owners				
					Land owned	Land rented	Total		
	Percent of total farms			*Percent of total acres*					
1935	47	10	42	37	13	12	25	32	6
1940	51	10	39	36	13	15	28	29	7
1945	56	12	32	36	17	16	33	22	9
1950	57	15	27	36	21	16	37	18	9
1954	57	18	24	34	23	18	41	16	9
1959	57	23	20	31	25	20	45	14	10
1964	58	25	17	29	26	22	48	13	10
1969	62	25	13	35	28	24	52	13	NA
1974	62	27	11	35	28	25	53	12	NA

NA = Not available.

[1] Also included are farm managers who represented 1 percent or less of farm operators from 1935 to 1974. After 1964 this classification was not used in the census.

[2] Excludes land rented by full operator to others; normally about 9 percent of total land owned.

Source: *Census of Agriculture.*

Table 4—Average size of U.S. farms by acres of land operated and by tenure of operators, 1935-74

Year	Full owner	Part owner			Tenant
		Land owned	Land rented	Land farmed	
			Acres		
1935	122	191	195	386	118
1940	124	235	253	488	132
1945	125	291	271	562	135
1950	136	288	224	512	147
1954	145	309	235	544	166
1959	164	332	272	604	222
1964	175	363	319	682	267
1969	220	434	385	819	390
1974	252	443	409	852	468

Source: *Census of Agriculture.*

Table 5—U.S. farm operators in each tenure group by value of gross farm sales, 1974

Gross farm sales	Full owners	Part owners	Tenants	All operators
		Percent of total operators		
$100,000 and over	3.1	13.9	7.9	6.6
$40,000-$99,999	7.6	26.2	19.7	14.0
$20,000-$39,999	10.3	19.9	19.5	13.9
$10,000-$19,999	12.8	13.5	16.4	13.4
$5,000-$9,999	14.4	9.3	12.5	12.8
$2,500-$4,999	15.3	7.2	10.0	12.5
Less than $2,500	36.5	10.0	14.0	26.8
All farms	100.0	100.0	100.0	100.0

Source: *Census of Agriculture.*

are averages across different sizes of farms for characteristics that affect both wealth and current net income. A strategy that will maximize wealth accumulation for a farm may adversely affect current net income and one that maximizes current income may result in little accumulation of wealth. Wealth accumulation for a farm would be enhanced by adopting a strategy of maximum growth in owned assets to take advantage of capital appreciation. This strategy, however, would result in high cash obligations for debt service. If the cash obligations for debt service exceed the increases in net cash income of the farm, the current income of the farm family (the amount available for family living and investment) will be decreased by a strategy of rapid growth.

The way in which different tenure and equity positions affect the financial conditions of individual operators is illustrated in table 6 for a typical 400-acre corn and soybean farm in east-central Illinois for 1975 through 1978. For the part owner, who typically owns nearly one-third of total land operated with approximately one-third equity capital, net returns and cash flow associated with this operation appear relatively favorable over the 4-year period. The operator is able to meet cash commitments each year out of current farm receipts and to maintain an average return to equity capital greater than 5 percent.

Table 6—Typical east-central Illinois corn and soybean farm: Financial position with different tenure and equity capital, 1975-78

Item	Unit	1975	1976	1977	1978
Farm structure data:					
Total assets (market value), Jan. 1	Dol.	644,451	682,203	886,125	1,139,027
Real estate assets	Dol.	530,800	539,200	734,800	971,200
Non-real estate assets	Dol.	133,651	143,003	151,325	167,827
Total land	acre	400	400	400	400
Corn	acre	200	200	200	180
Soybeans	acre	180	180	180	180
Prices:					
Corn	$/bu	2.50	2.35	1.88	2.04
Soybeans	$/bu	4.70	7.60	5.75	7.15
Yields:					
Corn	bu/ac	128	126	120	133
Soybeans	bu/ac	39	35	40	36

See end of table for footnotes.

Continued

Table 6—Typical east-central Illinois corn and soybean farm: Financial position with different tenure and equity capital, 1975-78—Continued

Item	Unit	1975	1976	1977	1978
			Typical part-owner tenure[1]		
Balance sheet:					
Owned assets (market value), Jan. 1	Dol.	245,416	245,589	308,689	395,666
Debts, Jan. 1	Dol.	46,126	45,128	45,274	59,063
Equity	Dol.	198,291	200,461	263,415	336,602
Debt/equity ratio	Dol.	.24	.23	.18	.18
Net income:					
Receipts	Dol.	60,738	67,835	54,493	61,269
Cash cost (including interest)	Dol.	24,828	23,498	26,303	26,015
Net cash income	Dol.	35,910	44,337	28,190	35,254
Less:					
Depreciation	Dol.	6,492	6,381	6,610	7,216
Operator family labor and management	Dol.	5,676	6,859	7,511	7,112
Net returns to equity	Dol.	23,742	31,097	14,069	20,925
Net returns to equity	Pct.	12.0	15.5	5.3	6.2
Additional returns to equity due to land revaluation	Pct.	19.6	4.3	26.8	29.1
Cash flow:					
Net cash income	Dol.	35,910	44,337	28,190	35,254
Less: Principal payment on debt	Dol.	5,470	5,353	7,668	6,899
Less: Federal and State taxes	Dol.	6,103	8,616	3,237	5,511
Remaining net cash income after principal and taxes	Dol.	24,337	30,368	17,285	22,844
			Full owner with minimum equity[2]		
Balance sheet:					
Owned assets (market value), Jan.1	Dol.	664,451	682,203	886,125	1,139,027
Debts, Jan. 1	Dol.	505,021	518,802	672,160	862,661
Equity	Dol.	159,430	163,401	213,965	276,365
Debt/equity ratio	Dol.	3.2	3.2	3.2	3.1
Net income:					
Receipts	Dol.	96,456	107,463	86,218	96,992
Cash cost (including interest)	Dol.	78,031	78,764	94,565	111,908
Net cash income	Dol.	18,425	28,699	−8,347	−14,916
Less:					
Depreciation	Dol.	10,061	10,885	11,333	11,619
Operator, family labor, and management	Dol.	5,676	6,859	7,511	7,112
Net returns to equity	Dol.	2,688	10,955	−27,190	−33,648
Net returns to equity	Pct.	1.7	6.7	−12.7	−12.2
Additional returns to equity due to land revaluation	Pct.	81.2	17.6	110.0	118.8
Cash flow:					
Net cash income	Dol.	18,425	28,699	−8,347	−14,916
Less principal payment on debt	Dol.	19,326	20,717	30,084	27,217
Less Federal and State taxes	Dol.	569	1,810	126	126
Remaining net cash income after principal and taxes	Dol.	−1,470	6,172	−38,558	−42,259

[1] Part owners typically own 30 percent in land and rent 70 percent of land. Equity is 30 percent land and 65 percent in non-real estate assets.

[2] Full-owner equity is 25 percent in land and 20 percent in non-real estate assets.

In addition, land value revaluation on owned land added substantially to the part owner's wealth or equity position during this period.

If a farm of the same size were purchased by using debt capital equal to 75 percent of total asset value and operated by a full owner, the financial impact would be substantially greater than that of the part owner. Net returns to equity would be substantially lower, due primarily to charges on land debts. The full owner would be in a cash flow bind in three years out of the four. The full owner would, however, be in a wealthier financial position due to substantial capital appreciation on the extra land he owns. Thus, although the operator's current financial position is unfavorable, the capital appreciation payoff from adopting a highly leveraged position is substantial.

Debt to equity ratios have traditionally been low in agriculture for most types of farms and higher leverage ratios have tended to be associated with larger farm sizes (table 7). Higher debt to equity ratios exist primarily because farm size growth is closely related to increasing use of debt capital. Part owners are normally more heavily indebted. Seventy percent of all part owners had some year end debt, based on the latest farm finance census survey (1970), compared to only 46 percent for full operators and 49 percent for tenants. The percentage of operators with year end debt in 1970 is broken down by gross farm sales as follows:

Gross farm sales	Percent of farms with debt
$100,000+	81
$40,000 to $99,999	78
$20,000 to $39,999	72
$2,500 to $19,999	51
Less than $2,500	37

High growth and farm consolidation strategies by individual farmers increase the competition for land (thereby raising its price), increase the use of debt (thereby increasing the vulnerability of the farm and the risk of business failure), and contribute to the "economic cannibalism" of farms. The longrun effects of this process are likely to be higher overall production costs than would otherwise be the case. The reasons for higher production costs are that increasingly greater proportions of farm expense in any year will become fixed obligations for debt service, and smaller proportions will be residual returns to the operator and his family.

An important matter of public policy is whether the Government has the responsibility to provide emergency funding at relatively low costs to operators who expanded too rapidly with excess leveraging and find themselves in a cash flow bind. The policy dilemma is that operators who use highly leveraged strategies contribute the most to the increasing land prices,

Table 7—Debt/equity ratio by type of farm and gross farm sales, United States, 1970

Type of farm	$100,000+	$40,000 to $99,999	$20,000 to $39,999	$10,000 to $19,999	$5,000 to $9,999	$2,500 to $4,999	Total
				Debt/equity ratio			
Cash grain	.19	.18	.16	.15	.16	.12	.16
Tobacco	.34	.19	.17	.16	.11	.09	.14
Cotton	.23	.14	.12	.12	.10	.24	.16
Other field crops	.35	.27	.24	.23	.19	.49	.29
Poultry	.58	.38	.40	.43	.18	.21	.44
Dairy	.40	.36	.33	.22	.16	.13	.30
Livestock other than poultry and dairy	.48	.34	.23	.22	.18	.21	.28
Livestock ranches	.25	.19	.14	.15	.09	.06	.17
General	.26	.28	.21	.22	.18	.13	.22
Miscellaneous	.54	.26	.17	.17	.16	.14	.24
Fruit and nut	.25	.38	.23	.38	.25	.17	.27
All types	.33	.27	.22	.19	.19	.15	.23

Source: (*9*).

increasing financial risks of production, and increasing cost levels of the industry. Providing such assistance would increase adverse economic and structural effects on the industry, reward those who aggressively sought to become wealthy, worsen the disparities in distributions of wealth, and increase the incentives for farmers to adopt high-growth, high-risk strategies.

Existing public policies of emergency credit, commodity programs that socialize some of the risks of production, and preferential taxation of capital gains (at 40 percent of the normal rate) favor the high-growth, high-risk strategies. Those topics are extensively developed in other articles in this collection.

FACTORS IN RENTAL VERSUS OWNERSHIP OF LAND

The importance of capital utilization by farm operators stems both from the restrictions on capital available to farmers and on how the operator views current returns as opposed to returns from capital appreciation. Farmers are continually faced with the alternatives of using capital for land resources or for their nonland capital needs and renting the land they need.

Costs of ownership of land versus the costs of renting appear to favor rental, if the operator desires higher current income. A comparison of the net cash rental and share rental rates with interest costs (at average interest rates and current market values for land) shows that cash rental is much more favorable and that share rental is somewhat more favorable than ownership (table 8). This basically says that if land were purchased with 100 percent debt capital, the cash outflow for interest would greatly exceed the cash rental costs, and the cash outflow for interest and taxes would exceed the share rental costs of the land. By not owning the land, the operator foregoes the increases in wealth due to land value appreciation, but receives a larger current net income and can use his limited capital to operate a much larger farm.

Farmers who make landownership investments must have sufficient cash flows to cover interest and debt retirement obligations, but can utilize equity generated by land value appreciation to acquire further parcels of land. Federal

Table 8—Average U.S. ownership costs and rental rates per acre on land for specified commodities, 1974

Commodity	Ownership costs at market value[1]	Rental rates		Proportion of total acres	
		Net share	Cash	Share rented	Cash rented
	Dollars per acre			*Percent*	
Wheat:					
Hard red winter	26.31	30.22	18.33	44	9
Soft red winter	59.05	30.06	28.15	50	6
Hard red spring	20.58	16.42	15.76	25	16
Durum	18.67	14.01	15.12	30	17
White	28.21	35.42	30.53	49	6
Corn	70.98	80.39	37.44	40	15
Sorghum	34.02	37.63	19.73	55	5
Barley	27.22	25.75	20.65	30	13
Soybeans	68.13	62.33	32.76	46	16
Flax	18.35	20.54	13.68	39	21
Cotton	41.23	24.69	30.42	41	19
Rice	54.95	112.18	34.20	43	7
Peanuts	48.22	154.14	79.37	10	42

[1] Ownership costs are defined as the current average Federal Land Bank interest rate times the average current market value minus any land tax.

Source: 1974 *Cost of Production Survey* (*16*).

Land Bank data indicate that 30 to 40 percent of farmers have used their accumulated wealth this way and that 8 to 13 percent have also used their increased wealth to shift their obligations from short-term notes to longer term mortgages (table 9).

Barry and Baker (*4*) recently pointed out that a farmer's life cycle strongly influences his pattern of debt use and resource control. Full ownership rises and tenancy declines with age, while part ownership rises through the 45 to 54 age bracket and then declines. The proportion of part owners is larger between the ages of 35 and 45, when farm size is largest, suggesting the important role of leasing in financing a farm's growth. During the growth stage, a blend of leasing and ownership provides financial diversification, stablizes resources control, and builds credit. Then, as farmers approach retirement and estate transfer, they tend to relinquish control of leased acreage and maintain their operations on owned land. After they retire, their operations become the sources of newly leased land.

In summary, land rental, equity financing, and debt financing of land purchases are all avenues that farmers can combine to strike a balance between current income and accumulation of wealth, between farm growth and debt retirement, and between exposure to risk and foregoing income opportunities.

IMPLICATIONS OF SEPARATION OF OWNERSHIP AND OPERATION OF FARMLAND

Concerns about the separation of ownership from operation of farmland stem from the possible increases in vulnerability of the farm sector to fluctuating product prices and asset values, the possible increases in cost levels in the industry if the landownership and the management inputs require separate returns, and the possibilities of disparate returns to landlords versus operators.

Most farmland is operated by its owner, who receives a return to the entire set of factors he supplies: land, labor, operating capital, management, and risk-bearing. The owner-operator with high equity is thus in a position to forego or delay returns on specific inputs in times of adverse prices. If there is separation of these returns—as occurs in separation of landownership and operation, use of high levels of borrowed capital, heavy reliance on hired labor, and shift of risks through insurance or market coordination—then the flexibility of the farm sector in adjusting to fluctuating prices is decreased. The level of committed costs relative to residual returns increases; hence the costs of production for the industry increase. If the ownership of land becomes concentrated in the hands of the

Table 9—Use of Federal Land Bank loans, June 30, 1973-77

Loan purpose	1973	1974	1975	1976	1977	1978
			Percent			
Farm real estate purchases	41.0	41.3	29.3	33.6	31.5	31.3
Refinancing:						
Mortgages held by FLB's	18.0	14.3	17.1	19.0	21.1	21.0
Mortgages held by others	14.9	16.6	19.9	15.8	14.4	15.0
Short-term loan held by others	8.1	8.0	13.8	10.4	13.3	12.8
Total refinancing	41.0	38.9	50.8	45.2	48.8	48.8
Other purposes[1]	18.0	19.8	19.9	21.2	19.7	19.9
All purposes	100.0	100.0	100.0	100.0	100.0	100.0

[1] Includes repairs and improvements to land and buildings and other purposes.

Source: Farm Credit Administration, *Agricultural and Credit Outlook,* 1979.

wealthy, corporations, nonfarmers, or foreigners, then the likelihood increases that there will be high returns to land and low returns to other factors.

An additional point regarding separation of ownership and operation is that if all land were in the hands of full owner-operators, the debt-equity ratio for the industry would be at least double the level. Operators typically have much higher debt levels than do landlords. Landlords are thus a source of net capital inflows to agriculture. Programs fostering the transfer of land from landlords to operators would thus increase the level of debt relative to the value of assets.

TENURE AND EQUITY BARRIERS TO ENTRY INTO FARMING

Entry into farming is extremely important because farming, as opposed to other industries, is not organized to allow production or employment of skilled human resources without large, direct investments by those employed. However, a structural organization of farming could evolve in the future that resembles the structure that has evolved in most other industries.

Family units operating farms generally provide the farm units that will be available to entrants, and their children become the entrants. Lu, Horne, and Tweeten estimated that between 1965 and 1974, low availability of single farm units meant that only two of five Oklahoma farm youths had the opportunity to enter farming (*12*).

Table 10 shows the capital requirements for farm proprietorships with annual gross sales of $40,000 to $60,000. The total capital requirements of $250,000 to nearly $600,000 indicate that, even with minimum equity, the capital requirements are high. Estimates from the 1970 Survey of Agricultural Finance show the average ratio of resources controlled (owned and rented) to equity to be 5 to 1 for farmers under 35 years of age. Based on this ratio and current asset values, the average farmer under age 35 has an equity of approximately $45,000.

The debt service burdens on low equity entering farmers would likely be prohibitive if land and other resources could not be rented. Cruitt, Obrecht, and Herr (*6*) estimated the ratio of owned, borrowed, rented, and jointly operated resources to equity to be $18 to $20 per dollar of equity for young Midwestern grain farmers. Many young farmers enter agriculture by combining farming and nonfarm employment of the operator or spouse.

In spite of these barriers to entry, the number of farmers under age 35 has increased. From 1970 to 1976, the number of young persons (ages 16 through 34) self-employed in agriculture increased by one-third, up about 94,000 (*5*).

Barriers to entry into farming, while severe, are made less stringent by the availability of land for rental, off-farm employment, favorable credit access and repayment terms, and help from other family members. Potential conflicts of public policy can arise through failure to target the benefits of inheritance and credit policies to entering farmers. Policies that are generally available to all farmers or to landowners can exacerbate the problems of entering farmers by increasing the competition for land, increasing the capital requirements, and decreasing the land available for rental. Entering into farming without benefit of inheritance then becomes less feasible.

Table 10—Average capital requirements for single farm proprietorship with $40,000-$60,000 gross farm sales, United States, 1976[1]

Type of farm	1976		
	Farmland value	Other capital	Total capital
	Dollars		
Cash grain	293,643	85,036	378,679
Cotton	299,421	113,086	412,507
Livestock ranch	458,806	113,750	572,556
Vegetable	174,022	72,290	246,312
Fruit and nut	195,762	89,666	285,428

[1] Compiled from the *1970 Farm Finance Survey* (*22*), but updated to 1976 to reflect changes in the value of farm assets.

POLICY ALTERNATIVES AND REFORMS

Tenure and equity of farm operators measure the ownership and claims against resources used in agricultural production. They are influenced by linkages with other issues and, directly or indirectly, by many policy instruments.

Tenure and equity relationships are also strongly influenced by income tax and estate tax and land inheritance policies. These policies provide many of the incentives for farms to grow, for nonfarm individuals and corporations to invest in farm ownership; and the policies provide the means to transfer farms intact from one generation to another. Linkages with technological changes occur through the incentives for farmers to adopt capital-intensive technologies to reduce production costs. These alter the equity positions of farms and create incentives for further expansion by rental or purchase of land. Interactions of tenure and equity relationships with credit policies influence tenure and equity directly through capital availability and credit terms. Lastly, there is a strong interaction between tenure and equity measures and (1) credit access and entry policies together and (2) increases in land prices.

Several public policy instruments and proposals deal directly with tenure. For more than 40 years, the Farmers Home Administration (FmHA) has been involved with supervised credit programs for beginning farmers and for farmers unable to obtain credit from commercial sources.

As of January 1, 1976, FmHA held an estimated 6 percent of the total real estate and nonreal estate debt outstanding. While 6 percent of the total debt is not large, the relative importance of these loans can be appreciated better when outstanding debt is examined by economic class and age group of their borrowers. Borrowers under 35, with total value of farm sales under $10,000 in 1971, relied upon the FmHA for 22 percent of their real estate loan funds; in contrast, borrowers over 65, with gross farm sales over $40,000, relied on the FmHA for less than 1 percent of their real estate loan funds. Thus, the FmHA specializes as a supplier of debt capital to the young and the smaller farmers.

The "Young Farmers Homestead Act" (*22*), proposed in 1976, consisted of Government programs for the purchase, lease, and (concessional) sale of farmland to young farmers otherwise unable to buy farmland. The proposal attempted to balance the considerations of size of tracts, rates of growth, and cash flow requirements for beginning producers. Although designed to avoid tampering with land markets, it would likely have generated some increases in the demand for land and would thus have raised land prices.

Other policy alternatives for aiding young farmers that would disrupt land and capital markets less would be to offer loan guarantees or direct assistance to those who sell or lease real estate to qualified young farmers at concessional prices (*4*). Such arrangements would lower the purchase costs or rental rates for young farmers, while maintaining the sellers' or lessors' returns. Also, since a high proportion of farmers start by leasing resources and purchasing land through seller mortgages and contracts, greater emphasis could be placed on publicly sponsored price and production insurance programs to cover the farmers' risks in meeting these obligations. The reduced risks of loss would make both lender and seller more willing to provide the financing for the sale.

Where land is sold by retiring farmers, special tax consideration might be given to inverse amortization schedules with lower payments at the beginning of the loan period and higher payments later on. This repayment pattern would ease the cash flow problem for young farmers yet compensate retiring farmers for the higher risk and lower cash return in early years of the financing period.

Barry and Baker (*4*) question whether policies for young farmers that foster still more debt capital in agriculture are needed. Instead, they suggest that the need is to reduce the financial disadvantage of the smaller, yet productive, operators, whether they are young or not. Existing capital gains tax advantages, equity-based land expansion, outside income, and related features already help the established and more

financially aggressive farmers to gain competitive advantages over those with equal or superior skills in production and marketing. An alternative might be a capital gains tax levied on farmers who use unrealized capital gains on their currently owned land as equity in financing the acquisition of additional land. This proposal would lessen the demand for land by established farmers and could improve the chances for access to land by the smaller operator.

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Economies of Size And Other Growth Incentives

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ESCS Agricultural Economist

INTRODUCTION

Economies of size is a technical expression economists use to describe declines in production costs as firm size increases. The current dialogue on the structure of agriculture has renewed interest in economies of size, both as a factor contributing to low-cost food supplies and also possibly as a factor contributing to rapid structural change in the farming sector. Larger farms are generally perceived to have lower production costs and to contribute to the efficient, low-cost production of food and fiber. That perception has been supported by the success of larger farms in a competitive agricultural industry, thereby making continued structural change inevitable, whether desirable or not. Some recent studies have suggested, however, that the role of economies of size in the expansion of farms may have been exaggerated. Most economies of size, these studies suggest, can be realized by a medium-sized farm (gross farm sales of $20,000 to $100,000). Above that threshold, farm expansion is due less to an attempt to reduce unit production costs or marginal production costs, than it is simply to increase the farm's income.

Nonetheless the role of economies of size in determining efficiency of production or structural change in farming is not well understood.[1]

This article examines some key issues concerning economies of size and other variations in production costs and their role in determining farm size and structural change.

Four interrelated issues stem from the concern about economies of size, production efficiency, and the competitive advantage of large farms over small farms:

- Are economies of size the source of any competitive advantages among farms or potential consumer cost savings that may exist?
- Does the competitive advantage available to some farms in the form of lower production costs contribute to structural change?
- Will significant efficiency gains and cost savings in overall food production result from continued growth and consolidation of farms?
- What are the implications of these questions for the design of economic and structural policies for the farming sector?

Both farmers and consumers have interest in these issues. Farm income and resource returns on farms of different sizes depend on taking advantage of size economies. For consumers, overall food costs are lowest when production takes place on efficient farms that use all available economies of size.

But economies of size may not be the real force behind the growth in average farm size and the efficiency of agricultural production. Some recent studies found large variations in production costs among farms, but suggested that differences in farm size were not responsible for this variation. Such findings suggest that factors other than economies of size are currently providing incentives for farms to grow. If so, the concept of economies of size may be of limited value for understanding structural change in agriculture and policymakers will need to focus on other factors to develop programs to minimize adverse structural impacts. Similarly, if economies of size are constant over some range of farm sizes, efficient food production may be possible under several alternative structures of the farm sector.

[1] Economists distinguish between technical efficiency and economic efficiency. Technical efficiency relates to the physical relationships between inputs and outputs. Economic efficiency reflects these physical relationships as well as the prices paid for inputs and the prices received for outputs. Technical economies of size are based on physical input-output relationships, whereas pecuniary economies of size result strictly from differences in prices paid and prices received. Increases in technical economies of size thus contribute to increased economic efficiency and improved allocation of resources in the economy, but pecuniary economies do not (unless they result from true cost savings or technical economies of size in other sectors).

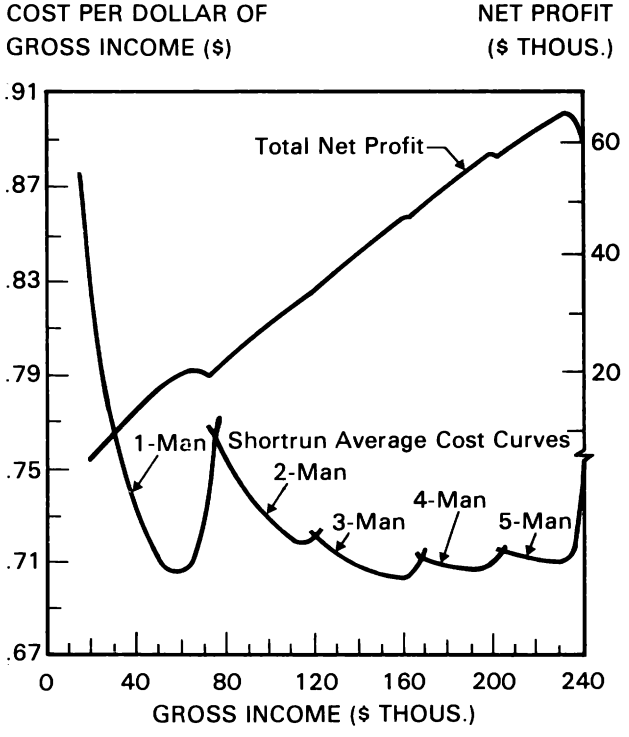
ECONOMIES OF SIZE AND DISTRIBUTION OF COSTS

Economies of size were investigated for numerous farms in the sixties. Many of these studies identified technically efficient, least-cost producing systems for specified states of technology. Figure 1, taken from a detailed summary of this work by Madden, typifies the findings (*8*).[2] Generally, production costs were found to decline considerably until the farm reached a size where one or two men were fully employed with modern equipment. Past this point there were only small, if any, gains in efficiency over a wide range of continually larger farm sizes. Little evidence of diseconomies was found on the largest farms.

[2]Italicized numbers in parentheses refer to items in References at the end of this article.

FIGURE 1

NET PROFIT CURVES COMPARED WITH AVERAGE COST CURVES



These average cost curves represent technical economies resulting from more complete utilization of machinery and labor inputs on medium-sized and large farms. Pecuniary economies—for example, discounts and premiums gained from buying and selling in large volumes, better access to markets, and efficiencies in the acquisition and use of information—were largely ignored. A study of these pecuniary economies on wheat farms found that operators of 12,000-acre farms received about 4.5 cents more per bushel through volume premiums than did operators of 1,500-acre farms (*6*). The large farms also had slightly lower production costs resulting from volume discounts on input purchases. However, because of the progressive nature of income taxes, these large wheat farms had aftertax rates of return that were similar to returns on the smaller farms. Other studies of pecuniary economies generally agreed with these findings, except for the impact of taxes. More detailed studies of taxes suggested that current Federal income tax laws appear to give the greatest benefits to larger, wealthier farmers (*11*, *19*). Conclusive evidence is not available, however, on whether the net effect of tax laws offsets pecuniary economies of the largest farms.

Many conclusions have been drawn from economies of size studies in agriculture. Tweeten has described how economies of size contribute to a chronic low-returns problem in agriculture (*17*, p. 180). Large, efficient farms bid up the price of land so that other farmers either incur losses if they pay the current land price or receive low rates of return on investment if they value owned land at the current market value. Other reports have described how economies of size can contribute to structural change (*2*,*7*,*16*,*18*). Recently, economies of size relationships have been used to estimate the impact of enforcing the 160-acre farm size limit on Bureau of Reclamation projects (*5*,*13*).

Many economies of size studies are outdated and reflect conditions of the sixties. While the general relationships have probably not changed,

continued developments in machinery technology and other innovations have changed input mixes and have likely shifted to the right the relationships shown in figure 1. This development has not been uniform, but has been more important in some producing areas than in others. Thus the minimum size at which a farm can be efficient—generally the separation point between small and medium-sized farms—may be increasing for some types of farms. The impact of this shift in the trend toward larger farming units has not been satisfactorily measured.

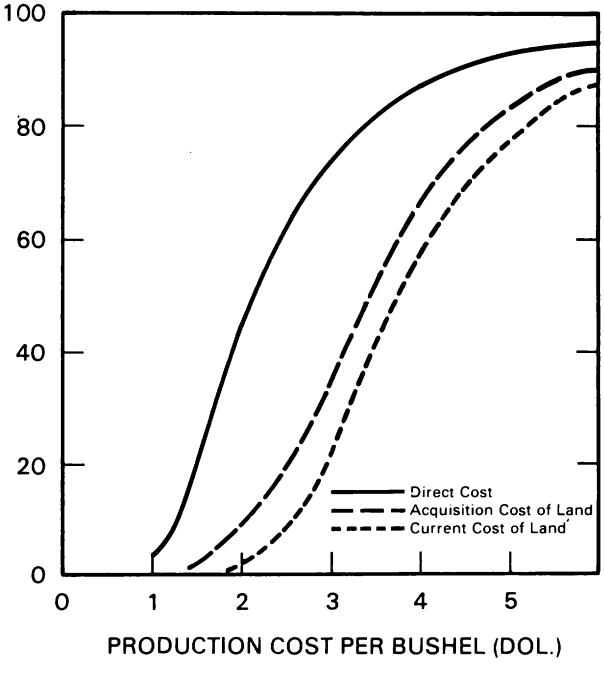
More recent information on production costs provides a different perspective on economies of size and cost variations on modern farms. Estimates of average production costs for major crops are prepared annually by the U.S. Department of Agriculture (*4*). The 1978 national average total direct costs of producing wheat, for example, were $2.45 per bushel, composed of variable costs of $1.37, machinery and overhead costs of $0.93, and management costs of $0.15 per bushel.[3] Prices above the $2.45 level provide a return to land. In 1978, a price of $3.75 per bushel would have provided a Federal Land Bank rate of return to land valued at the current market price on the average farm. A price of $3.16 per bushel would have provided this same rate of return to land valued at its acquisition price.

Some limited information is available showing how these costs vary among farms. The first cost of production summary by USDA contained charts showing the cumulative frequency distributions of costs for 1974 (*3*); these charts showed the cumulative percentages of total production produced at or below various per-bushel production costs.[4] In early 1978 these 1974 cost distributions were indexed to 1977 levels, arranged both by percentage of production and by percentage of farms (*14*). The updated cumulative cost distribution for wheat farms is shown in figure 2, which suggests that approximately 45 percent of 1977 wheat farms had direct costs of less than $2 per bushel.

Two recent articles suggested how this cost variation is related to farm size (*5,13*) for two different groups of farms in California. Very small farms were found to have high production costs. Both studies found a considerable variation of costs *within* farm size groups, and found that, beyond a minimum point, the size of farm, as measured in total sales, does not explain variation in costs of production. This last point agrees with data in figure 1. Seckler and Young

FIGURE 2

CUMULATION OF FARMS BY WHEAT COST LEVELS, 1977



[3]These per bushel costs were computed by dividing the published $73.12 total direct cost per acre by the trend yield of the recent period, 29.8 bushels per acre.

[4]While these 1974 frequency distributions are the only ones available, the original USDA study was inadequate from several standpoints: (a) differences in individual farm machinery costs were not considered, (b) different product prices compensated many producers in high-cost regions, and (c) the variation in per-bushel costs reflects the random weather influence on yield as well as technical and pecuniary factors.

observed that if the seven smallest, most inefficient farm observations were omitted, the remaining 27 observations would show a variation in costs totally unrelated to farm size (*13*, p. 583).

Combining these California findings with the USDA cumulative cost distributions provides a general picture of the relationship between farm size and costs for major groups of U.S. farms. If a random sample were taken of per bushel total direct costs for 50 U.S. wheat farms in 1978, it would be expected to yield data similar to those of figure 3. This figure is a synthesis of available information with the following characteristics: (1) The arithmetic average of the 50 individual costs equals the $2.45 national average cost of production; (2) the vertical distribution of costs has the same characteristics as the cumulative function shown in figure 2; (3) the relationship between size and cost in figure 3 is similar to that found in the California studies; and (4) the average annual sales of the 50 farms are approximately $63,000, close to the $62,100 reported in the 1974 Census of Agriculture for all farms over 140 acres in size. The smallest census acreages were omitted from this last comparison since such farms were omitted from the USDA cost of production survey (*3*, p. 4).

Figure 3 suggests that some earlier economies of size studies may have been too narrow in their focus, that they emphasized size as the primary factor affecting efficiency, and ignored other more important factors. There is a surprising variation in costs among farms—a variation that is, except for the smallest units, not related to size. In fact, there is much more variation *within* than *between* size groups. Martin has observed that such variation is due to differences in the technologies used, in the rate of adoption of technology, in management ability, and in resource productivity (*9*). Yield variations caused by annual weather factors also contribute to this variation, along with the productivity of fixed factors, the geographic distribution of prices, and price expectations that are imperfect (*15*). Such factors appear to be much more important than size in causing cost differences among commercial farms.

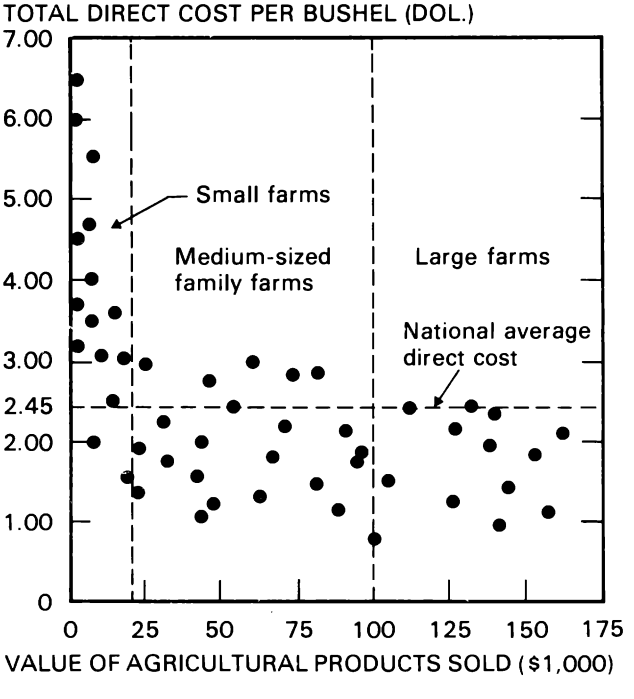
IMPLICATIONS FOR THE STRUCTURE OF FARMING

This perspective of economies of size and the distribution of farm costs has implications for farm competition and growth, the overall efficiency of food production, and structures policy for the farming sector.

The Distribution of Costs and Incentives to Growth

The relationship between size and production costs in figure 3 suggests that, in classifying farms for policy purposes, size has a limited value. Small farms clearly have higher costs than the commercial units. Size is a useful factor to separate these small farms from the rest and traditional economies of size relations may be

FIGURE 3
DISTRIBUTION OF TOTAL DIRECT COSTS OF PRODUCTION, WHEAT FARMS, 1978



responsible for their higher costs. Beyond this minimum point, however, different costs and production efficiencies do not appear to be related to size.

Figure 3 suggests that the medium-sized family farms are as efficient as the large farms. About 80 percent of these farms likely have costs *below* the national average cost of production, and the more efficient medium-sized family farms were likely earning substantial land returns with the wheat prices of the recent past. While the method used in constructing figure 3 prevents attributing too much accuracy to this 80-percent estimate, the figure has been carefully constructed from the best currently available data and research results. For wheat at least, medium-sized family farms are more efficient than the national average. From figure 3, the *most efficient* medium-sized farms appear to be earning a return to land of $1.25 per bushel with wheat prices in the neighborhood of $2.50 per bushel.[5] These findings dispel the common belief that these family farms are not as efficient as larger farms. There is little evidence here that economies of size work against the medium-sized family farm.

What explains the tendency of farms to grow in size far past the roughly $20,000 annual sales level, where economies of size become unimportant? The answer appears to be larger incomes rather than lower per unit costs and larger margins. The right vertical axis of figure 1 shows the net profit scale—profit has a rather constant upward slope as size increases. As these irrigated cotton farms increased output from $60,000 to $235,000, net profit increased from $15,000 to $67,000, even though average costs were constant over the entire range (*8*). A recent congressional report also observed that the relatively flat average cost curve provides farmers with a strong incentive to expand the size of their farms to increase total profits (*2*, p. 31). This incentive for larger incomes appears to be the major factor behind the trend toward larger farms within commercial agriculture. There is no evidence that economies of size is a significant force in this trend—it neither discourages nor encourages the trend.

This conclusion discounts the possible effect of changing technology on farm size. As discussed previously, changing machinery technology over time may be shifting the $20,000 sales level required for some types of farms to use the least-cost technology—the boundary line between small farms and medium-sized farms. An underlying issue concerns whether changing machinery technology has caused farms to grow or whether expanding farms have created a demand for larger machinery. The information reviewed here suggests that farm expansion has created a demand for larger machinery, more than larger machinery has caused farms to grow. Farms continue growing far past the point required to use the most efficient machinery.

The farm cost-size distribution in figure 3 illustrates two factors in the process of farm growth and structural change. Figure 3 indicates that medium-sized family farms are well represented among the efficient commercial farms that are growing. Approximately two-thirds of all farmland sales are for farm expansion, and efficient medium-sized family farms are parties to a significant number of these purchases (*11*). The factors causing variation in costs—and allowing low-cost farmers to generate the income required to purchase additional land—are a key element of this growth. The substantial variation in costs allows more efficient farms to bid land away from the less efficient, using income and equity from the original farm to finance the expansion. Economies of size is not a factor here; but variation of efficiency *within* the medium-sized family farm group may be a primary ingredient in this process.

Economies of size may encourage small farms to adjust or to grow. While the problem of small farms is the lack of a resource base to generate

[5] Since figure 3 shows total direct costs (all costs except land), the vertical distance between each farm's cost and the actual market price represents a return to land.

income, the high costs also may increase their incentive to grow, find nonfarm income sources, or sell to more efficient commercial farms. Thus, differences in costs allow efficient farms, irrespective of their size, to become larger; but economies of size may provide increased pressure for small farm operators to expand, to abandon production, or to become part-time operators. As resources and income with which to grow are limited, the latter two adjustments are those most frequently adopted.

Economies of Size and National Policy

Except for the policy questions on small farms, a review of economies of size and cost distribution data reveals little conflict between consumers' goals for low-cost food production and family farm or structural goals. For commercial agriculture, several alternative structures may be equally efficient—the policy choice between them must be made on grounds other than efficiency. The decision will have little bearing on longrun food costs. From the standpoint of food production efficiency, there is little evidence that a farming sector composed primarily of medium-sized family farms could not be as efficient as any other structure.[6]

Some components of a structures policy could be designed to modify existing economies of size to be more in favor of a particular farm size group. Such policies could attempt to increase the costs of larger farms or lessen some of the cost disadvantages of small farms. Or a structures policy may call for discontinuing current programs that increase economies of size.

The possible components of a structures policy are discussed in detail in other articles in this collection and need only be summarized here. The current commodity programs provide some possibilities. Target price provisions do not differentiate between family farms and corporate farms, size of farms, or the financial well-being of different farms. In the context of figure 3, these programs provide excess current income to the most efficient, regardless of size, and likely contribute to structural change by increasing the means for efficient farms to grow (*11*). The Federal assumption of risk through income support and disaster payment programs also has the tendency to encourage large-scale, single-purpose farms, financed by nonfarm investors using highly leveraged debt financing (*12*). Stringent limitations of Government commodity program payments to about $5,000 for any one recipient would be one way to avoid some of these impacts. Lowering target prices could also lessen their unfavorable impacts on structure.

Federal and State tax laws should also be reviewed for their impact on structure. By giving advantages to high-income farmland buyers, such laws have created incentives for farmers to shift their attention from efficiency and productivity to farm expansion, agglomeration, and appreciation of land value (*11*, *19*). A progressive tax on farm real estate, a shift to accrual accounting, a limit on the deductibility of interest on borrowed funds, repeal of the investment tax credit, and tough inheritance tax laws would all have the opposite effect. These proposals, along with strict commodity program payment limits, are opposed by family farmers and larger farmers alike—whose opposition appears to be exactly counter to the prevailing political mood in agriculture (*10*).

STATUS OF KNOWLEDGE

The actual distribution and variation of costs among farms are largely unknown. Some priority must be given to the empirical estimation of figure 3. If some family farms are truly among the most efficient of all farms, this group would certainly be a prime candidate for protection under the "selective surgery" of a structures policy. The problem then is to define this group to focus specific policies on its needs, and avoid providing more assistance to other competing groups.

[6]The exceptions are in poultry, cattle feeding, and some specialty crops such as lettuce.

Figure 3 suggests that farm size may have a limited value in stratifying farms for policy purposes, except to separate small farms from the commercial sector. Differences in costs *within* the medium-sized family farm category may, however, be a primary factor allowing efficient farms to get larger. Equity may also be a more important factor than economies of size in both structural change and in the differential effect of policy (*1*). Research on structure should thus give due consideration to factors other than size in stratifying farms for purposes of developing a structures policy.

Traditional economies of size studies should be updated, even if just to keep track of the minimum size required for a farm to be a commercial unit. Modern technologies may have substantially altered the economies of size that existed when some of the currently available studies were made. Double-digit inflation and ever-increasing energy prices may also be affecting economies of size in ways that are difficult to anticipate. The effect of Federal income tax laws should also be an integral part of all this research.

The inflated land values that result from commodity program payments increase the investment required to farm and worsen the chronic difficulties of new entrants. Federal risk assumption programs may encourage large-scale, single-purpose farms and the use of highly leveraged financing by both farmers and nonfarm investors in farmland. Income tax policies shift attention from efficiency and productivity to expansion, agglomeration, and capital gains from land value appreciation. Such policies have increased the profitability of landownership and tended to separate the ownership and operating aspects of farming which, when influenced by succession laws, may encourage a new "landed aristocracy."

The search for larger incomes provides much of the incentive of farms to grow; that incentive is augmented by the total impact of those Government programs. Economies of size, however, is a largely neutral factor in farm expansion.

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Entry and Exit: Barriers and Incentives

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INTRODUCTION

This article addresses issues related to entry into and exit from farming:

- What is the current rate of entry and exit and entries or exits concentrated in specific size groups?
- Is a "landed aristocracy" being created through unintended barriers to entry of new farm owners and operators?
- What rates of entry are necessary to assure the continuation of a "family farm" structure of agriculture?
- What barriers to entry do young potential farmers face?
- What policies can influence the rates of entry into farming?

The number of entrants into farming and the number of farms have declined for nearly 50 years. High capital requirements for farming, along with generally strong demand for labor in the nonfarm economy, have reduced the number of entrants, and potential farmers as well as established farmers have gone into other occupations. Today, there is concern that there will be a limited supply of new entrants, and even if additional farmers can effectively be employed, the capital and other barriers to entry may be too great. Thus, farming would continue to become more concentrated in the hands of fewer, older farmers. In contrast with previous decades where underemployment and low earnings in farming were major issues, more attention is being paid to promoting new entrants.

HISTORICAL CHANGES

Farm numbers declined to 2.7 million in 1978 from the peak of 6.8 million in 1935, during which period the average farm size increased 2.6 times to 401 acres. These farm adjustments were encouraged and enabled by the continuous stream of new technologies available to the farm sector. During the 1935-78 decline in farm numbers, fewer entrants replaced the exiting farm operators. The declining farm numbers, increasing average farm size, and rising average age of farm operators reflect a massive adjustment in agriculture. The future structure of agriculture may depend on the current demographic forces at work in the farm production sector.

Entry and Exit

Between 1964 and 1974, just over half the older persons leaving farming were replaced by young farmers. Of farm operators who were 55 years of age or older in 1964, 930,000 (64 percent) had left farming by the time of the 1974 Census of Agriculture. During this period, 475,000 younger farm operators (under 35 years of age in 1964) had entered.

The replacement rate for operators was lower on smaller farms, with only one new entry for every three departures on farms with gross sales of less than $40,000. But because there were so many more small farms, 70 percent of the total entries of young people in this period occurred on farms with sales of less than $40,000. Many of these entrants were part-time farmers whose income came primarily from nonfarm sources; however, the extent of entry through part-time farming is not fully known.

Replacement rates on farms selling more than $40,000 was high. Entry rates of young people exceeded the exit rates of older operators. This happened because some entrants combined two or more small farms and entered the larger size classes. Also, some of the smaller farms of entrants in the previous decade were enlarged into these classes. The exact extent of consolidation and expansion is unclear because these entry and adjustment rates are also influenced by inflation.

Current Demographics

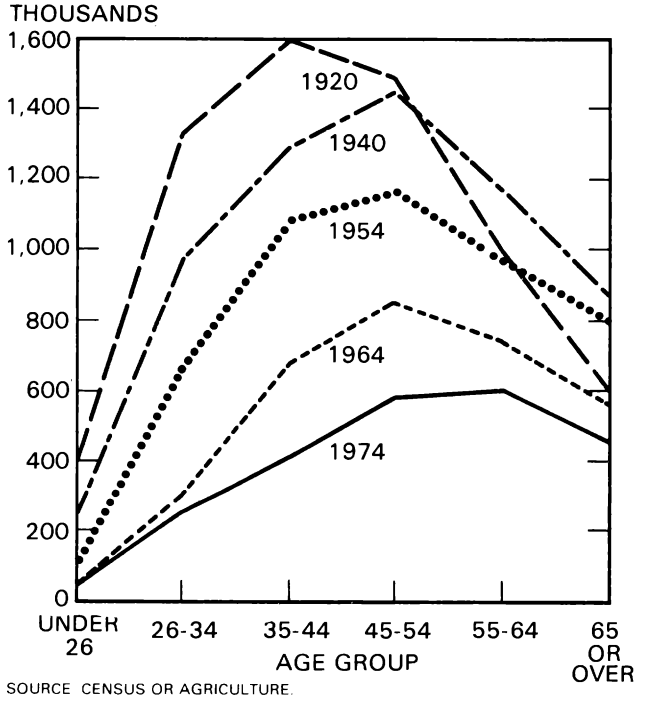
The average age of farm operators steadily increased from 48.7 years in 1945 to 51.7 years

in 1974. The change was significant for this 30-year period; such a change would normally occur slowly because many people spend over 50 years in the same occupation. The age distribution has shifted toward older operators as farm numbers have declined (see figure). The age distribution is shifting both because fewer young persons are entering to replace the older operators leaving farms, and also because many of the older operators are continuing to farm past usual retirement age and are then not succeeded by a younger person. The number of farm operators under 35 years of age declined from 711,000 in 1954 to 292,000 in 1974.

BARRIERS AND INCENTIVES TO EXIT

Farm operators' exits can occur through death, retirement, the taking of an off-farm job, or abandonment of production. Some factors that affect exits by farm operators are:

FARM OPERATOR AGE DISTRIBUTION, 1920-74



SOURCE CENSUS OR AGRICULTURE.

- Availability and potential earnings of nonfarm opportunities.
- Education, retraining needs, and expected working life of exiting farmers.
- Quality of resources and equity and value of assets held by exiting farmers.
- Potential buyers or heirs for these assets.
- Succession laws and taxation laws.
- Age at retirement or death of the farm operator.
- Goals, values, and aspirations of farmers.

Exits from farming are important not only because of their impact on the age and size distributions but also because they create the opportunity for new entrants.

From the thirties to the early seventies, young people seeking employment other than farming formed much of the emigration from the farming sector and rural areas. After weighing their expectations, talents, preferences, and farming opportunities against the relatively low returns in agriculture they chose not to enter farming. Young people, being more adaptable and mobile, accounted for a large proportion of the exits from farming, but more than half of the exits from farming were due to the death or retirement of the farm operator. Most farmers exiting before normal retirement age were operators on smaller farms who had been unable to achieve an income comparable to that from nonfarm alternatives.

Barriers to exit include a lack of skills to change occupations, the social adjustment costs, unavailability of employment opportunities without relocation, and the uncertainty of continued employment. Age interacts with skills and ability to adjust to a new occupation—which often includes a new living environment. Also, the number of remaining years to be employed in the new occupations determines if the expected income gain is sufficient to overcome the costs of adjustment. Lack of information about employment and the distance to areas with employment alternatives may also impede departures from farming.

BARRIERS TO ENTRY

Barriers to entry into farming are an important determinant of the future structure of agriculture. The most important potential barrier is the availability of land for new entrants. The supply of land and fixed assets available for purchase or rental by new entrants is largely determined by the rate of exits.

Five additional barriers to entry are due largely to the current economic and public policy setting:

- High capital requirements for specialized machinery and equipment.
- The large size required for new units to be viable farms.
- Rapid inflation of land values through capitalization of expected future land appreciation.
- Potential operating losses for beginning farmers.
- Intense competition by nonfarm investors for available farmland.

The substitution of capital for labor and the heavy reliance of today's farmers on purchased inputs (57 percent of the gross value of output in 1977) mean that an entering farmer must cover both his family's living expenses and debt service from the remaining 43 percent.[1] If an owner-operator has no debts and needs only $10,000 for family living expenses, the minimum viable size of farm must have gross sales of approximately $25,000. If the operator has significant debts, the required gross sales of the farm would expand rapidly; for example, if he required an additional $10,000 for debt service he would need gross sales of $50,000. The value of assets on farms with gross sales of $20,000 to $40,000 in 1977 averaged $276,000; their average equity was $229,000. Farms of this size appear to be the minimum viable size for entry unless there are large off-farm income sources available to the new farm family.

High capital requirements for specialized machinery are another manifestation of the substitution of capital for labor. Machinery complements for crop and crop-livestock farms with $40,000 to $60,000 of gross sales in 1976 had current or replacement values as high as $115,000. New farmers can reduce the capital barrier somewhat by purchasing used machinery, using custom services, or using outmoded technology and correspondingly higher inputs of family labor, but by doing so, their current costs of production will probably be higher than otherwise.

Rapid escalation of land values may occur through the combination of general inflation in the economy and recent rapid increases in land prices, which lead to expectations of continued future increases. Land prices are influenced by the capitalized value of expected future returns to landownership. If these expected returns include an expectation of future land price inflation that is not justified by expected returns from operating the land, a very strong barrier to new farmers is raised.

Operating losses in the initial years of operation by beginning farmers can result with the normal capitalization of land values. If the prices of the farm's products are expected to rise at a given rate and costs are expected to decline or increase at a slower rate, the discounted earning capacity of a farm (its capitalized value) will exceed its current earning capacity; this leads to real operating losses in the initial years.

The last barrier to entry is that nonfarm investors compete for farmland to convert the land to urban or extractive uses or to use the land as a hedge against inflation or to reduce their taxes.[2]

The agricultural ladder, where potential farmers gained experience and limited capital by working as hired men, became tenants, and then purchased their own farms, may no longer be feasible. Whether the ladder was ever a common method of entry is somewhat suspect because 82 percent of farmers are the sons of farmers. Thus, they likely had family assistance or an inher-

[1] In the long run, he must also replace his capital equipment from the residual after paying for annual purchased inputs, but these expenses can be deferred for the first few years.

[2] See the article by Boxley and Walker in this collection, "The Impact of Rising Land Values on Agricultural Structure."

tance to aid in entering farming.[3] With current rates of inflation, it would be nearly impossible for a full tenant to purchase the farm he is renting as its value would likely increase faster than his ability to accumulate capital for a down payment. Appreciation in value of farm assets has exceeded net farm income every year since 1971, and was four times as great in 1976. This, and the barriers to entry cited above, indicate that a modern agricultural ladder would likely require some combination of:

- Inheritance of a farm or large amounts of off-farm capital.
- Significant off-farm earnings for at least one family member.
- Partnership with an older farmer for several years prior to transfer of ownership.
- Purchasing ownership in a corporate farm or an incorporated family farm.

EXPECTED ENTRY, EXIT, AND STRUCTURAL ADJUSTMENT

Trends in entry, farm numbers and sizes, and technological change all indicate that there will be fewer viable farms in the future and a continued decline in the number of new entrants needed.

The large number of older farm operators who will be giving up farming would appear to provide many entry opportunities, but further examination of the data indicates that that is not the case. Nearly 1 million of the 2.3 million operators who reported their age in the 1974 Census of Agriculture were 55 years old or older. Only 16 percent of these older operators, however, were on farms with sales of $40,000 or more in 1974. So full-time farming opportunities on farms made available by retirements are likely to be very few.

The entries for hobby, part-time, and other small farms may decline, but the number of middle-sized farms ($20,000 to $40,000 of gross sales) will decline more rapidly and will have the lowest entry or replacement rate. This is because most of these farms are too large for part-time farms and too small for full-time farms. These farms become sources of expansion for existing farmers. Probably some young people will attempt to operate these medium-sized farms, but to be successful they will have to expand the farms or operate them only part time.

The trends indicate that the total number of new farmers will continue to decline and by the turn of the century will be about 60 percent of the 1964-74 level. The replacement rate of young for older operators, if the trends continue, will decline from 50 percent (one entry for every two exits) to 40 percent. But the proportion of entrants on farms with sales up to $40,000 will increase to about half of total entrants (from a fifth for 1964-74). The formation of larger viable farms will require high levels of equity or risk capital. Therefore, the farming opportunities will be limited to a few entries on larger farms, with the young people more often beginning on established farms as partners or shareholders with other family members in an incorporated farm.

PUBLIC POLICIES TO INFLUENCE ENTRY AND EXIT

Policies to influence entry or exit from farming should recognize that there are two groups of potential entrants—those who can succeed their parents on an existing farm and those who wish to enter farming without benefit of inheritance. The interests of these two groups are almost diametrically opposed. Entry by heirs of existing farmers would be facilitated by easing succession and estate tax laws, but this would likely contribute to further farm consolidation and growth as large farms are transferred within families. Entry by young people who are not heirs to existing farms would be eased by controlling inflation in land values, and by tightening the succession laws to force more farms to be sold at the death of the owner. The most effective policies or policy reforms that can affect entry and exit thus appear to be the indirect policies of:

[3] See the article "Demographic Aspects of Structure of Agriculture" by C. L. Beale in this collection.

- Controlling general inflation in the economy.
- Modifying succession laws and succession taxes.

Conflicts can arise between current income and asset valuations for both potential entrants and potential exits.[4] General policies that increase asset values hinder potential entrants and help present farmers; policies that decrease asset values have the opposite effect.

A variety of direct entry and exit programs could influence the rate at which the structure of agriculture changes. Depending upon the policy, the rates of entry and exit could be increased or decreased. How effective or efficient such programs would be is unclear since there has been little experience with them.

Encouraging Exits

The rate of structural change in agriculture could be changed by encouraging earlier exits of older operators and marginal small farmers. Older operators on small farms could be offered early retirement incentives, with their land going into a land pool to be used to establish farms of adequate size for young entrants.

Marginal operators could be retrained with subsistence payments and transfer cost subsidies to shift them to nonfarm employment. This program would also make production resources available for farm enlargement or for young entries, whichever was desired. However, if there is a current goal of reducing the growth and consolidation of farms, such a goal would tend to preclude direct programs to encourage exits as inconsistent.

Increasing Entries

Most present programs to encourage entry help the new farmer to overcome capital shortages. Probably, the most important existing programs to assist entry are those of the Farmers Home Administration (FmHA). The FmHA, through a program of direct loans and loan guarantees, has helped overcome the financial barrier for those unable to obtain credit. With a focus on younger operations, the average age of persons assisted by the FmHA has been declining recently—about 36 years in 1976. Sixty percent of farm ownership loans were made to persons under 35 years of age in 1976.

Minnesota and Saskatchewan, Canada, have plans that make land available; similar policies have been proposed in other States and by members of Congress. The plans have been funded at such low levels, however, that they have not had a significant impact.

[4] See the article "Tenure and Equity Influences on Farm Incomes" by Bruce Hottel in this collection.

Technological Change And Structure

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INTRODUCTION

Probably the most important factor contributing to structural change in U.S. agriculture since 1940 has been technology which provided the technical means for structural changes. Technological change increased the farm resource base available for food production and caused fundamental shifts in energy use, such as the shifts from human power to horse power during the Civil War, and from horse power to mechanical power during World War I. The direct consequence was an increase in productivity of resources.

Since technology made it possible for structural changes to occur, one may raise several questions relating to future changes in U.S. agricultural structure. Do emerging and newly adopted technologies alter the economies of size and hence the incentives for farm growth? What sizes of units can make effective use of emerging technologies? Are there alternatives that allow smaller farms to be viable?

To answer these questions, we need to know what technology is, how it links to different characteristics of structure, and what new technologies are emerging in the future. The purposes of this article are to examine the linkages between some selected characteristics of structure and technology, to identify some emerging technologies, and to study how emerging technologies might affect future structural changes.

TECHNOLOGY AND TECHNOLOGICAL CHANGE

Technology involves transformation of the material environment into a flow of goods and services to satisfy human wants (*13*).[1] Technological change enables farmers to produce more output with the same quantity of inputs or the same output from a smaller quantity of inputs. When technological change leads to savings of all inputs used in production in the same proportions, such change is called neutral technological change. If technological change results in greater savings (or using) of one factor than the others, such change is called biased technological change, which can be input-saving or input-using.

Binswanger concluded that between 1912 and 1964, the strongest bias of technological change in U.S. agriculture was a fertilizer-using bias, followed by a machine-using bias, and a strong labor-saving bias after 1948 (*1*). However, fertilizer-using and machine-using technologies were made possible by the development of new crop varieties and hybrid seeds.

Technology can also be classified as mechanical technology or biological-chemical technology. Mechanical technology, like tractors and their associated implements, enables a farm operator to cultivate a larger area of land. Typically such technology replaces or supplements human power. Mechanical technology is both labor-saving and capital-using. Historically, this was the most important technology, making larger farm sizes possible.

Biological-chemical technology, such as new varieties of crops, new breeds of livestock, fertilizer, herbicides, and pesticides, boosts output per worker through increases in land productivity. This technology is capital-using. Theoretically it benefits both large and small farms, but adoption lags by small farms usually allow benefits to accrue more to large farms.

TECHNOLOGY AND SOME CHARACTERISTICS OF STRUCTURE

Technological change is one of the major factors that made increased farm size possible. In studying the causes of increased size, Gardner and Pope related technology and farm size from 1910 to 1975 (*3*). The U.S. Department of Agriculture's productivity index, the ratio of output to all inputs, was used as a proxy for technological change and the average acreage per farm

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

was used as a measure of farm size. As shown in table 1, productivity more than doubled during the period, from 53 index points in 1910 to 113 in 1975, with the largest percentage increase coming in the fifties. The percentage changes in productivity generally followed the percentage changes in farm size. Gardner and Pope assumed that technological change was the mechanism that induced both productivity increase and expansion of farm size.

By comparing productivity change and changes in farm size, Gardner and Pope implicitly assumed that technological change was neutral. In fact, the major technological change which caused increased farm size was technological change biased toward machinery. Production assets per worker rose from $3,300 in 1940 to $97,601 in 1975, and productive assets per farm rose from $6,200 to $163,805 during the same period. In contrast, labor input declined drastically. Man-hours in agricultural production fell from 20.5 billion hours in 1940 to 5.3 billion in 1975, with a concomitant rise in labor productivity. At the same time, units of machinery were decreasing, but their values and sizes were increasing. The trend toward increased capital/labor ratios and larger sizes of machinery is apparently linked to increased size through declining average production costs (*12*).[2]

[2]The rapid substitution of capital for labor also resulted in rapidly increasing dependence on energy and petroleum-based chemicals.

Table 1—Productivity and farm size

Year	Productivity Index (1967 = 100)	Change	Average farm size	Change
	Index	*Percent*	*Acres*	*Percent*
1910	53	NA	138	NA
1920	54	1.8	147	6.2
1930	53	–1.8	151	2.7
1940	62	17.0	167	10.6
1950	73	14.5	213	27.5
1960	92	26.0	297	39.4
1970	101	20.7	373	25.6
1975	113	11.9	387	3.8

NA = Not applicable.

Interpretation of changes in the productivity index must be made with care. Some functions formerly performed by farms are now supplied by input or marketing firms. Today, farms typically use custom fertilizer-spreading services, product assembly and hauling services, and, occasionally, custom harvesting services. Formerly performed by the farm itself or by another farm or group of farms, these services are now supplied by nonfarm firms. The productivity index does not take account of these changes.

Income Distribution

In general, technological change benefits society as a whole, but the economic gains from new technology are not shared equally by all members. How the economic gains are partitioned between farmers and consumers, between rich and poor, between large and small farmers, and between farmers and landowners depends upon the elasticity of demand and supply curves and on the rates at which these curves are shifting over time. In a market with a highly elastic demand, producers can reap a relatively large share of the gains from technological change; in a market with inelastic demand, most of the gains from technological change will be passed on to consumers through lower product prices. Since demand elasticities for agricultural commodities are low, about 0.2 in the aggregate, consumers benefit the most from technological change.

Recently, Lu, Quance, and Liu estimated the economic benefits of technological change using a simulation model (*7*). They compared two scenarios: (1) the baseline scenario where research and extension expenditures were assumed to grow at 3 percent per year, and (2) the high-technology scenario where research and extension expenditures were assumed to grow at 7 percent per year to accelerate research and development of new technologies and to increase extension activities for disseminating the new technologies.

With inelastic demand for food and fiber and higher output from new technologies, they found, for the United States, that prices received

by farmers declined, consumers' surplus increased, and producers' surplus declined. In the year 2000, for example, moving from the baseline scenario to the high-technology scenario, consumers' surplus would increase by $27.9 billion in 1974 constant dollars, but producers' surplus would decrease by $11.1 billion. Thus, social benefits (measured as the sum of consumer and producer surpluses) would increase by $16.8 billion. However, to achieve higher productivity growth under the high-technology scenario, the public research and extension expenditures would be $3.1 billion greater in the year 2000 than for the baseline. Thus, for the year 2000, the total direct socioeconomic benefits, net of program costs, of selecting the high-technology option over the baseline would be $13.7 billion ($16.8 billion minus $3.1 billion).

The same conclusions were also derived for other countries. For example, technological change in the Colombian rice industry would benefit consumers, but would lower producers' benefits.

The transfer of the benefits of technological change in food production generally benefits poor people more than rich people because poor people spend a larger proportion of their budgets on food than do the rich. This progressive impact is most significant for staple foods that form the major portion of the diets of the poorest group.

This hypothesis is supported by Scobie and Posada's findings in Colombia (*14*). The annual average net benefits derived from adoption of new rice varieties in 1970 was $385 to consumers with incomes of $6,000 or less, in Colombian dollars. This benefit declined steadily as the income level progressed. For consumers with incomes between $60,000 and $70,000, the annual net benefits declined to $218. The net benefits as a percentage of income showed more drastic changes: 21.8 percent for an income of $6,000 and less, and 0.2 percent for an income of $60,000 to $72,000.

The income foregone by farmers is also distributed unevenly among producers. In the Colombian study, the group most severely affected was the small (low-income) upland farmers. Annual average income foregone from lower prices represented a high proportion of their 1970 income.

Although farmers in general do not benefit from technological change, the larger, progressive ones can benefit from a new technology through early adoption. Adoption lags, which systematically favor the larger farms, occur because it is more profitable for large farms than for small farms to invest in acquiring information. Also, extension agents and salesmen derive higher payoffs from convincing larger farms rather than small farms to adopt innovations.

In a study of adoption of new wheat and maize varieties in developing countries, Perrin and Winkelmann noted that new seed varieties and fertilizer, which should help large and small farms, favored larger farms because the small farms lagged behind in the early stage of adoption (*11*). Because of inelastic demand for food and fiber, the first farmer to adopt a new technology realizes the gains from it.

Land Price

Technological change in conjunction with supported farm prices has contributed to rises in farmland prices. Herdt and Cochrane indicated that the expectation of rising income from technological change coupled with supported farm prices provides an incentive to expand farm size (*4*). As many farmers compete to acquire more land to capture the expected gains from new technology and supported prices, farmland prices rise and expected gains from technological change vanish. They concluded that as long as farm prices are supported and technological change occurs, this process will push up farmland prices. Only the retiring farmers or landowners who sell land at the inflated prices reap the benefit of technological change.

Two points are neglected in the Herdt/Cochrane analysis. First, both mechanical and biological-chemical technological change provide incentives for farmers to expand the farm size. They lower the average costs of production and give farmers higher expected income when com-

bined with farm price support. However, usually only mechanical technology makes possible larger operations. Without continued mechanical technological change, it would be difficult to increase the size of farms although farmers would have the incentive to do so. Second, as farmland prices rise, the relative price of land to other inputs (such as labor and machinery) also rises. Such changes in relative prices will induce land-saving technological changes, which will reduce the demand for land and thus tend to dampen increases in land price.

Specialization

Traditionally, American farmers diversified to reduce risk. Technological change in agricultural production made specialization in a few production activities possible without a substantially increased risk. Technological change also eliminated the need for crop rotations and crop-livestock combinations. Some technologies encouraged specialization in large farms while others provided the means for specialization on farms of all sizes.

To conserve fertility, prevent erosion, reduce insect infestation, and control weeds and disease, farms traditionally used crop rotation systems. Most of those functions have now been replaced by biological-chemical technologies such as chemical fertilizer, insecticides, herbicides, and new disease-resistant varieties of crops. These biological and chemical technologies encourage specialization in farms of all sizes. Another biological-chemical technology that encouraged specialization was disease control. Farmers formerly used diversification to reduce disease risk. Disease-control technology made specialization in broiler and egg production possible; antibiotics made confinement hog production possible. Without such technology, the increased risk of disease might make large, specialized operations less advantageous.

Because technological change alters the form of the production function and thus changes the marginal rate of substitution of one product for another, technology can also cause specialization through optimal allocation of resources. To maximize profit, a farm should allocate a fixed bundle of resources among competing production activities or enterprises so that the marginal rates of substitution are equal to the inverse of the product price ratios for all pairs of products. In other words, the fixed bundle of resources should be allocated among all products so that the values of marginal products are all equal. When a new technology is adopted in production, the values of the marginal products using the technology will increase. Thus, it becomes more profitable to allocate more resources to the production activity or enterprise using the new technology. For example, adoption of hybrid corn which increases corn yield but not other crop yields would be expected to increase specialization in corn production.

Mechanical technology, which is usually labor-saving, is embodied in the form of capital equipment. Such technology encourages specialization in large farms for two reasons. First, the capital equipment is often useful primarily for single-enterprise farms but not for others (*16*). A controlled-environment hog house with automatic feeders and waterers will increase labor productivity in hog production but will have no impact on labor productivity in crops or beef production. A four-row cotton picker will increase labor productivity in cotton production but will have no effect on other enterprises.

To adopt these technologies, a farm must increase its capital investment and change the substitution relationships among enterprises, which will result in specialization as the farm grows. Second, certain kinds of capital inputs, especially the durable capital inputs such as grain combines and tractors, are large investments generally available only in certain sizes. With limited investment capital, a farmer, when enlarging the size of his farm, will probably expand inputs in only one enterprise.

Barriers to Entry

Adoption of new technologies increases capital requirements. As technological change requires increased farm size and higher capital and land investments, it makes entry into farming

more difficult. Hottel and Barry estimated that at 1976 asset values, capital requirements for farms with $40,000 to $60,000 gross farm sales ranged from $285,000 for fruit and nut farms to $573,000 for livestock ranches. The corresponding nonreal estate capital requirements were $90,000 and $114,000.

Changes in skill requirements of new technologies also can affect entry into farming. However, several case studies in other industries indicated no sharp or consistent increase in skill requirements as a consequence of switching to newer techniques. Whereas new techniques often require highly skilled labor at first, they generally use less skilled—and less expensive—labor after they are adopted (*9*).

FUTURE TECHNOLOGIES AND FARM GROWTH

Future American agricultural structure will depend in part on what types of technologies will emerge. According to a survey conducted in 1974 in cooperation with Resources for the Future and the Ford Foundation, the following 12 technologies were identified as having significant impact potential for agricultural production (*8*). Most of these technologies were also identified by the National Academy of Sciences study as being on the scientific frontiers.

1. *Enhancement of photosynthetic efficiency:* includes (a) improvements in the process by which living plants form carbohydrates through genetic selection, physical modification, and chemical modification; (b) enhancement of the biological capacity of living plants to absorb nitrogen for protein synthesis; and (c) enhancement of the growth rates of agronomic plants through elevation of atmospheric levels of carbon dioxide.

2. *Water and fertilizer management:* increased efficiency of input utilization through combined water and fertilizer management systems such as developed for potatoes in Washington; also includes expanded trickle or drip irrigation, new subirrigation techniques, and foliar application of fertilizer.

3. *Crop pest control strategies:* adoption of total pest management systems that incorporate resistant varieties, sex attractants, juvenile hormone analogs, and other biological controls that reduce energy inputs, environmental hazards, and pest control costs.

4. *Controlled environment or greenhouse agriculture:* use of plastic or glass covers over plants with or without the addition of heat and carbon dioxide—a practice likely to continue to be restricted to high-value and specialty crops.

5. *Multiple and intensive cropping:* double-cropping and intensive cropping to increase annual yields per acre.

6. *Reduced tillage:* expanded use of minimum or reduced-tillage techniques, a process minimizing the number of times a farmer must cultivate a given field.

7. *Bioregulators:* natural and synthetic compounds that regulate the ripening and senescence of horticultural products. Applied at the preharvest stage, they can enhance ripening and facilitate mechanical harvesting. Applied after harvest, they can slow down life processes, which prolongs shelf life of some fruits and vegetables and reduces cooling costs.

8. *New crops:* the development of new and improved hybrids and the search for alternate food crops.

9. *Bioprocessing:* an extension of traditional agricultural production so that unpalatable raw products, such as cellulose and petroleum materials, can be converted into edible protein, carbohydrates, and fats to provide additional feed sources for animals.

10. *Antitranspirants:* inhibition of plants' tendency to lose water through evaporation.

11. *Development of plants to withstand drought and salinity:* genetic development of plants that are more drought resistant or that thrive on saline water.

12. *Twinning:* multiple births in beef cattle through (a) breeding and selection of livestock for twinning genetic traits, (b) multiple ovulation through hormonal control, and (c) embryo transfer.

Most of the above emerging technologies are biological-chemical technologies, which can po-

tentially benefit farms of all sizes. Unlike earlier technologies, which were mostly mechanical, these emerging technologies do not appear to favor larger farms as much as mechanical technology has. Theoretically, these emerging technologies should not give advantages to larger farms.

However, some mechanical technologies such as four-wheel drive tractors, which encourage large farm size, are in an early stage of adoption. Further adoption of this mechanical technology, especially when combined with biological and chemical technologies, can provide strong incentives for continued expansion of farm size.

Technology is one of many factors that affect structural change. Future technologies do not strongly encourage large farms, but do not limit continued farm growth either. Factors other than technology are likely to dominate future farm growth and structural change.

Stanton identified the following incentives for increased farm size (*15*):

- The expectation of greater net income from more volume, unless unit costs rise very rapidly.
- The expectation of high return from real estate investment. Many farmers have profited much more from appreciation in the value of their real estate than they have from crop and livestock production on their farms.
- The feeling of power and success associated with larger farms. Status in the community, power that comes with the control of more resources, the relatively easy access to capital for investments, and an economic system that strongly encourages growth of business and new investment all contribute to the drive to get larger.

He concluded that if this picture is correct, the divisions between commercial farm businesses and the large number of part-time farms is likely to continue and to grow more pronounced. Commercial farms with sales of $40,000 and up will continue to expand operations, and the total number of farms will continue to decline slowly.

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Form of Business Organization

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INTRODUCTION

Farms in the United States have traditionally been operated as sole proprietorships and to a lesser extent as partnerships, usually among members of the same family. These forms of organization have become synonymous with the concept of a family farm. The corporate form of organization, a topical issue today, although not unheard of in the past, has been rare in American agriculture.

The growth of corporations in the farm sector is due to several factors. Some of the more important advantages of corporations over other forms of organization for operating a farm business are outlined below in this article. The increase in the number of farming corporations reflects a growing awareness by farmers of the advantages of operating their farm businesses as corporations rather than as proprietorships or partnerships.

The increasing number of farming corporations is not a threat to the traditional family farm system of agriculture. The vast majority of farming corporations *are* family farms that have chosen to incorporate for various business reasons just as any small business, nonfarm as well as farm, may choose to do.

The growth of corporate farms does, however, have implications for future structural change in U.S. agriculture. This is primarily because the corporate income tax provisions enable corporations to increase equity capital through retained earnings at a faster rate than sole proprietorships and partnerships. Consequently, corporate farms have a competitive edge over farms operating under other forms of organization with respect to their ability to expand and to increase their size of operation. As the number of farming corporations continues to increase, the result could well be an acceleration of the trend toward larger farms. This does not necessarily imply that farm incorporation in and of itself results in larger farm size. Farm size is determined primarily by a number of technological, economic, and social factors that are independent of the form of business organization. Corporate farms, however, because of their tax treatment, are in a stronger position than other farms to make the investments necessary to adopt new, size-increasing technology.

The growth of corporate farms also raises the potential for a growth in off-farm investment by the farm sector, as farm corporations may find it profitable to expand vertically into other stages of the food and fiber system, or into investments outside the food and fiber system. Thus, the growth of corporate farming may link more closely the farm and nonfarm sectors of the economy.

THE CURRENT SITUATION

Sole proprietorships, partnerships, and corporations are the principal forms in which farm businesses are organized. The sole proprietorship is the most common organizational form, although the corporation is the fastest growing. Nearly 90 percent of all farms in 1974 were sole proprietorships, fewer than 9 percent were partnerships, and fewer than 2 percent were corporations. The growth in corporations is evidenced by the increase in numbers between 1969 and 1974. In this 5-year period, the number of corporations increased one-third; the number of sole proprietorships increased 2.5 percent; and the number of partnerships decreased one-third (table 1).

Three-quarters of the land in farms in 1974 was held by sole proprietorships. Partnerships held 14 percent, and corporations held one-tenth. The amount of farmland held by corporations increased nearly one-fifth between 1969 and 1974. The amount of land held by sole proprietorships increased 2 percent, while the holdings of partnerships decreased nearly one-fourth. The value of farmland was also concentrated in sole proprietorships, who held over three-fourths of the total; 13 percent was held by partnerships and 8 percent by corporations. The shares of total farm real estate value held by sole pro-

prietorships and corporations increased between 1969 and 1974, while that of partnerships decreased (tables 2 and 3).

Sole proprietorships accounted for about two-thirds of the value of product sales from farms with sales of $2,500 and over in 1974 (table 4). Corporations accounted for 18 percent of 1974 farm product sales and partnerships for 14 percent. Between 1969 and 1974, the share of product sales accounted for by sole proprietorships remained constant. Corporations increased their share of farm product sales at the expense of partnerships.

Many people equate the growth in farming corporations with a growth in nonfarm ownership and control of farm resources. The available data on farming corporations, however, do not support this allegation. The 1974 Census of Agriculture survey of farm corporations showed that privately held corporations whose primary business was farming accounted for 87 percent of corporate farms, 85 percent of the land operated by corporate farms, and three-quarters of the corporate farm product sales. The 1974 data did not indicate that large nonfarm corporations had made major inroads into farm ownership and operations. All publicly held corporations accounted for 3.4 percent of corporate farms and 18.7 percent of corporate farm sales. This was about 0.5 percent of all farms with sales of $2,500 or more and about 3.5 percent of total farm product sales (table 5).

POLICIES INFLUENCING THE FORM OF BUSINESS ORGANIZATION

A number of Federal and State policies influence the form of business organization in farming, either by design or implicitly, as farmers choose a form of organization to take advantage of policies applicable to the general economy. Most, but not all, of these policies favor the growth of corporations in the farm

Table 1—Farms with sales of $2,500 and over, by form of business organization

Form of organization	1969		1974		Percentage change, 1969 to 1974
	1,000 farms	*Percent*	*1,000 farms*	-----	*Percent* -----
Sole proprietorships	1,480.6	85.4	1,517.8	89.5	+2.5
Partnerships	221.5	12.8	145.0	8.6	–34.5
Corporations	21.5	1.2	28.4	1.7	+32.1
Other[1]	10.1	0.6	3.8	0.2	–62.4
Total	1,733.7	100.0	1,695.0	100.0	–2.2

[1] Estates, trusts, and institutional farms.

Source: 1969 Census of Agriculture and 1974 Census of Agriculture, Vol. IV, Part 5.

Table 2—Land in farms, by form of business organization

Form of organization	1969		1974		Percentage change, 1969 to 1974
	1,000 acres	*Percent*	*1,000 acres*	-----	*Percent* -----
Sole proprietorships	665.7	72.5	678.7	75.0	+2.0
Partnerships	163.4	17.8	124.4	13.7	–23.8
Corporations	80.8	8.8	96.1	10.6	+18.9
Other[1]	8.4	0.9	6.3	0.7	–25.0
Total	918.3	100.0	905.6	100.0	–1.4

[1] Estates, trusts, and institutional farms.

sector by providing economic advantages to corporate farmers that are not available to individual farmers.

State Regulation of Corporate Farming

Several States, primarily those in the Great Plains and western Corn Belt, have statutes restricting or regulating farm corporations. State regulation of corporate farming ranges from a virtual ban on the corporate form of organization in North Dakota to the Oregon requirement that farm corporations submit an annual report to the State. The basic purpose of these statutes is to protect the family farm by preventing large businesses from controlling farm production and to stem the influx of outside equity capital into agriculture. Except for North Dakota, there are no major restrictions on family farm corporations. Although there are variations among States, these statutes attempt to control corpo-

Table 5—Farm corporations: value of farm products sold by kind of corporation

Corporation	Percentage of corporate farms[1]	Land in farms[1]	Value of products sold[1]
		Percent	
Primary farm firms	87.8	85.1	80.0
Privately held	87.3	84.5	74.6
Family	71.3	70.6	48.1
Other	16.0	13.8	26.5
Publicly held	.6	.6	5.4
Business-associated farm firms	12.2	14.9	20.0
Privately held	9.4	9.5	6.7
Family	5.2	2.9	2.0
Other	4.2	6.6	4.7
Publicly held	2.8	5.3	13.3
All farm corporations	100.0	100.0	100.0

[1] Components may not add to subtotals because of rounding.

Source: 1974 Census of Agriculture, Vol. IV, Part 5.

Table 3—Value of farmland and buildings owned, by form of business organization

Form of organization	1969		1974		Percentage increase, 1969 to 1974
	1,000 dollars	*Percent*	*1,000 dollars*	-----	*Percent* -----
Sole proprietorships	134.9	75.2	241.2	78.1	78.7
Partnerships	31.1	17.3	41.3	13.4	32.8
Corporations	11.8	6.6	24.6	8.0	108.5
Other[1]	1.7	.9	1.8	.6	5.9
Total	179.5	100.0	308.9	100.0	72.1

[1] Estates, trusts, and institutional farms.

Table 4—Value of products sold, farms by form of business organization

Form of organization	1969		1974		Percentage change, 1969 to 1974
	1,000 dollars	*Percent*	*1,000 dollars*	-----	*Percent* -----
Sole proprietorships	30,204.5	67.8	54,293.5	67.4	+79.8
Partnerships	7,766.2	17.4	11,231.9	13.9	+44.6
Corporations	6,296.1	14.2	14,648.5	18.2	+132.7
Other[1]	253.9	0.6	424.4	0.5	+67.2
Total	44,521.3	100.0	80,598.3	100.0	+81.0

[1] Estates, trusts, and institutional farms.

rate farming through restrictions on corporate agricultural landownership, prohibitions on corporate production of specific (or all) agricultural commodities, and restrictions on the number, family relationship, or residence of shareholders of farming corporations qualifying for exemption from the statutes.

These State regulations have had only a nominal impact on controlling or limiting the farming activities of large corporations. To date, large corporations have been unable to compete successfully in the types of agriculture conducted in the States with corporate farming statutes. The success of large corporate farms in other types of agriculture is attributable to uniqueness of risk, capital infusion, economies of scale, and type of management required. None of the States in which types of farming amenable to large-scale corporate production units are located have enacted restrictions on corporate farming.

Tax Policies

Federal tax policies probably have more influence on the form of farm business organization than any other single policy or program of the Federal Government. Federal income tax policies, in particular, encourage farm business incorporation, and the rate changes made in the Revenue Act of 1978 provide a greater incentive for farm incorporation than existed under previous tax legislation.

The new legislation graduated corporate income tax rates and made them lower than individual rates once taxable income rises above $25,000. The new corporate rate structure will probably be most attractive to farm operators who have large taxable incomes and to those using a strategy of rapid firm growth. The difference between individual and corporate tax rates allows high-income farmers to retain earnings and to build equity at a faster rate when organized as corporations than when operating as sole proprietorships or partnerships, which are taxed at the individual tax rates. Consequently, by incorporating, farmers are able to shelter a substantial part of their farm income against the higher individual rates. The value of this tax shelter increases as taxable income becomes larger. The maximum marginal tax rate for individuals is 70 percent, compared with 46 percent for corporations.

The provisions of the tax code that allow certain capital expenditures in agriculture to be charged off as current expenses and the provisions that allow farmers to use cash rather than accrual accounting procedures have also influenced the form of business organization in agriculture. These two provisions provide substantial tax advantages to agriculture that are not available to other sectors of the economy, and they have attracted equity capital into certain types of farming. The limited partnership is the primary organizational form employed to attract this outside capital. In the most common arrangement, the farm is operated by a general partner, it is usually set up as a corporation, and capital is raised by selling limited partnership shares to nonfarm investors. The individual investors can then charge off capital development costs for establishing such enterprises as orchards, groves, vineyards, and breeding livestock herds as current expenses to offset current nonfarm income. When sold, the assets are taxed at lower capital gains rates. Under the cash accounting provisions, taxable income can be reduced through proper timing of input purchases and product sales.

The current expense method for capital expenditures and cash accounting provisions have led to the phenomenon known as "tax loss farming"—the operation of a farm at a loss because of the advantage of using losses as offsets to nonfarm income. Recent amendments to the tax laws have attempted to reduce the tax advantages that can be obtained by nonfarm investors through these provisions.

Credit Policies

Federal farm credit programs, operated mainly through the Farmers Home Administra-

tion and the Farm Credit Administration, have attempted to assure adequate credit availability to farmers for both investment and operating needs. The programs of the Farmers Home Administration, in particular, by providing credit to farmers who are unable to obtain credit from commercial or other sources, have probably slowed the trend toward the corporate business form by enabling many small farmers to remain in business.

Increasing capital requirements for farming, brought about by rising land values and increased dependence on purchased inputs, have caused credit availability to become a more critical factor to the farm sector than in the past. From 1870 to 1950, savings and farm-generated investments provided the major source of capital entering agriculture. Since 1950, however, technological innovations, specialization, and industrialization have increased the capital needs of agriculture to the point that capital needs are now growing at a faster rate than farm earnings and depreciation.[1] Thus, it is becoming increasingly difficult for one individual to raise the capital needed to establish and operate a viable farm. As a result, the high capital requirements for modern farming are encouraging a shift from individually owned farms to multiownership forms of organization. A large proportion of these multiownership farms will adopt a corporate organization.

State credit policies may also affect the form of farm business organization. State usury laws prohibit commercial lenders from making loans to individuals at interest rates that exceed the usury rate. This stricture includes farms operated as sole proprietorships and partnerships. Loans can be made to corporations, however, at market interest rates above the usury rate. Consequently, in periods of high interest rates, farmers in States with usury laws may be required to incorporate to obtain operating loans from commercial financial institutions. This situation currently exists in a few States.

ADVANTAGES OF THE DIFFERENT FORMS OF BUSINESS ORGANIZATION

Farmers, as with other business owners, have the option of choosing any one of several forms of business organization. The most common of these are the sole proprietorship, the partnership, and the corporation. The choice of organizational form for a particular farm is a decision that must be made by its owner based on the farm's situation. However, each organization form has advantages and characteristics that also influence farm operators in choosing one form over the others. The major advantages of each of the three major forms of business organization are outlined below.

Sole proprietorship—The primary advantage of the sole proprietorship as a form of farm business organization is its simplicity. It avoids the potential interpersonal problems that may arise under a partnership arrangement and the legal requirements of operating as a corporation.

Partnership—Partnerships have several potential advantages over sole proprietorships as a form of business organization. Among these are the pooling of resources and skills of two or more individuals, the possibility of functional specialization of individual partners, and facilitation of the transfer of the farm business to heirs. Partnerships can be formed for a variety of purposes, ranging from the operation of a farm over a long term to single-transaction, short-duration projects such as feeding a single group of feeder pigs. The limited partnership has been used extensively to raise equity and investment capital in agriculture.

Corporation—The corporate form of organization offers advantages that are not available to farmers operating under the sole proprietorship or partnership forms. The tax advantages of a corporation and the resulting implications for

[1] John A. Hopkin, "Agriculture's Growing Liquidity Problem," *Feedstuffs*, Aug. 9, 1976.

retaining earnings in the firm and for farm growth have been discussed previously.

A corporation has a legal identity of its own that is separate and distinct from its stockholders'. Consequently, the corporate form allows farmers to separate their farm businesses from their household and other activities more completely than is possible under the sole proprietorship or partnership forms of organization. Because of the limited liability provisions of corporate law, debts and other legal obligations incurred by the farm corporation in the process of transacting its business accrue only to the corporation and not to its stockholders. This is a major advantage to farmers with sizable nonfarm assets. They are not personally liable for the corporation's legal obligations.

Incorporation may facilitate developing fringe benefit programs. Health and medical insurance plans and programs and retirement pension programs are becoming more important in the farm sector. These programs also qualify for income tax relief when properly developed and continued under a corporate form of business organization.

The corporate form is also becoming a more common vehicle for facilitating transfer of farms to heirs or others. Under the corporate form, the transfer takes place through the transfer of stock rather than physical assets. Through a judicious combination of stock gifts and sales, the transfer can be accomplished more smoothly and usually at less cost than with other forms of business organization.

FARM ORGANIZATION IN THE FUTURE

A continuation of farm incorporation can be expected, if current policies remain in effect. This does not mean, however, that there will be a major influx of large, nonfarm corporations entering farming. The growth in corporate farms will largely be internal to the farm sector. That is, it will be caused by existing sole proprietorships and partnerships choosing to incorporate to capture the advantages of the corporate form of business organization. Consequently, the continuing growth of farming corporations does not necessarily constitute a structural change in farming. The structural change will be brought about by other factors—advancing technology, increasing capital needs, changing market requirements, and so on. The form of farm business organization in the future will adapt to the conditions resulting from these factors.

The major fear that has been raised concerning corporations in farming is that their increase means that nonfarm investors are gaining control over farm resources and farm production. This fear arises from the tendency to equate the term "corporation" with giant industrial firms. Raising the specter of a "corporate takeover" of farming by a handful of giant conglomerate corporations is a rhetorical device that has been commonly and effectively used by special interest groups opposed to increased farm size and other structural changes in agriculture. The available data, however, simply do not support the allegation of a takeover of farming by nonfarm corporate interests.

Credit Availability Effects On the Structure of Farming

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INTRODUCTION

Earlier articles collected here have suggested that important elements of structural change in the U.S. farm production sector include changes in the number and size of farms, the types of farms, tenure patterns, legal forms of business organization, the degree of contract production and vertical integration, and the ownership and control of resources. Structural change has also occurred in asset composition, the degree of leverage, and the use of purchased inputs by farms. The impact of credit availability on these elements of structural change is examined here. Linkages between credit availability and public policies are also explored.

STRUCTURAL CHANGE AND AVAILABILITY OF CREDIT

In this section, the emphasis is on how the availability of credit affects the structure of U.S. agriculture. Public policy effects on availability of credit are discussed later.

Number and Size of Farms, Tenure Patterns, and Organization

The number of U.S. farms has declined substantially since 1935 and the average size has nearly tripled. The increase in farm size could not have been accomplished without readily available credit.

From 1935 to 1950, the United States experienced a substantial reduction in farm numbers and an increase in farm size while farm mortgage debt declined (table 1). In other words, the structural change which occurred during this period was not primarily a function of credit availability. This result is likely due to the post-Depression fear of debt which made farm operators extremely cautious in using borrowed funds. In addition, production shortages and high prices caused by World War II allowed farmers to reduce their debt.

Since 1950, the decline in numbers of farms and the increase in the size of farms has been accompanied by a fairly rapid growth in farm mortgage debt. While some of this structural change would have occurred even in the absence of credit, the number of farms would probably not have decreased as rapidly had credit for the purchase of land been less readily available. Since 1960, a growing proportion of the purchases of farm real estate have been financed with borrowed funds (table 2). If farm operators had instead been required to finance purchases entirely with accumulated earnings, the move to fewer and larger farms would likely have been slower. The move to larger farms might alternatively have been accomplished without the availability of borrowed funds, but only if there had been a substantial increase in the amount of land rented.

Readily available credit tends to facilitate adoption of capital-intensive production methods, thus abetting a shift to fewer and

Table 1—Number and size of U.S. farms in relation to the use of farm mortgage debt

Year	Number of farms	Average size of farms	Farm mortgage debt	Per acre value of land and buildings
	1,000	*Acres*	*Billion dollars*	*Dollars*
1910	6,361	138	3.2	40
1920	6,447	148	8.4	69
1925	6,371	145	9.9	54
1930	6,288	157	9.6	49
1935	6,812	155	7.5	32
1940	6,096	174	6.5	32
1945	5,859	195	4.9	47
1950	5,647	213	5.6	65
1955	4,654	258	8.2	85
1960	3,956	296	12.1	116
1965	3,351	339	18.9	146
1970	2,944	373	29.2	195
1975	2,487	426	46.3	341
1979	2,366	443	63.6	490

Source: *Farm Real Estate Market Developments.* U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, various issues.

larger farms. For example, Southern cotton farmers (who formerly used labor inputs) used new technology and readily available credit to shift to fewer and larger farms without prohibitive increases in labor costs. Changes in the structure of cattle feeding are another example of how financial effects are manifested.

The changing tenure patterns of U.S. agriculture are well documented in the earlier article by Bruce Hottel and David H. Harrington ("Tenure and Equity Influences on the Incomes of Farmers"). They note the rapid rise in percentage of farm operators who are full or part owners, but also note that part owners have made greater gains in the percentage of acreage farmed than full owners.

Has credit availability influenced these dramatic changes in tenure patterns? The changing terms of real estate loans appear to have been a major facilitating force behind the growth in full or partial ownership of farm real estate. In recent years, a higher proportion of purchasers used borrowed funds and borrowed a greater proportion of the purchase price (table 3). In addition, allowable amortization periods on real estate loans have expanded from an average of 3 to 5 years in the World War I era to current levels of 25 to 35 years.

The easing of the terms of real estate loans undoubtedly encouraged the shift to a higher proportion of full-owner and part-owner operators.

Penson and Lins (*9*) identified some circumstances under which the form of business organization can be influenced by the availability of credit.[1] For example, sole proprietorships and partnerships are normally subject to usury laws, but corporations are not. Thus, when interest rates reach or exceed usury limits, there is some incentive to organize as a corporation to be able to acquire debt capital. And until recently, corporations and partnerships were not eligible for Farmers Home Administration loans. This policy tended to encourage sole proprietorships over other forms of business organization.

The above factors, however, are seldom the major determinant in selecting a form of business organization. Surveys showed that a switch from one form of business organization to another is seldom predicated on the availability of credit. A study by Brock and others (*3*) in New York found that:

"For most farm operations, the form of business organization has little effect on financing opportunities or credit status. Seventy-six percent of the farmers interviewed stated that incorporation did not affect their credit status in any way."

A study by Krausz and others (*7*) found similar results in Illinois.

Table 2—Purchases of U.S. real estate from discontinuing proprietors and net increase in real estate loan funds

Year	Purchases of real estate from discontinuing proprietors	Net increase in real estate loans	Net increase of real estate loans to purchases
	Billion dollars		*Percent*
1960	3.0	0.8	27
1965	4.3	2.3	53
1970	4.1	1.1	27
1975	9.8	4.8	49
1978	12.7	7.5	59

Source: *Agricultural Finance Outlook.* U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, various issues.

Table 3—Percentage of U.S. farm real estate transfers on which debt was incurred and ratio of debt to purchase price

Year	Farm real estate transfers on which debt was incurred	Debt as a percent of purchase price
	Percent	
1945	44	57
1950	58	57
1955	64	59
1960	67	65
1965	73	72
1970	78	73
1975	88	76
1978	89	76

Source: *Farm Real Estate Market Developments.* U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, various issues.

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

Contract Production and Vertical Integration

A stage of production has been defined as an operating process capable of producing a saleable product or service. The linking of two or more stages of production is referred to as vertical coordination. Forward contracts are a common example of vertical coordination in agriculture. The use of forward contracts influences the availability of debt capital primarily because of the reduction in risk for the farm borrower.

Hedging through commodity futures contracts can affect the availability of credit. A lender may be willing to lend more to a borrower who has protected profits through proper hedging. Similarly, the use of cash forward contracts influences the availability of debt capital. For example, Barry and Willmann (*1*) found that, for cotton producers, cash forward contracting of two-thirds of expected cotton production would increase the availability of debt capital by more than $20 per acre over no contracting or 100-percent forward contracting.

Production-management contracts are agreements whereby farm products will be delivered according to certain specifications at some future date and agreed-upon price. The input supplier or processor may also furnish some of the inputs as well as debt capital to the producer. Producers who receive inputs from the dealer or processor likely have less need for traditional sources of short-term financing. And when credit is available through the dealer or processor, the contracting firm that provides the funds has better access to debt capital markets than does the individual producer. The net result is that because of lender reactions to reduced risk, contract production and vertical coordination are encouraged. However, the inducement for contract production is probably much more strongly associated with the need to control the quantity and quality of production than with the effects on the availability of credit.

Ownership and Control of Resources

The ownership and control of farm sector assets is becoming more concentrated in the large commercial farms. A classification of the resources by sales class of farm is presented in table 4. Farms with over $40,000 in gross sales control over 52 percent of the total farm assets, yet they account for only 19 percent of the total number of farms. More important, the same farms have over 70 percent of the farm sector liabilities—or debt capital. Since the total returns to investment in agricultural assets have substantially exceeded the cost of borrowed funds in recent years, the firms which are most heavily leveraged have been growing at the fastest rate. Thus, the availability of debt capital plays a major role in facilitating and encouraging a concentration of resource ownership and control in large farm firms.

Asset Composition, Leverage, and Use Of Purchased Inputs

The composition of farm assets has also changed. Aggregate farm sector balance sheet data (table 5) reveal some clear trends in asset composition. As a percentage of total assets, real estate and machinery have increased while livestock, crops, and financial assets have declined. The result of these changes in asset composition is that a growing proportion of the value of farm sector assets are held in a form that has low liquidity. Therefore, farm operators need to be more concerned with protecting other sources of liquidity, including credit reserves.

Changes in asset composition, however, are probably only partially the result of availability of credit. The relative increase in the proportion of the value of farm real estate assets is due to the rapid inflation in land values relative to other assets. While readily available credit has encouraged inflation in land values, there are other important factors involved.

The leverage ratio for farm firms—the ratio of debt to equity—increased from 10 percent in 1950 to over 20 percent in 1978.

An increase in the leverage ratio allows (a) a higher rate of growth in equity (assuming farming is profitable) and (b) greater financial risk. Since the leverage ratio can increase only if

credit is available, credit availability has resulted in larger farm firms which have more financial risk.

Farm firms also rely much more on purchased inputs. Changes in the ratio of production expenses to gross farm income—the gross ratio—are illustrated in table 6. Since 1935 the ratio has increased from 53 to 79 percent currently. The gross ratio is much higher for farms with gross sales over $100,000 than for those with less than $100,000 in gross sales.

To appreciate the impact of an increasing gross ratio, one must consider what it does to the potential variation in *net* income. Table 7 illustrates a hypothetical example of the effects of a 10-percent reduction in gross income for different levels of the gross ratio. With a gross ratio of 50, a 10-percent reduction in gross in-

Table 4—Balance sheet of the farming sector by sales, January 1, 1977

Item	$100,000 and over	$40,000 to $99,999	$20,000 to $39,999	$10,000 to $19,999	$5,000 to $9,999	$2,500 to $4,999	Less than $2,500	All farms
				Million dollars				
Assets:								
Physical assets—								
Real estate	134,025	118,058	64,835	43,062	30,482	27,095	66,289	483,846
Nonreal estate—								
Livestock and poultry	8,870	6,759	4,088	2,708	1,948	1,730	2,950	29,053
Machinery and motor vehicles	16,828	18,958	10,793	6,888	4,615	3,621	9,302	71,005
Crops stored on and off farms	7,677	7,259	3,410	1,760	880	440	572	21,998
Household equipment and furnishings	2,181	2,282	1,647	1,430	1,329	1,343	4,234	14,446
Financial assets—								
Deposits and currency	5,234	3,096	1,646	1,149	988	974	2,883	15,970
U.S. savings bonds	729	716	454	375	375	406	1,310	4,365
Investments in cooperatives	6,902	3,606	1,711	891	465	267	402	14,244
Total	182,446	160,734	88,584	58,263	41,082	35,876	87,942	654,927
Liabilities:								
Real estate debt	22,636	19,240	6,225	2,830	1,697	1,132	2,830	56,590
Nonreal estate debt—								
Excluding CCC loans	19,827	11,265	8,562	2,253	1,352	901	901	45,061
CCC loans	373	358	157	72	30	12	10	1,012
Total liabilities	42,836	30,863	14,944	5,155	3,079	2,045	3,741	102,663
Proprietors' equities	139,610	129,871	73,640	53,108	38,003	33,831	84,201	552,264
Total	182,446	160,734	88,584	58,263	41,082	35,876	87,942	654,927
				Percent				
Debt to asset ratio	23.5	19.2	16.9	8.8	7.5	5.7	4.2	15.7
Percent of all assets	27.9	24.5	13.5	8.9	6.3	5.5	13.4	100.0
Percent of total liabilities	41.7	30.1	14.6	5.0	3.0	2.0	3.6	100.0
Percent of the number of farms	6.0	12.9	11.9	11.5	11.2	11.2	35.3	100.0

Source: *Balance Sheet of the Farming Sector, 1978.* Agr. Info. Bul. No. 416, Supplement No. 1. U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, October 1978.

Table 5—Balance sheet of the farming sector, selected years

Item	1950	1955	1960	1965	1970	1975	1978[1]	1950	1955	1960	1965	1970	1975	1978[1]
	Billion dollars							*Percent*						
Assets:														
Physical assets—														
Real estate	77.6	102.2	137.2	167.5	215.8	368.5	525.8	57.7	60.5	65.2	68.7	68.5	71.4	74.2
Non-real estate														
Livestock[2]	12.9	11.2	15.3	14.5	23.5	24.6	32.0	9.6	6.6	7.3	6.0	7.4	4.8	4.5
Machinery and motor vehicles	12.2	18.6	22.7	24.8	32.3	55.7	77.3	9.0	11.0	10.8	10.2	10.3	10.8	10.0
Crops stored on and off farms[3]	7.6	9.6	7.7	9.2	10.9	23.3	24.6	5.7	5.7	3.7	3.8	3.5	4.5	3.5
Household equipment and furnishings	8.4	9.7	9.2	8.4	9.6	14.0	14.5	6.2	5.8	4.4	3.4	3.0	2.7	2.0
Financial assets:														
Deposits and currency	9.1	9.4	9.2	9.6	11.9	15.1	16.3	6.8	5.6	4.4	3.9	3.8	2.9	2.3
U.S. savings bonds	4.7	5.0	4.7	4.2	3.7	4.3	4.4	3.5	3.0	2.2	1.7	1.2	0.9	0.6
Investments in cooperatives	2.0	3.1	4.2	5.6	7.2	10.5	14.0	1.5	1.8	2.0	2.3	2.3	2.0	2.0
Total assets	134.5	168.8	210.2	243.8	314.9	516.0	708.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Liabilities:														
Real estate debt	5.6	8.2	12.0	18.9	29.2	46.3	64.2	4.2	4.9	5.7	7.8	9.3	9.0	9.1
Non-real estate debt to—														
CCC[4]	1.7	2.2	1.2	1.6	2.7	0.3	4.5	1.3	1.3	0.6	0.7	0.9	0.1	0.6
Other reporting institutions[5]	2.8	4.0	6.7	10.0	15.8	29.2	42.7	2.1	2.4	3.2	4.1	5.0	5.6	6.0
Nonreporting creditors[6]	2.3	3.2	4.9	6.3	5.3	6.0	8.3	1.7	1.9	2.3	2.6	1.7	1.2	1.2
Total liabilities	12.4	17.6	24.8	36.8	53.0	81.8	119.7	9.3	10.5	11.8	15.2	16.9	15.9	16.9
Proprietors' equities	122.1	151.2	185.4	207.0	261.9	434.2	589.2	90.7	89.5	88.2	84.8	83.1	84.1	83.1
Total	134.5	168.8	210.2	243.8	314.9	516.0	708.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary.
[2] Beginning with 1961, horses and mules are excluded.
[3] Includes all crops held on farms and crops held off farms by farmers as security for CCC loans. On Jan. 1, 1978, the latter totaled $1,827 million.
[4] Nonrecourse CCC loans secured by crops owned by farmers. These crops are included as assets in this balance sheet.
[5] Loans of all operating banks, production credit associations, the Farmers Home Administration, and discounts of the Federal Intermediate credit banks for agricultural credit corporations and livestock loan companies.
[6] Loans and credit extended by dealers, merchants, finance companies, individuals, and others.

Source: *Balance Sheet of the Farming Sector*, Agricultural Information Bulletin No. 416.

come leads to a 23.3-percent reduction in net income. With a gross ratio at 70 percent, net income falls by 33.3 percent, and with a gross ratio at 85 percent, net income falls by 66.7 *percent*!

Clearly, farm operators, particularly those on farms with high gross sales and a high gross ratio, need to be concerned about the declines in gross income. A 10-percent drop in gross income could mean a hefty drop in net income.

Table 6—Production expenses as a percentage of gross production income for the farm production sector[1]

Year	All farms	Farms with sales over $100,000	Farms with sales less than $100,000
		Percent	
1935	53	–	–
1940	62	–	–
1945	51	–	–
1950	60	–	–
1955	67	–	–
1960	71	88	68
1965	74	89	70
1970	76	87	70
1975	78	85	72
1978	79	85	71

[1] Farm income estimates are before inventory adjustments and before income taxes.

Note: Dashes mean data not available.

Table 7—Illustration of the effects of the gross ratio on variability in net income

Item	Gross ratio[1]		
	50 percent	70 percent	85 percent
		Dollars	
Gross income	70	100	200
Production expenses	40	70	170
Net income	30	30	30
Gross income reduced by 10 percent	63	90	180
Net income with gross income reduced by 10 percent[2]	23	20	10
		Percent	
Percentage reductions in net income due to 10-percent reduction in gross income	23.3	33.3	66.7

[1] Ratio of production expenses to gross farm income.
[2] This assumes production expenses are not affected by the changes which caused the reduction in gross income.

Several options have been used to ensure against declines in gross income. First, farmers have demanded price protection in the form of Government programs. For example, target prices are attempts to limit declines in gross income. Because the gross ratio is higher for higher sales class farms, those farmers may push as hard or harder than smaller farmers for such Government support programs. Second, the potential variation in net income due to a high gross ratio is likely to lead to a greater demand for forward pricing contracts. Again, the greatest demand for forward pricing is likely to come from farmers with large sales because the gross ratio is higher on their farms.

Short- and intermediate-term credit has helped to facilitate the shift toward greater reliance on purchased inputs because many of these inputs are purchased on credit. But the primary reason for the shift is that it has allowed for specialization and greater efficiency in production. Total profits are increased, but profit margins are reduced.

CREDIT AVAILABILITY AND PUBLIC POLICY

The discussion above suggests that changes in farm structure are encouraged or facilitated by the availability of credit. The question then is: Does public policy influence the availability of credit? The answer requires an examination of direct intervention in financial markets in the form of federally sponsored credit programs and of policies that influence the availability of debt capital from nongovernmental sources.

Federally Sponsored Farm Credit Programs

There is a long history of Federal intervention in farm credit markets. The need for credit for U.S. agricultural firms was minimal prior to the late 1800's. Available land was claimed under the Homestead Act of 1862. Hoag (*6*) indicated that, over time, pressures for better farm credit markets increased to the point that in 1912, "all three political parties—Republican, Democratic,

and Progressive—called for the establishment of a farm credit system." There was a strong feeling that private financial markets were not adequate to meet the needs of rural America.

The Federal Farm Loan Act of 1916 established the Federal Land Banks with the Federal Government supplying the original equity capital and providing a mechanism for the Government capital to be replaced over time by users of the system. This model was so successful that the remainder of the Farm Credit System as well as the Federal Home Loan Banks, Federal Deposit Insurance Corporation, Federal National Mortgage Association, and others have followed this pattern. Government capital has been repaid in all these institutions. Clearly, Federal intervention authorized by public law is responsible for much of the contemporary financial system.

The Farmers Home Administration (FmHA), a Government lending agency, was established to provide direct low-cost loans from the Federal Government to farm operators with limited resources. A condition for such loans was that the borrowers be unable to obtain sufficient financing from other sources. Borrowers "graduate" to commercial lenders after they have become established. But the intent of FmHA programs is to increase the availability of loan funds above what would exist in the absence of such programs. Over time, programs of the FmHA have been broadened to include the entire rural community. The availability of FmHA rural housing loans has likely encouraged more "farmettes"—rural residences with just sufficient acreage to generate a small amount of agricultural income. A greater emphasis on guaranteed loans rather than insured loans has also developed. Guaranteed loans are made by commercial lenders, with up to 90 percent of the loan guaranteed against default by FmHA. Such guarantees allow a greater flow of funds from commercial lenders at less risk of default.

Recently, the Small Business Administration (SBA) has been granted authority to provide direct and guaranteed loans to farm firms. Both FmHA and SBA farm loan programs have resulted from a perceived need to provide loan funds to farm operators with limited resources or to farm operators adversely affected by economic and natural disasters. Most Government loan programs for agriculture contain a subsidy, either in the form of interest rates below market costs, or in the form of appropriations to pay for administrative expenses.

The Commodity Credit Corporation (CCC), a U.S. Government corporation operating under the Agricultural Stabilization and Conservation Service of the U.S. Department of Agriculture, also provides loan funds to farm operators. CCC nonrecourse loans allow farm operators to pledge eligible commodities as collateral on loans. At the option of the borrower, the commodity can be forfeited as full payment for principal and interest on the loan. The CCC also provides relatively small amounts of loan funds for farm commodity storage and drying facilities.

The role of Federal agencies in providing farm loan funds has varied over time. The Federal Government's lending agencies have provided between 4 and 8 percent of the total farm real estate loan funds since 1945 (table 8). However, Government lending agencies accounted for between 25 and 35 percent of all nonreal estate farm loan funds throughout most of the forties and fifties. More recently the relative share of nonreal estate farm loans provided by Government lending agencies has declined. For all farm loans, the Government's lending agencies have

Table 8—U.S. Government farm loans as percentage of total farm loans

Year	Government farm real estate loans	Government non-real estate farm loans		All Government farm loans
		Farmers Home Administration	Commodity Credit Corporation	
		Percent		
1940	0.5	12.1	12.9	8.9
1945	4.0	13.3	20.0	16.0
1950	3.6	5.0	25.0	18.2
1955	4.6	4.4	23.6	17.1
1960	5.6	3.1	9.2	9.0
1965	6.8	3.6	8.6	9.4
1970	7.8	3.3	14.9	10.8
1975	6.9	2.9	0.9	5.6
1978	6.3	5.6	8.1	9.7

provided between 5 and 10 percent of the total in recent years. The primary source of variation in this total has been in CCC loans.

Federally sponsored farm credit programs have had a mixed impact on the structure of agriculture. Federal support of the Farm Credit System helped to develop a system that is very successful in acquiring loan funds for agriculture, which has facilitated a shift to fewer and larger farms, a greater proportion of farm operators with full or partial ownership, and a concentration of resource ownership and control in large farm firms. In contrast, FmHA farm loan programs have focused on farm operators of limited resources and those affected by disaster. The impact of these programs has been to keep up the number of farms and to slow the concentration of resource ownership and control in large farms.

Policies That Influence Credit Availability

Many public policies and actions influence the availability of credit from commercial lending sources. The most obvious are the monetary policies of the Federal Reserve System. The Federal Reserve is charged with controlling the Nation's money supply and these controls directly influence the availability of credit in the economy. Studies by Lins (*8*) and Francis (*4*) showed that monetary policies are not neutral with respect to agriculture. Consequently, monetary policies affect not only the structure of agriculture, but also the well-being of the farm sector relative to other sectors of the economy.

Public policies also affect the credit available from commercial lenders by changing the returns, risk, and liquidity of farm loans. For some time, Government policies have provided price supports, acreage allotments, deficiency payments, target prices, and other similar mechanisms designed to improve the returns on agricultural production. While there is some debate over whether such programs have actually improved income, there is little question that they have tended to stabilize income and thereby reduce the risks associated with making farm loans. The effects on structure are suggested by a recent study of the financial impacts of Government support price programs. Boehlje and Griffin (*2*) conclude that:

"With current price expectations and government program parameters and conservation inflation rates, the cost-of-production based support price mechanism could increase land prices dramatically within a short period of time. Although all current land owners receive the benefit of the capital gain that would result, the larger, high-equity operator is best able to pay the higher price for additional land. Furthermore, the guaranteed cash flow that results from such a support program is much greater for the larger, higher equity farmer. . . . Thus, the great majority of the benefits of such a program go to larger, high-equity producers."

A host of State and Federal regulations also influence the availability of debt capital for the farm production sector. Some of the more important are:

- Usury laws.
- Banking structure laws, including regulations on bank organization, mergers, branching, and bank-holding companies.
- Reserve requirements on deposits at banks.
- Regulations governing legal lending limits of banks, insurance companies, and the Farm Credit System.

Each of these regulations affects the availability of debt capital. Researchers have examined many of these regulations, but implications for the structure of the farm production sector are seldom explored. The impact of these regulations on credit availability and the structure of agriculture needs to be examined in more detail.

RESEARCH ISSUES

While Federal policies affect credit availability, many questions remain unanswered. More information is needed on the degree to which FmHA-SBA programs create inefficiencies in farm production. Is the inefficiency a short-run phenomenon that is overcome as borrowers graduate to commercial lending sources? How

much do economic emergency loans hinder a response to economic signals of overproduction? How can economically depressed groups be assisted without distorting price signals?

The effects of monetary policy on agriculture are poorly understood and not well documented. Does an expansionary monetary policy favor or hinder agriculture relative to other sectors? What impacts does monetary policy have on the structure of agriculture?

Another research issue is the extent to which government support programs reduce risk and thereby affect credit availability. Are loan funds more readily available because of support programs? Are there differences among geographic regions and different farm types?

There is little available information on how regulation of financial intermediaries affects the structure of agriculture. For example, do limits on the ratio of debt to security on farm real estate loans favor established farm operators versus young farm operators? A wide variety of regulations affect credit availability, but their ultimate impact on farm structure is not clear.

Research is needed on the substitutability between federally sponsored credit and commercial credit. Would private lenders provide funds if FmHA programs were reduced or eliminated? Would credit provided through CCC loans be available through commercial channels? If so, what would be the impact on the structure of agriculture?

Credit availability has facilitated and encouraged structural change in the farm production sector. The impact of Federal programs on credit availability and the welfare implications deserve more public debate.

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Farm Labor And the Structure Of Agriculture

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INTRODUCTION

The farming industry in most of the United States developed in a technological and social setting vastly different from what exists today. The availability and use of labor was a dominant factor in determining the historical structure, whereas labor considerations influence the contemporary agricultural industry only marginally. To understand how labor use and the farm labor market influence the present structure of American agriculture, it is necessary to look briefly at labor's role in agriculture in this country.

The Emergence of Hired Labor in Agriculture

The initial motivation for farming in the United States was to provide the sustenance of the farm family. The structure of the farming industry that emerged as the Nation was settled reflected that orientation. Farming units were usually diversified enterprises of a size that could be worked by one family, which supplied virtually all the farm's productive resources. The farm family attempted to produce enough for its own needs and a small saleable surplus to obtain income to purchase necessities that they could not produce. Marketable agricultural commodities were limited to a small number of storable, transportable items. Aside from the plantation system of the South, there were few other exceptions. Where hired labor was used, it had to reside on the farm, and the few large enterprises that existed were essentially replicas of family units.

In the South, the plantation system developed, dependent on slaves as a cheap and available source of labor. These workers too were located on the farming unit; they could be marshalled during periods of peak labor demand and kept largely idle at low cost at other times. Thus, the structure of both the family farms of the Northeast and the plantations of the Southeast resulted from labor availability but differing philosophies with regard to labor use. However, in neither case was a "labor market" involved, in the sense in which that term is used today.

The plantation system collapsed with the depletion of the South's soil and the draining away of the labor supply by the end of the slave trade and the Emancipation Proclamation. Concurrently, technological developments both in agricultural production and in transportation and marketing channels facilitated larger volumes of production on individual farms and provided an incentive to specialize in a few commodities. The subsistence model of farm structure began to give way to the modern commercial farm.

The major impetus for the development and adoption of improved farm production technology was to enable the presumably fixed resource base on individual farms—chiefly the farm family's labor and their land—to produce more agricultural products or to produce them more cheaply, thus, to increase the income of the farm family. The result for the farming industry as a whole, however, was that productive capacity increased more rapidly than demand for farm products, reducing the prices of commodities. The smallest and most inefficient units were forced out of business, no longer able to provide an adequate income for a farm family. The land used by those units was absorbed by units that were expanding or it reverted to less intensive uses. The labor forced out of farming was replaced by capital investment on the expanding units. The total labor input in agriculture declined drastically as millions of farm families and hired farmworkers could no longer earn a living in agriculture.

The same trends toward commodity specialization and farm enlargement that resulted from improvements in production technology proved an impetus to the development of further labor-displacing technology. Mechanization increased the amount of seasonal work such as planting or harvesting that could be done in a day, permitting the farmer to expand production of his

most profitable crops. In many cases, the new production technology could not be exploited profitably unless its fixed costs were spread over a larger number of units of product, thus adding further impetus to product specialization and farm enlargement. However, advances in production technology did not occur evenly across all steps in the production process; increased specialization sometimes exacerbated peak labor demands for activities that were more difficult to mechanize. Fruit harvesting and production of vegetables and some field crops required an enormous expansion of the seasonal hired labor force in major producing areas. Such activities thus became the focus of intense mechanization efforts. Harvest mechanization advanced rapidly in the fifties and sixties, reducing the seasonality and total amount of farm employment. As a result, additional hundreds of thousands of migrant and seasonal farmworkers lost their farm jobs.

Changes in labor demand and use have thus been both the result and the cause of specialization and technological change. For the most part, however, since the onset of the technological revolution in American agriculture, the farm labor market has been shaped by developments in the agricultural industry, rather than the labor market affecting the structure of agriculture.

Hired Labor Use in Agriculture

Farm employment grew with the expansion of agriculture until shortly after the turn of the century, after which farm employment shrank drastically as the impact of technology began in earnest (see table). The rate of decline was especially rapid from the post-World War II period through the sixties, when the decline slowed sharply. The employment of hired farmworkers stabilized in the seventies, while family labor use continued a slow decline.

Family workers were still the dominant source of labor in 1978, accounting for slightly over two-thirds of annual average total employment in agriculture, down from three-quarters a decade earlier. The absolute level of annual average hired farmworker employment (1.3 million in 1978) has remained relatively stable for the past decade. The number of operators and family workers (2.7 million in 1978) has continued its longstanding decline.

The proportion of operators to hired farmworkers differs widely from one part of the country to another, reflecting different farm circumstances. The 1970 Census of Population offers the only data available for making local comparisons. Although the numbers have changed since then, regional patterns are thought to have remained fairly constant. In the Midwest, from the Great Plains to the eastern edge of the Corn Belt in Ohio, farm operators and family members are in the overwhelming majority in the farm work force. Farm operators rather consistently outnumbered hired workers by more than 2 to 1 in 1970 and in many counties the ratio was as high as 5 to 1 and 8 to 1.

Total, family, and hired employment on farms, selected years, 1910-1978

Year	Annual average farm employment[1]			Percentage hired	Total hired farm work force[2]
	Total	Family	Hired		
	1,000			*Percent*	*1,000*
1910	13,555	10,174	3,381	25	NA
1920	13,432	10,041	3,391	25	NA
1930	12,497	9,307	3,190	26	NA
1940	10,979	8,300	2,679	24	NA
1950	9,926	7,597	2,329	23	4,342
1955	8,381	6,345	2,036	24	3,292[3]
1960	7,057	5,172	1,885	27	3,693
1965	5,610	4,128	1,485	26	3,128
1970	4,523	3,348	1,174	26	2,488
1971	4,436	3,275	1,161	26	2,550
1972	4,373	3,228	1,146	26	2,809
1973	4,337	3,169	1,168	27	2,671
1974	4,389	3,074	1,314	30	2,737
1975	4,342	3,025	1,317	30	2,638
1976	4,374	2,997	1,377	31	2,767
1977	4,152	2,856	1,296	31	NA
1978	3,937	2,681	1,256	32	NA

NA = Not available.

[1] Average number of persons employed at any one time.

[2] Total number of persons employed at any time during the year.

[3] No survey conducted in 1955; average of estimates for 1954 and 1956.

Source: U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service.

This area is predominantly a producer of food, feed grains, and livestock. In the seventies, the ratio of family workers to hired workers declined slightly, but this area remains the least intensive user of hired agricultural labor.

Some small upland tobacco farming areas of the South and scattered areas of the West also have high proportions of operators and family members in the work force but never so extensively as in the Midwest. Surrounding these areas are others in which farm operators, though dominant, are not nearly so preponderant (less than 2 to 1); included are much of the rest of the upland South, the dairy areas of the Northeast, central Texas, and much of Montana and Idaho.

In the rest of the United States, in a crescent-shaped pattern including both coasts, most of the old plantation areas of the South, the Rio Grande Valley, and the Southwest, hired farmworkers outnumber operators. In Florida, the Mississippi Delta, the Rio Grande counties of Texas, and California and Arizona, hired workers are preponderant, outnumbering operators by 2 to 1 or more. These are areas in which farms have historically been large. In general, there tend to be more hired workers than family workers where irrigation is extensive, where fruits and vegetables are the leading crops, in the vicinity of large cities where horticultural operations are concentrated, and in plantation and ranching areas where units have always been larger than could be handled by a single family.

There is a distinct racial aspect to the pattern of intensity of hired labor use. Among operators, non-Hispanic whites are in the great majority in every State except Hawaii. Where farm operators outnumber hired farmworkers, the hired workers tend to be drawn from the same ethnic stock as the farmers. However, where farming employs more hired workers than operators, many more of the hired workers are drawn from the black, Mexican-American, or other ethnic minority populations. In the 12 States of the Midwest, 96 percent of the hired farmworkers were non-Hispanic whites. However, in the 27 States where hired workers are in the majority, only about 58 percent were non-Hispanic whites, the remainder being blacks, Hispanics, or other ethnic minorities. Thus, in most areas where farming has emphasized hired labor and a limited number of entrepreneurs, many of the employees have come from disadvantaged ethnic minority groups. An element of potential race and class conflict is present that is almost entirely absent among the operators and regular hired workers elsewhere. The pressure for unionization and collective bargaining has been greatest in areas with large concentrations of hired labor. Organized labor activities have been most notable in the fruit and vegetable producing areas of California, Florida, and the North Central States.

Mechanization, the shift to market-oriented production, and other economic incentives to specialization and farm enlargement have increased the amount of hired labor used on individual farms. That fact is not readily apparent in agricultural employment statistics, because overall farm employment has declined rapidly. However, it is exemplified by an increase from 2 regular hired workers per farm on the 631,000 commercial farms employing regular hired workers in 1950 to 3.2 regular hired workers per farm on the 223,000 commercial farms employing regular hired workers in 1974.

Agricultural wage rates rose steadily in the past several decades, averaging $3.07 per hour for calendar 1978, and $3.37 per hour in January 1979. As a result, farm employers' hired labor expenditures have escalated dramatically from $3.7 billion in 1967 to $7.4 billion in 1977. However, wages comprised only 8.5 percent of total production expenses in 1977, a slightly smaller proportion than a decade earlier.

The proportion of hired labor costs in total farm expenditures varies substantially by the type of farm. Labor expenditures for hired and contract labor accounted for more than one-third of farm production expenses on fruit and nut and horticultural specialties farms, according to the 1974 Census of Agriculture, and for

nearly one-third of production expenses on vegetable farms. Farms that produced vegetables, fruits and nuts, and horticultural specialties accounted for one-third of all hired-labor expenditures and more than half of contract labor expenditures in 1974. Farmers in California alone paid nearly one-quarter of the Nation's hired farm wages in 1974.

Hired labor expenditures, therefore, although large, are not a substantial cost item on many farms. Where the use of hired labor is preponderant, however, the availability of workers, their productivity, and their cost are of sufficient importance to be a factor in farm operators' business decisions. Hired labor may, thus, influence the agricultural industry in certain regions. The magnitude and direction of the influence is simple to describe but impossible to predict. Clearly, economic or social developments that reduce the availability of workers or increase labor costs will stimulate further mechanization, retard the growth of output of labor-intensive commodities, increase consumer prices, and favor shifts in production to areas of lower labor cost and higher labor availability. However, the evidence suggests that labor is not exerting much influence on the structure of most farms.

Characteristics of the Hired Farm Work Force

Because the peak demand for seasonal labor occurs at different times for different commodities and regions, and the seasonal farm work force is comprised largely of local residents, many more people do hired farmwork at some time during the year than are at work at any one particular time. This is abetted by high labor turnover, especially among seasonal workers. In 1977, while hired farm employment was 817,000 in January and 1.87 million in July, approximately 2.8 million different people did some hired farmwork at some time during the year. The size of the hired farm work force has remained relatively stable in the seventies after a gradual but long decline.

The hired farm labor force epitomizes the classical secondary labor market profile: weak labor force attachment, high representation of racial and ethnic minorities, youth, and women, and low level of education. More than half (54 percent) of the hired farm work force are not in the labor force most of the year; more than one-third (39 percent) are students most of the year. Employment tenure is very low: 41 percent worked 25 days or less in agriculture during the year. Only 40 percent of those 25 years of age and older (largely eliminating students) had completed high school. One quarter were racial and ethnic minorities. Only 39 percent were heads of households or single individuals; the remainder were spouses or other family members. While data on undocumented alien employment in agriculture are not available, a significant proportion of the illegal aliens who are apprehended are employed in agriculture.

A substantial portion of the hired farm work force are seasonal workers. In 1976, only 12 percent worked 250 days or more in agriculture and fewer than one-quarter worked as many as 150 days at farmwork. Even some of those workers who did substantial amounts of farmwork were seasonal workers who pieced together a sequence of temporary jobs. Few demographic distinctions can be made between the short tenured and longer tenured workers, other than the fact that women are more likely to be temporary workers. Migratory workers, who constitute about 8 percent of the hired farm work force, average slightly more days of work and slightly higher annual earnings than nonmigratory workers, because nonmigratory workers are preponderant among the shortest tenured seasonal workers.

Most hired farmworkers are also low-skilled manual workers. The occupational category of farm laborers and farm foremen has ranked second only to domestic household workers at the bottom of the income scale for many years. In 1976, all hired farmworkers averaged $2,859 in annual earnings from all sources, $1,652 of it from farmwork. Even those workers who averaged 250 days or more of hired farmwork received only $6,480 in earnings from all sources in 1976. Hired farmworkers' earnings are kept

low by a potentially large supply of unskilled workers, the highly competitive structure of an industry with many small producer employers, and the lack of organization and bargaining power among workers. On the other hand, agricultural employment is one of the last remaining major employment opportunities for youth, low-productivity rural workers, and persons unwilling or unable to cope with the regimen and discipline imposed by a highly industrialized society.

Foreign workers have been legally employed in seasonal agricultural work in the United States for many decades. The most recent organized program to recruit and admit them was the Bracero program, which admitted large numbers of primarily Mexican workers to work chiefly in the West. The number of foreign agricultural workers in the United States employed under this program peaked at more than 300,000 in 1959. However, the program was the target of bitter criticism by domestic farmworker groups, and was allowed to terminate by Congress in 1964. Since that time, reported employment of foreign nationals has dwindled rapidly, and dropped below 9,000 workers in the late sixties. The numbers later increased somewhat, exceeding 20,000 workers in the early seventies, but then fell to about 15,000 for the past few years. Legally admitted foreign workers were used in only four agriculturally related activities in 1978—apple harvest on the Eastern seaboard, woods work in several Northeastern States, sugarcane cutting in Florida, and sheepherding in several Western range States.

Emerging Agricultural Labor Issues

The same technological factors that affected agricultural employment also had an impact on capital and land in agriculture. Unquestionably agriculture is moving toward greater specialization in factor supply, and away from the situation in which all factors are supplied by the farm operator household. The traditional pattern of a hired hand who moved up to tenant farmer and then graduated to a farm operator, is now past. The current reality is a permanent, hired class of agricultural workers, who are performing more and more of the labor, as the farm operator shifts into a managerial role.

This development has important implications for agriculture and particularly for farm operators. If inputs, including labor, are to be increasingly obtained in the marketplace, it becomes imperative that efficient marketing channels exist, and that the managers know how to use these channels. This means that managers must learn techniques for recruiting, supervising, compensating, training, negotiating labor contracts, and all other aspects of labor management. There is an increasing potential for labor-management conflict that did not exist when labor and management consisted of the farm operator and his family. This potential requires that farm operators consider methods of resolving such conflicts, including collective bargaining. Such requirements in turn call for managerial expertise in labor relations, creating additional pressure for more specialization of management input.

Collective bargaining as a method of resolving labor-management conflicts in agriculture has made some headway in recent years, aided by favorable legislation in some States, particularly California. (Federal collective bargaining legislation does not cover agriculture.) However, the geographic dispersion of much of the agricultural labor force, the lack of an organized employer group to bargain with, and the weak labor force attachment of many agricultural workers will probably limit labor union growth in agriculture in all but a few areas that have large concentrations of workers.

Many of the same technological and social developments that had a profound effect on the farm have also affected nonfarm industry and rural society. Agriculture's rural location limited the available local labor force. It also meant that farm operators did not have to compete with nonagricultural firms for the rural labor force. However, over the past several decades, the rural population has become much more mobile and

much more industry has moved to rural areas. These trends, coupled with the urbanizing effects of mass communications, school consolidations, and other social developments, have forced agriculture into direct competition for labor with a wide range of nonagricultural employment, and produced an "industrial" labor market, even in many rural areas.

Increased levels of public support for low-income persons have undoubtedly helped to increase the employer costs at which the lowest-paid workers in the rural labor force will make themselves available for work. Employers of low-skilled and seasonal agricultural workers thus have to consider not only alternative nonfarm employment opportunities but also social welfare programs in setting competitive minimum employment standards. In addition to the welfare and income maintenance programs available to the general population, some Federal programs are targeted specifically for migrant and seasonal farmworkers to help improve their living and working conditions. These programs provide the workers and their families with educational opportunities, farm and nonfarm job training, job placement services, family counseling, child care, and free or low-cost health services.

The increased industrialization of agriculture, the development of an agricultural working class, and the dilution of agriculture's political strength have resulted in the gradual extension of protective labor legislation to agriculture. Beginning with Social Security coverage, and extending to minimum wage legislation, Workmen's Compensation, Unemployment Insurance, and others, most of the original blanket exemptions for agricultural workers have been eliminated from Federal and State labor legislation. Coupled with a growth in worker protectionism throughout the economy, particularly in the area of occupational health and safety, the rate of growth in farm labor legislation and regulation has been rapid.

Much of this legislation and regulation now covers only large farms. Agricultural exemptions based on minimum numbers of workers or amount of payroll still exist in almost all labor legislation; such exemptions make agricultural coverage less comprehensive than coverage in nonagricultural industries. However, while most programs leave many small *employers* uncovered, they cover substantial proportions of total agricultural *employment* and *production*, as well as most nonfarm employment. This creates a competitive norm for all employers. Rather than disadvantaging larger farms, the managerial burdens imposed by these measures fall hardest on small employers because of the specialized knowledge required to deal efficiently with labor management and regulation. The cost of acquiring and maintaining this expertise creates, in essence, another fixed cost to be spread over all units of production.

Thus, while labor is available to agricultural employers in a physical or numerical sense, the economic and managerial costs of acquiring and retaining a farm labor force have risen rapidly. That farmers feel that the labor supply is drying up and that things were better "in the old days," is a predictable result.

The agricultural labor environment seems to have stabilized in the late seventies. The pace of mechanization has abated and employment is relatively steady. Changes in the next decade are likely to be less chaotic than in the fifties and sixties, and will probably reflect the gradually increasing separation of labor and management rather than the dramatic impact of technological development. Farm management will have to accommodate a regulated labor market, direct competition with nonfarm employers, and the potential of labor-management conflict. A few agricultural activities, especially tree fruit harvesting, still require large amounts of manual labor and may experience major dislocations produced by mechanization though no technological breakthroughs are foreseen. The developments in the farm labor market favor continued growth of large, technologically and managerially efficient operations at the expense of smaller ones. On the whole, however, it appears

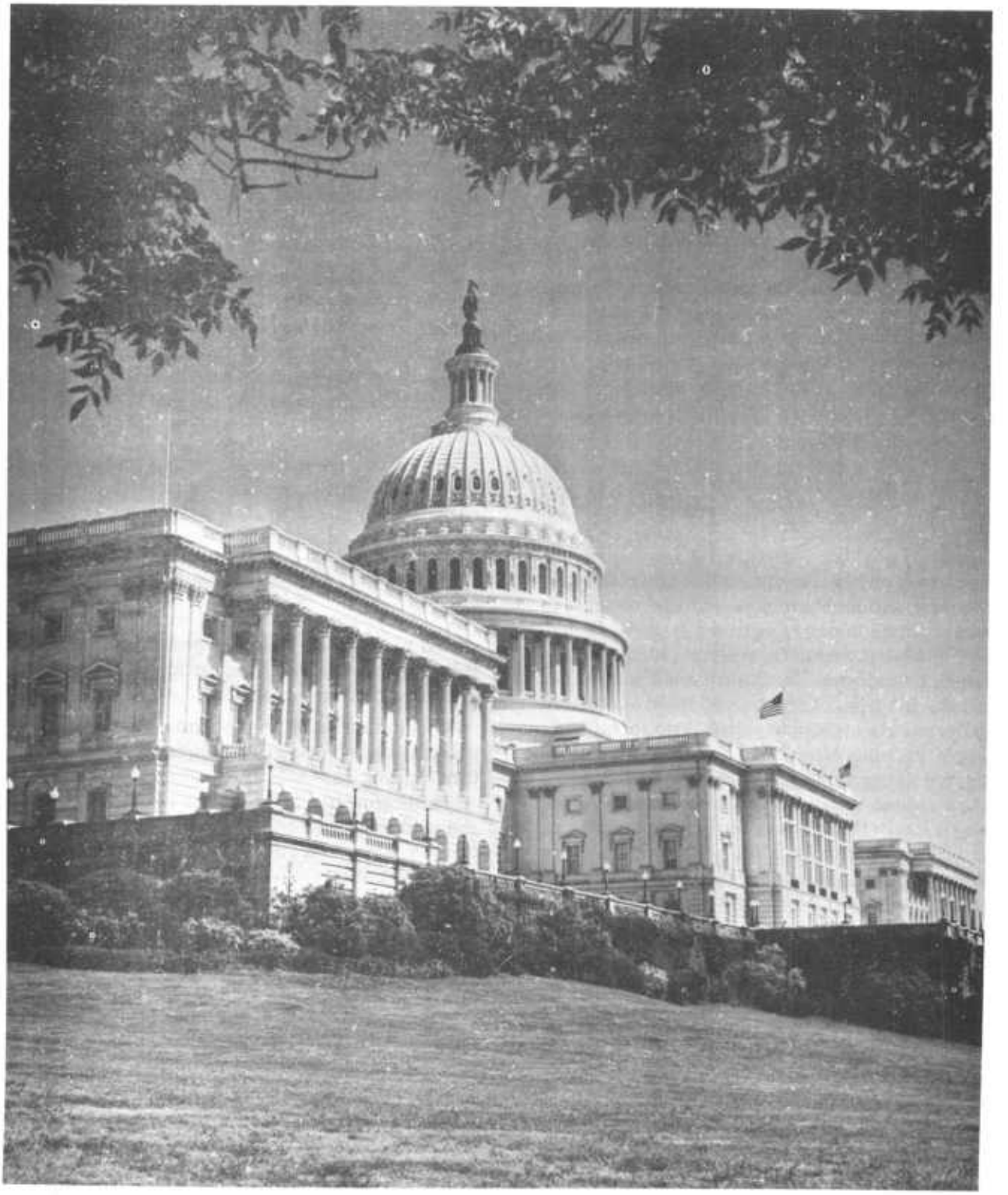
that developments in sectors of the farm economy other than labor, will be the main influence on the economic structure of farming, and of farm employment patterns, in the coming years.

FUTURE ROLE OF LABOR

The labor market is not likely to be a significant influence on the future structure of American agriculture. Labor availability and cost will exert some influence on farm size and structure in regions where farms have traditionally been large and in labor-intensive commodities, such as fruits, vegetables, and horticultural crops. In the emerging farm labor environment, farm operators will need to be increasingly skilled in labor management and labor relationships.

The modern commercial farm was shaped by the technological revolution in agriculture, which began after the Civil War and instigated a long process of evolution toward large, specialized farm operations that are market oriented and capital intensive. These changes, accompanied by a substantial reduction in both farm family labor and hired farmworkers, have created a permanent agricultural working class. At present, the rate of decline in family employment has slowed and hired farm employment has stabilized. Family employment still dominates agriculture, but farm operations have expanded by increasing the amount of hired labor used, thereby creating an agricultural working class, comprised chiefly of seasonal workers.

Public Policies



U.S. Tax Policy And Agricultural Structure

ESCS Staff

INTRODUCTION

The structure of agriculture has changed over the last several decades. The number of farmers has decreased sharply, farms have grown larger, capital requirements for entry have inflated faster than other costs, and the traditional family farm now seems in danger of disappearing. Some analysts have suggested that Federal tax policy was at least partially, if not largely, responsible for these developments. This article describes these tax policies. It is not intended to resolve any issues, rather, to lay out the assertions and list the issues raised about income tax, estate and gift taxes, and other tax features.

For as long as the United States has taxed incomes, farmers have been entitled to report farm income under rules that give some freedom in choosing the time for realizing income and taking deductions. Certain rules allow specified capital investments to be deducted as current expenses. Assets whose status is doubtful and whose cost has often been deducted may also be treated as capital gains. When these rules are manipulated to the taxpayer's advantage, it seems likely that the tax burden on farming income is less than it is for many other sectors. Such thinking has led to a number of assertions about the impact of income tax laws on the structure of agriculture:

- The tax law encourages growth and expansion of existing operations.

- Farm income is so highly favored for tax purposes that nonfarm capital has been drawn into the farm sector. As a result, farmland prices are higher than they would otherwise be, some products are in greater supply and lower priced than they would otherwise be, and absentee ownership has increased.

- The income tax laws favor certain kinds of farm assets over others. Investment in farmland, certain improvements to farmland, and certain animals is encouraged over other farm investments.

- High-income taxpayers tend to benefit from most tax laws more than lower income individuals. As a consequence, increasing quantities of farm assets are falling under the control of a decreasing number of high-income owners.

- Because some tax benefits are available only to owners as distinguished from operators of farm assets, the tax laws encourage legal arrangements for ownership and operation in ways that may not be desirable. Syndications and corporations, for example, are said to be encouraged.

- The tax incentives for capital investment and the higher tax burdens on labor (Social Security, Unemployment Compensation, and Workmen's Compensation) are said to affect the mix of capital and labor employed in agriculture.

- Before-tax economic losses can be converted to after-tax profits. Operations that offer this opportunity to a select group of taxpayers are encouraged as a result.

- Tax-motivated buying and selling alters the patterns and timing of transactions in agricultural inputs.

These concerns over income tax laws have changed little over the years. The 1976 legislation on estate and gift taxes, however, has raised new questions:

- Does the preferential valuation of farmland for estate tax purposes make farmland a more attractive investment, driving prices higher? If so, for whom?

- Does the deferred payment of estate taxes, allowed some farming enterprises, attract outside capital? Does it have an impact on farm size or conflict with preferential valuation?

- Does carryover basis discourage sales of farmland and restrict the amount offered for sale?

THE INDIVIDUAL INCOME TAX

The U.S. income tax is a progressively graduated tax imposed on net income for a particular year. Although determination of net income is difficult, a general set of principles has evolved, applicable to most businesses. Two of these principles are particularly important for agricultural investments because they are not required of farmers.

Cash Accounting

Generally, if income is produced by the sale of goods, only the net profit, that is, the sales proceeds less the cost of the goods sold, is taxed. Costs associated with unsold goods, which have produced no income, may not be deducted from income produced by other sales or activities. This matching of income with its related expenses is accomplished through "accrual" accounting.

Under accrual accounting, sales are said to produce income and be subject to tax when the goods are delivered and the buyer is obligated to pay, even though payment is not made until some time later. The costs and other expenses related to all goods are taken into account when the obligation to pay them becomes fixed. At the end of the year, these total costs are divided between those related to sold and unsold goods. The unsold goods—those on hand at the year's end—are counted first, and their cost established. This cost is then subtracted from the total costs for the year, and the amount left is said to be the cost of the goods sold. This amount is deducted from the sales, and the difference is the net profit on the goods sold. This amount is subject to income tax. The expenses of earning income are matched against the income they produce.

This accrual technique can be used only where the goods on hand can be counted and their cost determined; that is, the goods can be valued. In many industries, rules of thumb and other approximations are used. This process is known as taking inventory, the goods on hand are inventories, and the cost established is the inventory value.

In farming, however, the Government has not required accrual accounting. In the early days of the tax system, most farmers did not earn enough to require payment of tax. It was thought that valuation of goods would be difficult for farmers, who had little access to professional accounting help. Thus, they were allowed to use cash accounting in reporting their farm income and expenses.

Under cash accounting, income becomes taxable when it is received in cash. Expenses are deducted from this income when they are paid. Inventories at year's end are ignored. Income and the expenses of producing it are properly matched only where expenses are paid in the year of production and all products are sold for cash in the same year. In other cases, the cash received this year may have been produced by last year's sales, and the expenses paid this year may relate to next year's crops. In fact, a common method of reducing taxable income is to purchase fertilizer, seed, and other supplies in the current year to be used in the following year. This mismatching of income and expenses is important because income is reported annually and because the tax system is a progressive one where tax *rates* increase as taxable income increases.

The first of these points can be illustrated simply. Suppose that in 1979, a taxpayer grows a grain crop with a value of $1,000 which cost $900 to produce. The profit is $100. If the taxpayer sells the crop in 1979 but does not receive payment until 1980, and if he pays all his expenses in 1980, he will not pay any tax until he files his 1980 tax return in 1981. If expenses were paid in 1979 but the taxpayer did not receive the cash until 1980, he has $900 of expenses in 1979 and $1,000 of income in 1980. The tax results may also be reversed by getting cash for the crop in 1979, when income would be $1,000, and paying the $900 in expenses in 1980.

The second point is that the tax system is progressive; the rate of tax depends on income

in the year the cash is received or expenses are paid. Suppose that, in the above example, the taxpayer had $100,000 of other income in 1979 but only $1,000 in 1980. By paying expenses in 1979, he would save $630 and would pay only $140 in taxes when he received the income in 1980. If the order were reversed with the taxpayer receiving the $1,000 income in 1979 and paying the $900 of expenses in 1980, he would pay $700 in taxes on the income and save $126 in taxes in 1980. The differences in these two treatments are striking when compared (table 1). Case 1 matches the income against the expense and assumes it was received in 1979. In case 2, the expenses are paid in 1979 and cash is received only in 1980. The maximum tax benefit is realized. In case 3, cash is received in 1979 and expenses are paid in 1980. This is the least favorable tax treatment.

The tax results have a powerful impact on the cash left after taxes. If all events are recorded as they would be in other businesses, $30 remains after taxes. If favorable tax circumstances are used to the full advantage, this after-tax profit becomes $590. If the tax planning is poor, the taxpayer can be $374 poorer.

Numerous farmers and nonfarm investors in farm properties have become familiar with these rules. While few could consistently produce results as favorable as in case 2, many have learned in recent decades to use this system to their advantage.

Table 1—Cash accounting[1]

Item	Case 1	Case 2	Case 3
		Dollars	
Cash from farm sales received in 1979	1,000		1,000
Cash from farm sales received in 1980		1000	
Cash farm expenses disbursed in 1979	900	900	
Cash farm expenses disbursed in 1980			900
Profit from farm operations	100	100	100
Taxes on farm income due in 1979	70	–630	700
Taxes on farm income due in 1980	0	140	–126
Sum of taxes due in 1979 and 1980 on farm operations	70	–490	474
Cash left after taxes on farming operations	30	590	–374

[1] The examples assume that the farmer had $100,000 of taxable nonfarm income in 1979 (70 percent marginal tax bracket) and $1,000 of taxable nonfarm income in 1980 (14 percent marginal tax bracket).

Deducting Capital Expenditures

Exactly the same situation can exist where items other than inventories are involved. Some expenditures, referred to as capital expenditures, are made by businesses to benefit the operation over a long period of time, such as, the expenditure for the purchase of a building. Usually, such expenses may not be used to reduce taxable income in the year in which they are paid (cash accounting) or incurred (accrual accounting). If the items are used over a period of time, they are "depreciated," and a portion of their cost is deducted from income each year. Depreciation results in a matching of income against associated expenses. If these items are not used up, their cost is not deductible at all except from the sales proceeds when the items are sold.

Again in contrast to operators of other businesses, farmers have been allowed to write off (or deduct) the cost of some capital expenditures as these costs are incurred or paid. When capital expenditures are deducted rather than depreciated, income and expenses are not matched properly. To the extent that the deduction is more than the proper amount of depreciation, the situation is the same as the example in which the expenses were deducted in 1979 and the income taxed in 1980.

This inappropriate deduction for capital expenditures occurs in many farm situations. Costs associated with caring for vineyards prior to their producing grapes are capital expenditures but may be deducted. Similarly, the cost of raising a cow to maturity is a capital expenditure that can be deducted. These deviations from proper accounting are based on administrative rulings dating back to the earliest days of the income tax.

In addition, the Congress has from time to time passed legislation allowing deduction of items that are properly capital expenditures. Under Section 175 of the Internal Revenue Code, soil and water conservation expenses up to 25 percent of taxable income from farming may be deducted from income in any 1 year. There are also deductions for land clearing expenses (Section 182) and for lime and fertilizer (Section 180).

Capital Gains

Since 1921, gains and losses produced by the sale of capital assets have been specially treated for tax purposes. Today, these gains and losses are classified either as "short term" or "long term." Generally, a gain or loss is short term if it results from the sale of property held not more than 12 months, and long term if held more than 12 months. Net short-term gains are generally fully taxable, but net short-term losses may be deducted from income only up to $3,000 in any 1 year. The treatment of long-term gains and losses is different. Generally, only 40 percent of long-term gains and losses are considered for tax purposes—only 40 percent of gain is taxable and only 40 percent of a loss is deductible. Capital gains of losses usually refer to long-term items rather than short-term gains or losses.

With these differential tax treatments, controversy sometimes exists over what constitutes a capital asset that produces capital gain or loss. Without laying out hard and fast rules, we can say that most property that is not either inventory or property used in a business is a capital asset. Even though property used in a trade or business is not a capital asset, *gains* from property used in a business are treated as if they were gains from capital assets—under certain circumstances. In those cases, only 40 percent of the gains realized from sales of property used in the business are taxable. For farmers, most assets associated with the farm except inventories are property used in the business and thus will produce capital gain if held more than a year. Horses and cattle must be owned 2 years to receive this treatment. A substantial part of farm assets will, if sold at a gain, produce long-term capital gain. Some observers believe that some farm assets, most notably livestock, are treated as property used in the business and thus yield capital gain, when in fact they are similar to inventory.

Putting It Together

When all tax rules are considered together, there are generous tax benefits for farmers. The best combination seems to be an investment that produces fully deductible expenses and yields income taxed as long-term capital gain. These benefits are greater, the higher the tax bracket of the investor. Because of this, the higher bracket taxpayer can break even at price levels that would bankrupt taxpayers in lower brackets. For example, if $1,000 of ordinary expense deductions that will later yield capital are incurred by three taxpayers, one each in the 70-, 50-, and 20-percent brackets, the after-tax break-even points for them appear in table 2.

Table 2—Examples of break-even points by tax bracket

Item	Income tax bracket		
	20 percent	50 percent	70 percent
	Dollars		
Expenses	1,000	1,000	1,000
Tax benefit from deducting expenses	200	500	700
Unrecovered costs remaining after deduction	800	500	300
Amount that must be realized on sale of asset to recoup unrecovered cost and pay tax incurred on sale	870	675	417

Some farmers have learned to use these rules for their benefit. For those who are not farmers, devices have been designed to take advantage of the tax benefits. These include agency agreements, partnerships, and syndications founded on the principle that tax benefits can be bought and sold. In the last 10 years, however, efforts have been made to preserve these benefits for legitimate farmers while excluding others.

In 1969, the excess deductions account (EDA) was enacted to convert some capital gains to ordinary income where it was believed that the accounting rules produced tax losses that were not economic losses. In the 1976 act, the Congress largely laid EDA aside. Rules requiring syndicates to capitalize certain expenses and limit losses to the amount at risk were enacted. Some corporations were required to forego cash accounting as well as capitalize some expenses. These rules make the tax law tremendously complex. Nevertheless, few sophisticated observers believe that the benefits have been confined to the true family farmer. Other observers believe that, even if benefits were so confined, family farmers vary so much that some still benefit more than others.

ESTATE AND GIFT TAXES

Until the mid-to-late sixties, few farmers had sufficient net assets to incur Federal estate tax liability. Since then, however, increasing land and capital requirements for farming coupled with chronic inflation have made farm families increasingly subject to estate tax. Apprehensions about the effects of the estate tax mounted until 1976, when a general movement—strongly supported by the farm sector—succeeded in modifying the Federal estate tax provisions.

Three provisions of the 1976 act are of particular interest. Two are estate tax provisions enacted to give farm estates special relief, although neither provision is confined to farms. The third is an income tax provision so closely related to estate taxes that it is discussed in connection with estate taxes.

Use-Value Assessment and Deferred Payment of Taxes

The estate tax is a progressively graduated tax levied on the net value of assets in the decedent's estate. Net value generally equals the full market value of all assets minus any liabilities and expenses. In response to farm groups' claiming that the market value of farmland was greater than its value for producing agricultural products, the 1976 act allows some farm estates to value farmland at its use value rather than at its market value for estate tax purposes.

While there are two alternative techniques, the most likely method is to divide the average annual gross cash rent (less property taxes) for comparable land by the average annual effective interest rate for new Federal Land Bank loans. Because the value established in this way is expected to be lower than the market value of the land, the estate tax should be lower than if market value were used. This technique may not, however, reduce the value of the estate on which the tax is imposed by more than $500,000. Although the exact amount of tax reduction will depend on the size of the estate and its composition, some observers have estimated that use valuation can reduce farmland values from 40 to 70 percent, perhaps even more.

Deferred Payment of Estate Taxes

Before the 1976 act, estate taxes generally had to be paid 9 months after death. This due date could be extended for 1 year in most cases, up to 10 years in others. The 1976 act liberalized these rules slightly. It also prescribed a new set of rules for estates of farmers or other small businesspeople. If the interest in the small business or farm amounts to 65 percent of the estate, the tax on the small business or farm may be paid in 10 equal installments, the first payment due 5 years later than would otherwise be required.

Effects of Farm Estate Tax Preferences

Consider the case of a farmer with a $1 million estate consisting entirely of real estate.[1] Without either of the provisions discussed here, the tax would be $298,800. If the executor were to value all the land for estate tax purposes at its use value, the value of the estate could be reduced by $500,000. One may then assume that the taxable estate would be $500,000. The tax on this estate would be only $108,800. The special valuation thus would produce a savings of $190,000.

All of the estate would qualify for the deferred payment of taxes, and the executor could choose to pay even the reduced estate tax in 10 annual installments beginning 5 years after death. Interest would accrue at a 4-percent interest rate. Since the market rate of interest would quite likely be above 4 percent, each payment represents an additional savings to the heirs. Indeed, the present value of the estate tax of $108,800 payable in this way when the market interest rate is only 7 percent is reduced to $58,310.

These provisions provide a powerful incentive for individuals to minimize their Federal estate tax by buying farmland. The Congress attempted to safeguard these provisions by passing restrictions on the use of these farm preferences. Before the "use-value" assessment can be used, the property must have been in its present use for 5 of the 8 years preceding the owner's death; he (or a member of his family) must have participated materially in its operation for the same period, the property must pass to a qualified heir, and the value of the farm must comprise at least 50 percent of the adjusted value of the gross estate. The benefits are recaptured in full if the property is transferred to nonfamily members or if its use is changed from the approved use in the first 10 years following death and recaptured in part for 5 years after that. There is thus a definite incentive for investment in farmland.

[1] The marital deduction is not taken into account here.

Carryover Basis

Before the 1976 act, appreciation on property that was unrealized (that is, accrued on assets not sold) during an individual's lifetime was not taxed under the income tax. The tax basis of the inherited property was "stepped up" to its fair market value when the property passed to heirs. When the heir later sold the inherited property, the gain was the difference between the sales price and the stepped-up value of the property at the time it was inherited from the decedent. Under the new "carryover" basis rules,[2] property does not receive a new basis at death. Rather, the decedent's basis carries over to the person inheriting the property. If the property is later sold, the heir uses the decedent's basis for computing gain or loss. The carryover basis provisions do not apply before 1980, however, and there is speculation they will be repealed.

There were a number of arguments for adopting the carryover basis provision. Many tax authorities felt that the stepped-up basis was a major tax loophole through which billions of dollars passed untaxed each year. Many also felt that, since the new law substantially lowered the estate tax, it was an appropriate time to introduce changes which would raise some revenue and increase tax equity. The carryover basis represented a compromise: Some advocates sought the taxation of asset appreciation at death while others wanted to retain the stepped-up basis rule.

Opponents of the old stepped-up basis approach argued that it was inefficient because it created a "lock-in effect." Older persons were discouraged from selling appreciated assets because tax considerations made bequests more advantageous. Their families could avoid income tax on the appreciation if sales were postponed until after death.

The validity of this argument seems doubtful. If the older generation is truly locked in, the carryover basis would seem to perpetuate this

[2] Appreciation deemed to have occurred prior to 1977 is added to carryover basis. This protects appreciation that occurred before the law was changed.

condition for the younger generation, especially if farmland values continue to appreciate at rates comparable to the past decade. The new requirements provide a permanent disincentive to sell appreciated property, a disincentive which becomes greater the longer the property is held if the property's value continues to appreciate.

MISCELLANEOUS TAX MATTERS

While there is a consensus that these income and estate tax provisions are the major tax factors affecting the structure of agriculture, several other matters have some impact.

Taxes on Capital and Labor

The investment tax credit, accelerated depreciation, minimum wages, and unemployment compensation and FICA taxes are considered together. All have an impact on the structure of the farm sector because they may affect the mix of capital and labor in agriculture. Too, the investment tax credit and accelerated depreciation encourage the use of capital by offering a tax incentive for capital purchases. Moreover, the tax incentive increases with the size of the taxpayer's income, due to the graduated Federal income tax. The other three—minimum wage, unemployment compensation, and FICA taxes—increase the cost of labor-intensive modes of production by assigning the farmer some of the costs that laborers formerly had to bear. The net effect may be a substantial tax inducement that encourages the use of capital and discourages the use of labor. Cumulatively, these tax features may lead to larger farm operations.

The Corporate Income Tax

While there are a few large corporations in farming, most corporate farms are as much "family" farms as any farms operating as sole proprietorships. There are differences in business organization, however, and tax planning seems to encourage some farmers to incorporate. Farm businesses seem to incorporate for three important tax reasons, but none of the three is directly related to the nature of farming.

One involves the corporate income tax rates. With the individual income tax, the marginal tax rate gradually increases from 14 to 70 percent as taxable income grows. In the corporate income tax structure, the brackets are much larger than they are for the personal income tax, and the tax rates are generally lower than the individual rates for taxable incomes over $12,000. Profits that are not withdrawn through dividends can be accumulated for expansion at lower rates than if the profit had been taxed at the individual rate. If dividends are paid, the "second tax" on distributions will increase the total tax burden over direct taxation to the shareholders. In many cases, however, the stock in the corporation can be sold to others, and the total of the corporate tax and the capital gains tax on the sale of corporate stock will be less than the tax that would have been paid on the farm income if earned directly by the shareholders.

A second tax incentive for farm businesses to incorporate flows from the estate and gift tax. Under the law, an individual may transfer up to $3,000 a year to any other individual in his family free of gift tax. An individual and a spouse may transfer $6,000. Thus, if a couple has two children, each year they may make gifts of $12,000 free of tax. Several years of this practice could lead to the transfer of an entire farm, or a substantial portion of one, tax free. Farm businesses, however, do not lend themselves to these piecemeal transfers because physical division of the farm is rarely feasible. But transfers of small portions may be achieved without physically dividing the farm by incorporating and then transferring shares of stock in the corporation each year.

A third tax incentive involves "fringe benefits." Many of these benefits can be deducted by the corporation but need not be included in the employees' gross income, even if they are shareholders. A corporation may then provide a greater amount of these fringe benefits to its owner-operators at a lower after-tax cost than a

noncorporate business can. For example, self-employed individuals and partners in a partnership are limited to annual contributions of $7,500 or 15 percent of their income, whichever is less, in tax-sheltered "Keogh" retirement plans. In contrast, corporations may establish much more generous plans and receive deductions for contributions to them.

TAXATION OF INVESTMENT BY NONRESIDENT ALIENS

U.S. tax laws said to encourage the purchase of American farmland by nonresident aliens have become the focus of recent concern. The tax law applicable to investment by nonresident aliens is not uniform. For residents of countries with which the United States does not have treaties, the Internal Revenue Code lays out the rules for taxation. When treaties have been negotiated with the alien's home country, the treaty governs the manner in which the alien is taxed.

The Internal Revenue Code, as distinguished from a treaty, imposes a 30-percent withholding tax on gross income from a *passive* investment, including land rental. Deductions are not allowed, and long-term capital gains are excluded from the tax base. If, instead of flowing from passive investment, the income is effectively connected with a business operated in the United States, the withholding tax does not apply. Instead, the net income of the business is taxed under the regular rate schedules, and the regular deductions are allowed. A capital gain effectively connected to a business is also subject to tax in the usual way, but other capital gains are not taxed. If a nonresident alien has passive income from real estate, the alien may choose to have it taxed as a business. If so, the 30-percent withholding tax gives way to the usual rate on net income, and capital gains effectively connected to the business are taxed. Once one has chosen to be taxed in this way, no further change may be made.

Treaties often modify these arrangements. Most treaties lower the withholding rate on passive income to some amount lower than 30 percent, and provide that capital gains of a nonresident alien out of the country at least half the year are taxed only if the capital gain is effectively connected to a permanent establishment in the United States. The major difference, then, is that capital gains are not taxable merely because they are connected to a business, but must be connected to a permanent establishment. A permanent establishment requires more ties to the United States than does the mere operation of a trade or business. A treaty is also likely to offer the choice of taxing income from real estate as business income rather than passive income. If so, real estate capital gains would be taxed if effectively connected to a permanent establishment.

The election for real estate income to be taxed as a business probably would be exercised in cases where there were any significant expenses, as in most share cropping arrangements. If so, capital gains resulting from the sale of farmland would probably be taxed only if the nonresident alien has a permanent establishment in the United States. There are planning devices, however, that may allow the gain to go untaxed even in these circumstances.

In general, results in particular cases turn on treaty provisions. There are then no easy comparisons between American and foreign investors. Since the results do depend on treaties, the Congress' power to modify these arrangements unilaterally is also open to question.

EFFECTS OF TAXATION ON AGRICULTURE

A recent study measured differential tax effects by comparing average tax rates for three different socioeconomic classes, through use of the Brookings MERGE microeconomic synthetic data file. The study sheds some light on the aggregate effects of Federal taxation on agriculture. The personal income tax, corporate income tax, sales and excise taxes, payroll taxes, property taxes on land and improvements, and indirect taxes were considered. These taxes were not directly compared to individual taxable in-

comes to determine average tax rates, however. Both individual tax liabilities and individual incomes were adjusted so that the variables corresponded to economic concepts of real tax liabilities and income received within a specific period. Tax liabilities were imputed based on economic theory about the "shifting" of each separate tax to determine the eventual "bearer" of the levy. A somewhat more comprehensive definition of income was calculated for each individual. The ratio of these two variables was then used to compare across the different socioeconomic groups.

Three socioeconomic groups were compared: the total population, families who reported some farm income, and families who had over half their income from farm sources. Some interesting differences emerged. The tax burdens are progressive for the first two, the total population and families who report some farm income, but they were essentially proportional for the group who had more than half their income from farm sources. Furthermore, the tax differential appears almost entirely due to the differences in the Federal taxes each group pays—hardly what one would expect from a Federal tax system which is generally considered more progressive than the State and local tax system.

These results suggest a number of preliminary conclusions about the overall effect of the tax system on agriculture. First, it appears that farmers do enjoy significantly lower tax burdens than nonfarmers. Families with more than half their incomes from farm sources would have paid nearly $1.1 billion dollars more in taxes if their tax burdens had been commensurate with the tax burden of the general public. This differential is a significant portion—16 percent—of the total tax these families actually paid, $6.9 billion. Second, the Federal tax system appears responsible for most of the difference in total tax burdens. This seems to indicate that farm tax preferences do affect tax liabilities on farm income. Third, the gap between farm and nonfarm tax burdens seems to widen as income increases. This phenomenon is striking for families reporting more than half their income from farm sources, as well as for families reporting some farm income.

The major beneficiaries of the special farm tax preferences thus appear to be a narrow group, not necessarily the class the Congress intended to aid. Of course, these tax concessions may have advantages that go beyond their distributional effects, since tax reductions may be passed on to consumers in the form of lower agricultural prices. Nonetheless, there seems to be a basic self-defeating nature to preferential tax rules for an industry such as farming where there are few requirements to qualify for the special rules. These rules provide little benefit to the intended target group.

Ownership and Land Use Policy

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INTRODUCTION

Farming's reliance on land sets it apart from almost all other businesses. Agricultural land space is limited, as are the ways to parcel it out among a given number of farm operators. Thus, the two most common parameters used to describe the structure of American agriculture—number of farms and average size—also describe how farming is spatially organized within the country or its regions.

Land has other characteristics that give it a special role in any consideration of agriculture's structure:

- The amount of land available for cultivation in the United States is essentially fixed; it can be increased only slowly and at considerable expense.
- Nearly all farmland in the United States is privately owned—99 percent of the cropland and over three-fifths of the pasture and rangeland. Of the 2.3 million farm operators counted by the 1974 Census of Agriculture, slightly over 2 million owned at least some of the farmland they operate. About 300,000 of these operators also lease (or sublease) farmland to other farmers. According to the 1978 ESCS Landownership Survey,[1] the Nation's privately owned farm and ranchland is held by some 6.2 million ownership units (a unit can be an individual, a partnership, or a corporation). Thus, there are considerably more farmland *owners* than there are farm *operators.*
- Although the majority of farm operators own some farmland, it is not correct to equate "operatorship" with "ownership." Farming is characterized by a diversity of tenure arrangements in which operating control is frequently separated from the ownership of land. In fact, full owner-operators (farmers who operate only land they own) account for only slightly over one-third (35.3 percent) of all land in farms. On the remaining part-owner and tenant-operated farms, at least two parties make most land use decisions.

Thus, with limited exceptions, the supply of farmland is fixed and in the hands of private landowners, not all of whom are farm operators. These basic relationships suggest that the control points for public policies designed to affect structure may not necessarily be the same as those for traditional farm policy. Policy formulation must explicitly take landownership and land use into account.

CURRENT PATTERNS OF LANDOWNERSHIP

The stakes in questions of land distribution are not small. And the current distribution of landownership is much more concentrated than most people imagine. The recent survey by the U.S. Department of Agriculture gives a picture of farm and ranchland ownership.

Farmers own almost half of all land, and 56 percent of the farmland. Retired people own 17 percent of the farmland. White and blue collar workers together own about 22 percent, some of them farming their land. Only in the Northern Plains and Mountain States do farmers own significantly more of the land than in the Nation as a whole. But in the Southeast and Appalachian regions, farmers own less than 40 percent of the land that is farmed. Families and individuals own about 92 percent of the farmland through proprietorships, partnerships, and corporations; nonfamily corporations own about 2 percent. In the Mountain, Pacific, and Southeast States, nonfamily corporations own from 4 to 6 percent of the farmland. In most other regions, they own considerably less than 2 percent.

But the distribution of ownership of farmland is uneven. The 3.6 million farms of less than 50 acres are 57 percent of all farm units but they

[1] Economics, Statistics, and Cooperatives Service. *Who Owns the Land? A Preliminary Report of a U.S. Landownership Survey.* U.S. Department of Agriculture, ESCS-70, Sept. 1979.

have only about 6 percent of farmland. The 1.6 percent of the farm units that are over 1,000 acres include 34 percent of the farmland. The 0.2 percent over 5,000 acres have 14 percent of the farmland. Five percent of the landowners own slightly more than half of all farmland. The largest 5 percent of landowners own 70 percent of the land in the Pacific States and 66 percent of the land in the Mountain States.

THE EVOLUTION OF OWNERSHIP POLICY

Thomas Jefferson's support of the Lockean view of property as a natural right of man strongly influenced the early policy of the United States. Widespread property ownership and owner cultivation were logical policy extensions of such a philosophy. The Federal Bill of Rights in 1791, the Preemption Act of 1841, the Homestead Act of 1862, and the Hatch Act of 1887 all encouraged widespread landownership. Although somewhat diluted, Jefferson's philosophy remains strong after two centuries, despite the fact that the conditions under which it was nurtured have changed radically.

The Tenancy Crises of the Twenties and Thirties

During the early years of the Nation, public policies were aimed at transferring lands in the public domain to private ownership. Even with free land available on the frontier,some tenancy existed. In 1880, one-fourth of all farmers were tenants. Over the next half-century, this proportion increased dramatically. Following the economic depressions of post-World War I, it reached a peak (42 percent) in 1930. During the thirties, there was widespread concern over this rise in tenancy and the declining equity in farm real estate of farm operators. Although many social and financial factors were involved with the growth of tenancy, the structural issue of this period was loss of control over land. Farmers saw their opponents as banks, insurance companies, and landlord/financiers. The Reconstruction Finance Corporation, the Farm Credit Administration, the Emergency Farm Mortgage Act of 1933, and the Farm Credit Act of 1933 were designed to help redress the financial situation of farm operators during this period. Later, the President's Farm Tenancy Committee and the Bankhead-Jones Farm Tenant Act also addressed ownership issues.

Post-War Adjustments of the Fifties and Sixties

From a land tenure perspective, probably the most significant structural adjustment after World War II was the emergence of the part owner-operator. From 1945 to 1969, the percentage of part-owner operators increased from 11 to 27 percent, while the share of land they operated rose from 33 to 52 percent. Over this period, the proportion of tenants decreased from 32 to 16 percent and the number of farms fell from 5.9 to 2.7 million. The absolute decline in tenant-operator numbers was substantial.

These changes in farm numbers and tenure helped mitigate many of the tenure and control issues of the thirties. The exodus of a large number of farm operators paved the way for farm consolidation and expansion. Many departing farm operators retained ties with agriculture and became landlords or creditors to those remaining. Other landlords were retired farmers and widows or other heirs; a significant portion of the leases involved interfamily rental arrangements. Farm consolidation occurred more in operating units than in ownership units, although many farms did increase their ownership base. In this setting, the separation of ownership and operating control was less threatening because it occurred largely within the agricultural family.

Many of the land use problems attributed to tenure uncertainty in the thirties also appeared less important to the part-owner—given his stronger bargaining position—than it had been to the full tenant earlier. During the sixties, a new concern emerged—intergenerational transfer of farm assets and the ultimate disposition of closely-held family corporations. But problems of landownership and control did not become major policy issues.

Separation of Ownership and Control—The Seventies

The fifties and sixties can be characterized as a period in which ownership and structural adjustments were accommodated within the agricultural sector. The early seventies began a period in which the sector became much more attractive to outside investors, and the problem of loss of control over land resources has resurfaced. Instead of banks and insurance companies, the antagonists are perceived as corporations and foreign investors specifically, and as absentee owners generally.

To date, the new antagonists are not well defined (corporations), numerous (foreign investors), or intrinsically "good" or "bad" (other absentee owners). Nevertheless, public policy actions have been taken. As of December 1977, 10 States had enacted legislation restricting corporate farming operations or their ownership of farmland. The intent was to protect the family farmer from unfair competition by large agribusiness corporations. Unfortunately, much of the debate surrounding the corporate farm issue is obscured by the semantic and practical difficulty of distinguishing between "good" and "bad" corporations.

The major source of information about corporate involvement in farming is the Census of Agriculture. In 1974, the Census reported 28,600 corporate farms (1.7 percent of all Census class I-V farms). Over 40 percent of these had sales of $500,000 or more; they accounted for nearly 10 percent of all farms in this sales class. The relative dominance of corporations in the high sales classes is not necessarily an issue, however, as most farm corporations, including the largest, are closely held by the farm operator and family. The structural issue seems more reasonably interpreted as one of control based on concern about dominance of the farm sector by outside corporations. In this case, there are no usable definitions ("agribusiness" is the closest, but inadequate), much less sufficiently precise data to deal with corporate control as an issue.

The outside control issue is more apparent for foreign investors. Since 1974, the Congress has passed three acts on foreign investment in the United States: The Foreign Investment Study Act of 1974, the International Investment Survey Act of 1976, and the Agricultural Foreign Investment Disclosure Act of 1978. The latter act addresses agricultural landownership explicitly and requires registration by nonresident alien investors in U.S. agricultural land. Several States have statutes prohibiting or otherwise restricting alien landownership. The General Accounting Office and the Senate Committee on Agriculture, Nutrition, and Forestry have also sponsored several studies. The scant empirical evidence available to date, however, indicates that foreign holdings of U.S. farmland are small.

In some cases, explanations of the foreign investment interest in the United States apply to domestic investors as well. Land prices have tripled since 1970, increasing 14 percent in 1978 and far exceeding previous record rates of increase. This increase occurred during a period in which stock market prices moved erratically and in which inflation seriously diminished the attractiveness of traditional investment. From an ownership perspective, the image of land as a superior inflation hedge is sure to attract additional farm and nonfarm investors. In 1977, a storm of protests and congressional hearings followed announcement of a proposal by two investment firms to create a mutual fund-type land trust for the purpose of investing in farmland.[2]

OWNERSHIP AND STRUCTURAL POLICY

Policy questions on farmland ownership and farm structure can be divided into two categories: (1) What should ownership policy be, and (2) how can consistency between ownership policy and structural policy be maintained?

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[2] Hearings before the Subcommittee on Family Farms, Rural Development, and Special Studies of the Committee on Agriculture, House of Representatives. 95th Congress, 1st Session, Ag-Land Trust Proposal, Serial No. 95-A, U.S. Govt. Print. Off., Feb. 1977.

What Should Our Ownership Policies Be?

A discussion of ownership policy must recognize that the Nation has a strongly-held ethos which favors widespread, unrestricted landownership. Although the general State policy of unrestricted real property ownership has been abridged in some cases by State prohibition or limitations on corporate or alien farmland ownership, the restrictions have been cautious and limited. At the Federal level, public concerns about foreign ownership of land have led to reporting requirements under the Agricultural Foreign Investment Disclosure Act but have stopped short of regulation.

Future ownership policies need not be bound by precedent, of course. Over the years, the concept of "absolute" private property rights has been modified by society—for example, in response to land use and environmental concerns. Private landownership can significantly aid the farm firm in obtaining credit, accumulating capital, or in managing farm risks. In considering agricultural structure, however, we need to recognize that no technical reasons exist for a farm operator to own any land.

Ownership policy can focus on either the owners or the amounts of land owned. For example, policies could restrict farmland ownership to certain classes of owners such as active farmers, or restrict the maximum amount of land any individual or family can own. With few exceptions, the United States has no explicit limitations on who may own farmland or on how much land any individual or firm may own, leaving decisions about ownership distribution and use of farmland to the marketplace. Although it is difficult to be definitive, this policy has probably resulted in a larger, more diverse set of landowners than if farmland ownership had been restricted, say, to active farmers.

Unrestricted farmland ownership may ease entry of young farmers into agriculture by assuring a larger pool of prospective landlords or land sellers. With many landowners, the opportunities for land monopolization and landlord exploitation is reduced. Unrestricted landownership attracts outside capital into agriculture and may result in income flows into agriculture (from nonfarm landlords) during hard times within the sector. Unrestricted landownership may help keep farm-generated capital in the sector over family generations, even though many heirs seek nonfarm employment. Widespread ownership spreads risks and wealth. To the extent that absentee owners or nonfarm investors have longer planning horizons than farm operators, their ownership should foster better stewardship and care of the land.

Small, fragmented landholdings may create problems for farm operators in "blocking up" contiguous or reasonably compact operating units. Consolidation of ownership parcels into larger ownership units, if needed later, also involves greater expense for negotiation, surveys, and dealing with holdouts. Farm operators renting from several landlords will have greater negotiation costs and may face greater tenure uncertainty compared with the full owner-operator alternative. Land and rental markets may become more volatile if there are many nonfarm investors and if returns on alternative investments fluctuate. Income may flow out of the agricultural sector, as well as out of the region or the country.

Consistent Ownership and Structural Policies

The popular conception of the family farm frequently assumes the full owner-operator tenure form. But full owner-operators hold only a third of U.S. farmland while there are many more farmland owners than there are farm operators. The difference between ownership and operatorship must be distinguished for three reasons:

- Policies designed to help present or future farm operators may primarily benefit current landowners instead. It is generally recognized that many of the benefits flowing from commodity price-support and similar programs tend to become capitalized into land values and thus are captured by the landowner. Where ownership of the land is separate from ownership or control over the other factors of production, such farm programs may alter the relative bar-

gaining position of the farm operator and landlord and result in a redistribution of income different from that intended by the policymaker.

- Policies designed to influence farm structure may have adverse or unexpected consequences for ownership. Examples of the adverse ownership consequences of structural programs can be found in many tax and land use programs. In 1976, for example, the Internal Revenue Code was altered significantly with respect to estate taxation. The changes in the Code were intended to ease the problems of intergenerational transfer of family farm operations. They included a provision for appraising farmland at its agricultural use-value rather than its presumably higher market value, so long as the heirs maintain agricultural operations on this land. Potentially, this change may lock heirs into farming whether they are suited to it or not. It is also possible for ownership policies to have adverse consequences for structure. For example, the current debate over enforcement of the 160-acre restriction on farm units receiving water from Bureau of Reclamation projects in the West is an explicit ownership policy which may be incompatible with the economics of irrigated agriculture as currently organized.
- Exclusive focus on the full-owner operator may overlook a range of tenure-based tools and programs available to policymakers. During the thirties, the problems of tenure uncertainty resulted in considerable research and extension work on farm leasing. With changing agricultural conditions following World War II, interest in such research waned. Consequently, there is little work available on farm leasing and much of what is available is colored by the normative judgments of an earlier period. (Under the old "agricultural ladder" concept, tenancy was considered inferior, and the goal of many tenure policies was to help every farm operator climb the ladder to full ownership.) With the movement toward greater separation of ownership and operating control over land, an efficiently organized and operated rental market becomes important for both absentee landowners and farm operators. A number of old tenure issues, such as the concern that renters are less careful with conservation and care of the land should also be reexamined. Tenancy alternatives broaden the range of structural choice and should be recognized as part of farm structure policy options.

LAND USE POLICY AND STRUCTURE

The Federal Government had a much more active land use policy and supporting programs in the early years of the country. In its essence, that policy was to settle the country and place land into private ownership as quickly as possible. Once the major land settlement programs were established, attention turned to research, extension, and other aids to help private landowners manage and use their land effectively. Today, there are some 112 Federal land-oriented programs within some 23 Federal departments and independent agencies. Under most of these programs, however, final decisions on land use rest with the private landowner.

Under the Constitution, States have the primary authority to control private land use. The only major direct involvement of the Federal Government in land use is in the management of publicly owned land, primarily in the West. The Bureau of Land Management and the Forest Service lease some lands to individuals and administer a system of grazing permits in 11 Western States. Issues on the distribution of permits or the setting of grazing fees arise occasionally but the number of farm or ranch operations affected is small (less than 13,000 farms in 1974). Because of the critical importance of water in the Western States, the major Federal resource use policies affecting farm structure have been water development policies.

Although the Federal Government currently has no single land use program comparable to say, the Homestead Act of 1862, pressures to establish explicit, comprehensive land use policies are growing. These pressures originated in the environmental movement of the sixties. In every session since 1970, some form of national

land use planning legislation has been introduced in the Congress.

The common approaches to this legislation have been to provide Federal grants to States to encourage "process" reform and initiatives underway in some States to take back certain land use control authorities historically delegated to local governments. In 1978 and 1979, legislation was introduced in the Congress focusing on Federal policy regarding the retention and preservation of agricultural land. Steps to establish a more comprehensive policy have also been taken within the Executive Branch, including a USDA land use policy memorandum and requirements that all Federal agencies include an analysis of "prime and unique farmland" in environmental impact statements per the National Environmental Policy Act of 1969.

A relatively new dimension of land use policy also relates to land management as a water quality and pollution control technique. Areawide planning for nonpoint pollution control under Section 208 of the Clean Water Act of 1972 promises to be an important factor in future land use decisions. A number of States are also experimenting with land use control techniques including property tax relief, exclusive farmland use zoning, agricultural district formation, and purchase of development rights. All these programs have implicit or explicit goals of preserving agricultural or open space land uses.

IMPLICATIONS FOR STRUCTURE

Significant support for the preservation of agriculture has come from agriculture itself. Land use planners see agricultural land use as a goal and view farmers as potential allies. Agriculture is important to the planner because it occupies space that might otherwise lie idle or be consumed by subdivisions, and because it provides visual/cultural diversity to the landscape. As structuralists, planners tend to harbor an idealized image of relatively small scale, "family" type farms. Where this image is compatible with the structural goals of the agricultural community, a basis for coalitions between the farm and urban communities may exist.

A number of land use planning techniques have structural implications. At last count, 48 States had some form of preferential property taxation for agricultural lands. New York State has almost a decade of experience with its Agricultural District Law; one purpose of the law is to convey to farmers the sense of permanence they need before making long-term capital improvements on their farms. A number of other States are considering the New York approach; others are experimenting with purchase of development rights or exclusive farmland use zoning programs. The impacts of these land use programs are likely to be greatest near (and may be restricted to) major urban centers or regions, but within these areas the programs may help maintain diversity and slow shifts in the location of agricultural production.

Planners need to consider agricultural landownership and farm structure as elements of land use policy. Evidence from a number of cases shows that planners do not distinguish adequately between farmland ownership and control, and consequently may not efficiently target their programs. For example, tying eligibility for some preferential real property tax assessment programs to gross farm sales may exclude landowners who rent their land. Also, it is not certain whether policy instruments currently available to land use planners are appropriate in dealing with agricultural preservation. Unless the agricultural economy is basically healthy, efforts to preserve agricultural lands through land use policy may be ineffective, frustrating to other land use planning goals, and wasteful in the sense of having caused unintended wealth transfers (for the purchase of development rights, for example) or long-term restrictions on land use.

Public involvement in land use decisionmaking broadens the area of potential conflict between individual and collective goals. To date, most approaches to land use planning have respected property rights of the landowner and farmer and have relied primarily on incentives and voluntary approaches. In fact, a frequent

criticism of most incentive-type programs has been that they do not extract an appropriate *quid pro quo* from the landowner in exchange for the benefits conveyed. The search for more effective land use control devices, particularly in the area of water quality enhancement, may bring the conflict between private and public goals into the open. It may also provide insight into similar goal conflicts in farm structure policies.

FUTURE POLICY DIRECTIONS

In considering directions for either landownership or farm structure policies, there are two points to keep in mind:

- Landownership and farm structure are highly related, and policies concerning one generally cannot be changed without affecting the other.
- Agricultural structural goals need to be consistent with ownership goals.

Many of the principles underlying our present landownership policies were worked out during the early years of the Nation, and survive basically unchanged. We have given less attention, however, to the status of landownership and consequently have little information on who owns the land. This means that our knowledge of ownership issues frequently may be less precise than our knowledge of farm structural conditions; it does not mean ownership issues are less important.

In considering structural policy, we need to improve the range and effectiveness of ownership options. Most farm operators choose to own at least part of the land they operate, but landownership is not a necessary condition for a successful farm operation. In examining ways to assist beginning farmers it may be more useful to focus on their credit needs for operating capital rather than for land purchase, or to explore modified land rental/purchase arrangements. The increasing role of absentee owners as suppliers of land services to agriculture suggests that they may also pose special problems (such as lack of close consultation between landlord and tenant or lack of owner knowledge of farm problems) which structural programs can address. Other opportunities for developing compatible ownership and structural programs may arise from State and Federal efforts to develop more comprehensive and consistent land use policies.

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Water Use And Water Use Policy

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INTRODUCTION

About 40 million acres in the United States are irrigated today, 10 million through Federal irrigation projects. A high percentage of fruits, nuts, vegetables, cotton, sugar, and other high-value crops are grown on irrigated lands. In total, the Federal Government currently spends about $10 billion yearly for planning, development, management, and use of the Nation's water and land resources. The magnitude of this involvement reflects the potential Federal policies have for affecting agricultural structure.

Past Federal Involvement

The purpose of the Reclamation Act, passed in 1902, was to settle the West through irrigation development for family farms. To ensure that family farms would benefit, the Congress limited size of farms receiving reclamation water to 160 acres per individual or 320 for a married couple. By 1977, reclamation projects throughout the 17 Western States provided water for 9 million acres of cropland. Output from these projects was $4.4 billion, producing enough food to feed 30 million people. On a smaller scale, other Federal water programs have also been important to agriculture. USDA has long provided technical and financial assistance to farmers for water conservation, farm water development, and water management, and has built numerous small watershed projects for flood control, drainage, and related purposes.

Few studies have been made of the impact of Federal involvement in water resource development, management, and use on agricultural structure. Irrigation development in the West is thought to have been a major factor for the shift of cotton production there from the South. Other regional production shifts, while perhaps not as dramatic did, cause some adjustments.

As with the reclamation programs, USDA programs have generally been aimed at the family farm. However, an underlying objective of all of these programs has been efficiency. Since larger farmers benefit most from improving efficiency through water development and technical or financial assistance, public research and development programs have contributed to the trend toward larger farms. The 160-acre limitation feature of reclamation projects has provided opportunities for many farm families. Where the limitation was not strictly enforced, however, many large farms benefited from the highly subsidized water projects. Except for the 160-acre limitation then, Federal involvement has probably led to larger farms.

Present and Future Policies and Programs

President Carter has initiated a major revision of water policy, emphasizing conservation and nonstructural alternatives. These revisions imply a much different Federal involvement than before. Large-scale dams and other structures will receive much less emphasis, even without the new policy, since most of the best dam sites have been utilized and environmental concerns pose constraints. Nevertheless, the President's water policy reform will further de-emphasize large water projects as a means of solving water problems.

CRITICAL WATER PROBLEMS

Current critical water problems most important to agriculture as identified in the Water Resources Council Second National Assessment (1978) and the major areas affected are listed as:

- Inadequate surface water supply—Most of Southwest and Great Plains.
- Overdraft of ground water—Parts of California, Utah, Arizona, New Mexico, Colorado, Texas, Louisiana, Arkansas, Mississippi, Illinois, Wisconsin, Indiana, and North Carolina.
- Water pollution—Practically every State. Surface water pollution from point sources greatest in northern part of Eastern United

States. Nonpoint pollution critical in many of same areas plus areas in the South and Mountain States. Eutrophication of water bodies is critical in large areas throughout the Nation and ground water pollution is critical in many areas.

- Erosion and sedimentation—Most of the East and large areas of Utah, Arizona, New Mexico. Several other scattered areas.
- Wet soils and drainage—Almost entire area between Mississippi River and Allegheny Mountains. Several East Coast States.

Inadequate Surface Water Supply

Instream and offstream projects are constantly competing for available water. Projections for the years 1985 and 2000 show increasing rates of consumption for offstream use (see table).

The President has identified water conservation as the cornerstone for solving water supply problems. To bring about the projected decrease in agricultural withdrawals shown in the table while at the same time increasing consumption will require major increases in irrigation efficiency. One study has estimated that it would cost $14.6 billion to increase conveyance efficiency by 10 percent, on farm efficiency by 13 percent, and the overall system efficiency by 17 percent.

Overdraft of Ground Water

As indicated, groundwater overdraft is occurring over a wide area. Proposed solutions are: (1) finding alternative sources of water, (2) developing artificial recharge (refilling underground water sources), (3) relocating water-using activities, and (4) reducing water use through improved water management. Even given the actualization of these proposals, it is still likely that large areas of pump irrigated agriculture will be forced out of irrigation because of increasing

Total withdrawals and consumption of water for offstream use, by functional use, for the 21 Water Resources Council regions—1975, 1985, 2000

Functional use	Total withdrawals			Total consumption		
	1975	1985	2000	1975	1985	2000
	Million gallons/day					
Fresh water						
Domestic:						
Central (municipal)	21,164	23,983	27,918	4,976	5,665	6,638
Noncentral (rural)	2,092	2,320	2,400	1,292	1,408	1,436
Commercial	5,530	6,048	6,732	1,109	1,216	1,369
Manufacturing	51,222	23,687	19,669	6,059	8,903	14,699
Agriculture:						
Irrigation	158,743	166,252	153,846	86,391	92,820	92,506
Livestock						
Steam electric generation	88,916	94,858	79,492	1,419	4,062	10,541
Minerals industry	7,055	8,832	11,328	2,196	2,777	3,609
Public and other lands[1]	1,866	2,162	2,461	1,236	1,461	1,731
Total, fresh water	338,500	330,375	306,397	106,590	120,545	135,080
Total, saline water[2]	59,737	91,236	118,815			
Total, withdrawals	398,237	421,611	425,212			

[1] Includes water for fish hatcheries and miscellaneous uses.
[2] Used mainly in manufacturing and steam electric generation.

costs (exacerbated by rising energy prices) or depletion of ground water stocks.

Water Pollution

Nonpoint pollution from agricultural areas, as well as pollution from feedlots and other point sources, are causing major water quality problems in many areas. Water quality management accounts for a larger amount of Federal water-related expenditures than any other purpose (42 percent in 1974). A large part of this goes for urban waste treatment facilities, although control of agricultural pollution is also a high priority.

Control of agricultural nonpoint pollution is directed at ways to reduce erosion and runoff. This includes changing cropping patterns, improving water management and farming practices, and using physical measures such as terraces.

Erosion and Sedimentation

Erosion and sedimentation are natural processes, but they are accelerated by human acts. They are the most pervasive water-related problems in the United States. The average cropland soil loss from sheet and rill erosion was 8.6 tons per acre in 1975 or approximately 1/16 inch of soil. In some areas, the loss was 25 tons or more. This loss not only adversely affects the productive potential of cropland, but the sediment carries pollutants, reduces water quality, damages fish and wildlife habitat, and causes flooding.

Wet Soils and Drainage

An estimated 43 million acres of cropland need improved drainage, which can be accomplished by practices including improving irrigation water management, land grading, drainage ditches, underground drains, and outlet channels. A possible 11 million acres of wet forest and pasture land could be converted to cropland.

WATER RIGHTS

Water rights, a strong influence on agricultural structure, change slowly. Resolution of Federal reserved rights and reserved rights for Indian reservations could have substantial impact on the character, number, and size of farms, both on those communities getting increased water supplies and on those getting less.

The doctrines governing the allocation and use of water are primarily a matter of State law. The doctrines governing *surface* water rights are (1) the riparian doctrine—an equal cosharing of water among owners of bankside property, and (2) the appropriation doctrine—first in time is first in right, coupled with the application of water to a beneficial use. The riparian doctrine prevails in the Eastern States, with some degree of importance in the West, and the appropriation doctrine is dominant in the Western States.

All of the Western States and some Eastern States have State-administered permit programs for the allocation and use of ground water. These programs have varying degrees of effectiveness as to conservation, recharge, and economic efficiency, depending on the jurisdiction.

During the settlement of the West in the last century, the Federal Government, recognizing that the regulation of water use was primarily the province of the States, permitted the control and distribution of water resources on public domain lands to pass to the States and allowed the public to appropriate the water in accordance with State law. At the same time, the Federal Government was creating Indian and other reservations from these public lands. Since 1903, the courts have held that when reservations were created from public lands, sufficient supply of water was simultaneously reserved to satisfy the purposes for which the reservations were created.

Reserved Water Rights

With the increasing competition for limited water resources plus recent drought conditions

in the West, controversy arising from conflicts between Federal *reserved* water rights and State-granted water rights has been heightened with respect to the determination of the water quantities for reservations' future needs. Executive directives issued July 6, 1978, on implementing the President's water policy statement of June 6, 1978, included a statement that Federal agencies should promptly inventory and quantify Federal and Indian reserved water rights. The quantification was to be made administratively and formal adjudication would be sought only where necessary The Secretary of the Interior, responsible for coordinating the efforts, was to report to the President by June 6, 1979.

Ground Water

A twofold conflict exists for ground water. Many States that have permit programs do not regulate the quantity of water removed. Consequently, the problems of inadequate recharge, drawdowns, and economic inefficiency are not addressed. In addition, many State regulatory programs do not recognize the hydrologic interrelationship between surface and ground water. Thus, decisions on one resource may have serious adverse effects on the other.

160-ACRE LIMITATION

The reclamation program was originally conceived to serve a social purpose—to settle the sparsely populated West with stable, small family farm communities rather than subsidize western agricultural production. As water projects became associated with "pork barrel" politics, however, some projects failed to meet the conceived purpose and became highly subsidized projects sometimes benefiting large, wealthy landowners. In 1976, there were 2.2 million "excess acres"—those in excess of the limitation.

The Department of the Interior, having compiled proposed rules for enforcing the 160-acre limitation, is preparing an environmental impact statement (EIS) on this enforcement. ESCS is responsible for a statistical land tenure survey of reclamation projects and an analysis of the agricultural impacts of enforcement. Tentative results of the ESCS studies show that cash flow for new farmers with little or no capital is usually negative. This implies that it may not be economically feasible to redistribute land to small farmers unless some way is found to enhance income in the short and midterm period. The main problem is the high capital and interest cost due to high land cost and interest rates. Existing farmers who purchased land at much lower prices and interest rates a decade or more ago and have low land payments can acquire additional land at market rates and maintain an adequate cash flow for living expenses. At the same time, their net worth continues to grow because of rapidly increasing land values.

The implication of these results on farm structure is clear. High land and capital costs will lead to larger farm sizes or part-time farmers with enough nonfarm income to maintain cash flow adequate for living expenses.

To achieve the objective of small family farm communities, the Department of Interior has proposed rigid, complex rules for enforcing the acreage limitation. These include strict limits on acres (although the proposed limit is increased from 320 owned by a married couple to 960 per operating unit of owned and leased land), requirements that farmers reside on or near the farm, requirements for material participation and antispeculation features, and civil penalties.

The Congress seems to be taking a much less restrictive view of acreage limitation. Senate Bill 14 sponsored by Senator Church would set the acreage limit at 1,280 acres, not require residency, and liberalize many other provisions.

IMPLICATIONS FOR STRUCTURE

As called for in the Resource Conservation Act (RCA), USDA is appraising the soil, water, and related resources of the Nation. Other specific requirements of the act require an appraisal of "data on current Federal and State laws, policies, programs, rights, regulations, owner-

ship . . . of soil, water and related resources, and . . . costs and benefits of soil and water conservation practices."

Both the President's water policy and the RCA have potentially powerful effects on the structure of future Federal water policies and programs. The specifics of the policies and programs can directly affect who gets what and how much. Programs can be designed specifically to affect small farms or large farms, to encourage or discourage absentee ownership, to ease entry into farming or to place barriers on entry, and to improve income of the poor or the wealthy.

Number and Size of Farms

Past water policies and programs have undoubtedly contributed to the general trend of fewer and larger farms. Irrigation development encouraged an influx of capital and high-level management. Economy of size benefits resulted, and farm size tended to increase. Farm output also increased overall, resulting in downward pressure on commodity prices, adding pressure to increase efficiency. Larger farms tend to be more efficient because certain fixed costs are spread over more acres. Thus, increasing farm size has been seen as a major way to combat low prices.

The principles and standards for water resource planning aim for both economic efficiency and environmental quality. Social well-being, although a recognized objective, plays almost no part in the design of Federal water projects. The more efficient irrigation projects are, the greater the benefit-cost ratio, and the more likely the project will be funded and built. Since larger farms are or are at least believed to be more efficient, the planning procedures for Federal projects tend to favor large farms.

The Department of the Interior's enforcement of acreage limitation rules limiting delivery of water to family farms is a major attempt to influence farm size. This is a highly controversal issue due to the large subsidy involved in water irrigated through Federal funds. The Department of the Interior is taking the position that these subsidies are intended for small family farmers. Those favoring no acreage limitation argue that large farms are more efficient and that efficiency benefits not only the farmers but the local communities and consumers by holding down prices.

ESCS analysts are now studying economies of size of reclamation projects. Preliminary results show considerable economies of size for most projects. There is also an ongoing ESCS study of the socio-demographic impacts of enforcing the 160-acre limitation rules, addressing many structural issues. However, the results will not be available until late in 1980.

Implementation of programs to improve water conservation in agriculture (the cornerstone of the President's water policy) will also tend to increase farm size. Alternatives being considered are cost sharing, pricing incentives, improved water management, and reduced uncertainties in water supplies. Unless specifically targeted to small farmers, programs to implement water conservation would likely increase efficiency, costs, and access to technology—all which lead to increased farm size.

Probably the same can be said about Federal policies and programs aimed at the problems of ground water overdraft, water pollution, and erosion, sedimentation, and drainage of wet soils. Proposed solutions tend to rely on capital, management, or technology, and to focus on efficiency.

There are any number of suggestions and ideas to modify water rights to increase efficiency and equity. Creating a separate market for water or otherwise increasing the flexibility of water allocation could influence agricultural structure but this is likely to happen only on a limited basis, since laws governing water rights change slowly. If such markets or arrangements were implemented they would likely favor larger, more efficient farms.

The appropriation doctrine is often said to encourage waste because the requirement to put

water to beneficial use sometimes encourages persons to use their full entitlement even though it is not actually needed. If water rights could be modified so that farmers would not run the risk of losing them when not used, increased supplies could be available for other uses. The result could be either an increase in the number of farms or in the size of existing farms.

Degree of Specialization in Production

Irrigation development has clearly led to increased specialization in agricultural production. Fruit and nut production requires irrigation in most regions. Vegetable production utilizing irrigation water has tended to become specialized, using advanced technology in production. There is less direct impact on specialization of most other Federal water policies or programs.

Ownership and Control of Resources

Federal water policies and programs have tended to assist owner-operated farms more than renters. Technical assistance, structural water conservation facilities, irrigation development, and other programs tend to increase income-producing capabilities of the land, which in turn increase land values. As most of these programs must be implemented by operators, there is additional incentive for owner-operators to participate in these programs. Policies to implement water conservation and nonstructural alternatives in the future will likely have the same impacts.

Barriers to Entry and Exit

Except for the acreage limitation for reclamation water, Federal water policies and programs have probably had little direct impact on entry or exit from agriculture. The most significant impact has likely been the tendency toward larger farms. The large capital requirement for farms of sufficient size to provide adequate returns excludes many who would like to be farmers.

Social and Economic Characteristics

Federal water policies' and programs' effects on the social and economic characteristics of rural communities vary with the region. For example, in areas where reclamation projects resulted in cropping patterns requiring large amounts of hand labor, two distinct groups with vastly different social and economic characteristics have emerged. Landowners and operators tended to have relatively high income and living standards; farm laborers remained poor and often needed to migrate to maintain enough income. Many reclamation projects where the acreage limitation has been enforced have evolved into viable, pleasant communities based on family farms.

Other Federal programs have undoubtedly benefited wealthier farms more because they could best use the programs, which has resulted in unequal income distribution. Future programs and policies will likely have similar impact unless specific provisions or limitations are built in to benefit a particular group.

Price and Income Policies And the Structure of Agriculture

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INTRODUCTION

Public food and agricultural policies seek to accommodate simultaneously the multiple interests of farmers, consumers, traders, transporters, manufacturers, suppliers, rural communities, and food-deficit countries. Policy objectives include the amount and stability of farm income, equitable treatment of producers of various commodities and in different regions, stable markets, expanded exports, food aid, economic viability of rural areas, and the costs of programs to achieve these objectives.

Programs emanating from such policies must be adaptable to changes in weather, the environment, and the general economy. They seek to shift some of the production and price risk from farmers to society, and ultimately to increase farmers' incomes. Consumers benefit from these programs by being assured of adequate food supplies and reasonable prices.

The major component of food and agricultural policy has been price and income policy executed through commodity programs.

There is a growing concern that these commodity programs may have had unintended, perhaps undesirable, effects on the structure of agriculture, even though these programs are aimed at improving the economic viability of farming.

This article discusses price and income policy in a historical context, current policy trends, and recipients of direct income supplements generated by current farm programs. Particular attention is given to possible structural impacts in connection with price and income support programs as they relate to the production and price risk borne by producers and the relationship of price and income support to farmers' price expectations. The article also relates the role of price and income policy to farm structure. It specifically addresses the following questions:

- Do price and income support programs implicitly encourage farm consolidation, leading to fewer farms of ever increasing size?
- Do these programs provide more benefits to land rent and ownership than to management and operatorship?
- Do programs that reduce production and price risk lead to a more economically efficient agriculture or to overinvestment in production resources?
- Does reduced risk encourage more specialization in farming (a monocultural agriculture) which increases threats of major production shortfalls, such as the one caused by the 1970 corn blight?
- How do price and income programs affect producers' price expectations and investment decisions?

PRICE AND INCOME POLICY IN A HISTORICAL CONTEXT[1]

The U.S. Government has enacted a series of laws since the twenties to reduce economic and social imbalances within the agriculture sector and between that sector and the rest of the economy. Commodity price support legislation dates back to the passage of the Agricultural Adjustment Act in 1933. The long succession of laws and programs that have followed can be considered during three major periods:

- The thirties through the fifties.
- The sixties through 1973.
- 1973 to the present.

The Thirties Through the Fifties

Federal policy instruments have included supply control through acreage restrictions, allotments, long-term land retirement and

[1] This section draws from (*10*) and (*3*). (Italicized numerals in parentheses identify item in References.)

marketing quotas, and price supports through direct purchases of commodities and use of nonrecourse price support loans.

Market price support for individual commodities was the most heavily used policy tool to enhance farm income from the thirties to the fifties. This was a period of mechanical, biological, and chemical revolution in agriculture. The effect of this technical revolution was higher land and labor productivity. Farm surpluses mounted and price support programs outgrew their initial temporary status. The Government established price supports at levels aimed at improving farm income. For the first 30 years of commodity policy these levels were consistently above market-clearing levels in world markets. This allowed foreign competitors to undersell the United States and increase their market shares under the protection of the U.S. price umbrella. This price umbrella also gave stability to world markets.

Price supports above market-clearing levels accentuated further the supply problem by encouraging additional production. Production controls were introduced when Government stocks became unmanageable. Commodity marketing quotas and allotments were applied to individual commodities. This could bring the production of a surplus commodity under control; but, because farmers could switch to the production of uncontrolled commodities, price and income problems shifted to supported commodities. Policymakers in the sixties realized that change was needed in the inflexible and restrictive price support and production adjustment programs that had been used.

The Sixties to 1973

First steps toward making farm programs responsive to market conditions were taken in the sixties. Donation and concessional exports initiated under Public Law 480 in the mid-fifties were costly and did not provide an adequate outlet for U.S. production. Policymakers then turned to the commercial world market as a viable outlet for the growing production. They soon realized that the United States would need competitive prices to expand its export market. Policymakers began taking actions to lower price supports and to pay export subsidies to domestic exporters. Direct payments to farmers were made to maintain farm income in light of lower support prices. This led to another program decision, which was to make programs voluntary. Only the incomes of producers voluntarily complying with acreage control programs were supported through the direct payment. Producers who chose not to participate had to rely on market prices.

The Agriculture Act of 1970 introduced two additional major changes in traditional policy tools. First, acreage restraints for individual commodities were discarded in favor of the set-aside concept. Once a farmer set aside, or idled, a specific number of acres, he could produce any combination of crops except those subject to marketing quotas. The basis for direct payments remained the individual commodity allotment or base. This resulted in farmers receiving payments based on crops they were not actually producing.

The second major program change introduced in 1970 placed a limit of $55,000 on the amount of program payment that any producer of wheat, corn, or cotton could receive from *each* program. The program payments had been, and continue to be, disbursed on the basis of volume of production; thus, some large producers had been receiving huge direct payments. The payment limitation was a response to public criticism of huge payments to some farm operators or owners.

1973 to the Present

The Agriculture and Consumer Protection Act of 1973 continued the movement toward fewer program restrictions and greater reliance on market signals to guide production decision-making. The principle of setting commodity price support levels at or near world market levels was retained. The direct payment principle was further institutionalized by the establish-

ment of the target price/deficiency payment system. This system separated income support from price support. Deficiency payments are made whenever market prices fall below the target levels established or adjusted by law. The 1973 act also initiated a disaster payments program to supplement the income of farmers who lose all or specified portions of their crops or cannot plant because of natural disasters.

The Food and Agriculture Act of 1977 retained the basic tenets of the 1973 act. Changes included more flexible price support levels, linkage of target prices to individual commodity costs of production, abolition of historic allotments in favor of current planted acres, and the development of managed, farmer-owned grain reserves with explicit release prices (table 1).

CURRENT POLICY TOOLS AND THE CONCEPT OF A PRICE CORRIDOR

The price support program (specifically the nonrecourse loan and purchase programs) has been the primary Government means to increase farm income. Separation of price support and income support began in the mid-sixties. It was achieved fully in the Agriculture and Consumer Protection Act of 1973, which introduced the target price/deficiency payment concept. This concept allows income support payments to vary inversely with the market price of commodities. The addition of this new policy tool allowed price supports to be set in relation to market-clearing levels, avoiding overproduction and excess stock accumulation.

The Food and Agriculture Act of 1977 carried the concept further, defining a *price corridor* within which commodity prices may move as market conditions change. The market thus performs the function of resource and product allocation within this corridor. On the low side, the price support loan program defends a price minimum which protects producers from disastrously low prices. The 1977 act also provided for a managed reserve with specified operating rules, including predetermined prices at which the reserves may be returned to the market. The release prices and the synchronized release prices for Commodity Credit Corporation owned stocks establish an upper defense on price movements. This sytem implicitly defines a price corridor bounded by the loan level and the reserve release prices. These changes now make it possible to administer the loan rate consistent with price stabilization objectives and to administer deficiency payments consistent with farm income policy objectives. This is illustrated in the following discussion.

Consider the hypothetical movement of the market price of a grain, the price of corn, for example, over many years as shown in the figure. The nonrecourse loan and reserve programs could be administered to provide an associated price corridor that, ideally, would eliminate the extreme price peaks and valleys. This would enable the market price to accurately provide price signals to both producers and consumers under normal conditions and avoid erroneous signals of extreme price fluctuations. The policy tools used to keep price within the bounds are grain reserves and cropland set aside and diversion. Prices would tend to remain within the corridor. However, prices can move above or below the bounds. Prices falling below the loan rate could result from transportation problems, lack of adequate storage, or inadequate levels of participation in the farm programs. Movement above the bounds could result from inadequate supplies or reluctance to sell stocks.

If market prices, moderated by the price corridor, do not provide producers with a return that the political system judges to be equitable, the market-determined return can be supplemented with direct payments. Under the current direct payment scheme, deficiency payments are paid to producers participating in the commodity programs any time market prices fall short of the target price (for a specified time period). The target price should provide producers with a shortrun safety net against losses arising from unfavorable market conditions.

Table 1—Farm program provisions for major farm commodities

Commodity	Target price protection	Disaster payment provision	Incentive payments	Indemnity payments	Non-recourse loans	Direct purchases	Cropland set-aside authority	National program acreage	Acreage allotment	Marketing quotas	Marketing orders and agreements	Grain reserve	Payment limitation[5]
Wheat	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes
Corn	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes
Sorghum	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes
Barley	Yes[1]	Yes[1]	No	No	Yes	No	Yes[1]	Yes[1]	No	No	No	Yes	Yes[1]
Oats	Yes[1]	Yes[1]	No	No	Yes	No	Yes[1]	Yes[1]	No	No	No	Yes	Yes[1]
Rye	No	No	No	No	Yes	No	No	No	No	No	No	No	No
Upland cotton	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	Yes
ELS cotton	No	No	Yes	No	Yes	No	No	No	Yes	Yes	No	No	No
Peanuts	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	No
Rice	Yes	Yes	No	No	Yes	No	Yes	No	Yes	No	No	Yes[2]	Yes
Soybeans	No	No	No	No	Yes	No	No	No	No	No	No	No	No
Tobacco	No	No	No	No	Yes	No	No	No	Yes[3]	Yes	No	No	No
Sugar	No	No	No	No	Yes[4]	No	No	No	No	No	No	No	No
Fruits and vegetables	No	No	No	No	No	No	No	No	No	No	Yes	No	No
Milk/dairy products	No	No	No	Yes	No	Yes	No	No	No	No	Yes	No	No
Wool and mohair	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Bees	No	No	No	Yes	No	No	No	No	No	No	No	No	No

[1] Barley and oats may be designated program crops, for payment purposes, at the discretion of the Secretary.

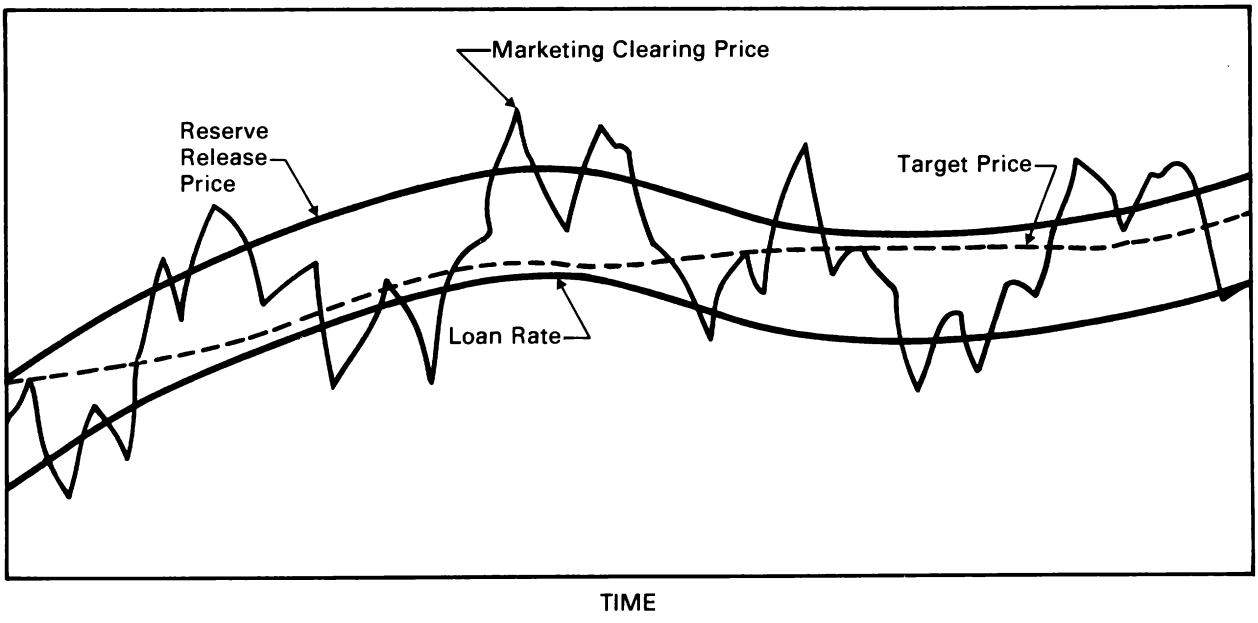
[2] The 1977 act reserve provisions refer specifically to wheat and feed grains. Rice was added to the existing reserve through authorities provided by permanent legislation.

[3] The allotment provision does not apply to burley tobacco.

[4] Program regulations provide for loans to domestic processors who guarantee to pay producers a minimum price.

[5] Disaster payments, nonrecourse loans, and grain reserves are exempted from these limitations.

FIGURE 1
HYPOTHETICAL BEHAVIOR OF MARKET PRICES AND A PRICE CORRIDOR



COMMODITY PROGRAMS, RISK, AND STRUCTURE

Returns to a farm can fluctuate widely among enterprises and over time. Sources of risk include variations in physical production as a result of weather and disease. Risk also comes from market price and income fluctuations resulting from changes in either domestic or foreign supply/demand balances. Commodity programs seek to shift a portion of production and price risk from the producer to society. Provisions of the programs which affect the amount of risk borne by the producers include:

- The price support program which places a stop-loss floor under commodity prices.
- Direct payments which supplement income when market prices are depressed.(Since deficiency payments are based on assigned rather than actual yields, producers' incomes are supplemented when prices are depressed even in the event of a complete crop failure.)
- The disaster protection program which supplements the incomes of producers with crop failure regardless of market conditions.

Risk and Farm Numbers and Sizes

Many economists argue that reducing production and marketing risk through Government programs can lead to fewer and larger farms, and that these programs result in increased output (*11*). These effects occur as a result of increased use of new technology, increased specialization of production, and greater use of external sources of capital. Quance and Tweeten argue that price supports in the sixties provided producers with incentive to expand (*12*). Larger farms were enabled to adopt output-increasing technology because of supports while smaller farms were enabled to continue production in the short run (usually until the operator retired). They were unable to continue in the long run as they fell behind technologically.

Raup reaches the same conclusion from a different direction. He argues that the more wealthy farmers and landlords have a number of economic advantages over the smaller landholders in bidding for additional land. The major advantages of larger farms beyond being somewhat more efficient, lie in:

- Inflation and its impact on the value of current landholdings, and the associated leverage it gives to the established owner in obtaining debt capital and meeting payment obligations.
- Tax advantages for those in high tax brackets including cash-basis accounting, preferential taxation of capital gains, interest and depreciation deductions, and investment tax credit (*13*).

The traditional family farm has been able to compete for land by supplementing lower economic returns per dollar invested with possible noneconomic benefits attributed to owning land. But, Raup argues, credit and tax policies have helped subsidize farm capital investment and offset noneconomic benefits attributed to landownership by owner-operators. He also suggests that reduced risk of price collapse provided by price and income supports gives the large-scale producer an additional economic advantage over the small-scale producer in bidding for land.

Small farms are often considered less vulnerable to market and production risk than large farms in that they have lower cash costs and relatively fewer fixed obligations. Lins noted that the ratio of production expenses to gross farm income has increased over time and is much higher for large farms than small farms (*9*). Consequently, relatively small downswings in gross farm income can lead to substantial changes in net farm income. Small farms also have lower debt-asset ratios which make them less vulnerable to price declines than are larger farms. High gross ratios and high debt-asset ratios common on large, or rapidly expanding farms, make these farms doubly vulnerable through unstable net incomes and high fixed obligations. It appears that policy instruments which provide insurance against severe downswings in commodity prices and farm incomes would be of more benefit to producers and farms which are highly leveraged or vulnerable to cash flow squeezes.

A conflicting hypothesis stated by Robinson is that a moderately risky agriculture is dynamic, while a more stable price system could lead to complacency in investment and changes in agriculture (*15*). If significant price swings occur, major new investment in land and machinery is made during high price years, and the inefficient operations are squeezed out during low price years. He expects these price swings to have a ratchet effect on land prices. His logic seems to imply that farm consolidation would take place rapidly under the more risky environment. This is opposite to conclusions of Raup, Quance, and Tweeten. Those squeezed out during low price years, however, might not be the inefficient producers, but the highly leveraged recent purchasers of land—those likely to march on Washington when crop prices fall.

Risk and Diversification

Many farm management studies have shown that one way farmers can maximize their chance of survival in a risky environment is to grow several cash crops or grow both crops and livestock. Because prices of farm commodities do not always move together (are not perfectly correlated) the diversified farmer is likely to receive high prices from at least one of his enterprises each year. Diversification usually means lower profits in the long run relative to specialization, but a greater chance of surviving short-run problems.

There is less need for farmers to diversify to survive if risk is assumed by the public sector (price risk is reduced through price and income supports). One of the major structural changes of the sixties was the trend toward specialization. Price stability and chemical and mechanical technology were important factors behind that trend.

Risk and Investment

The risk associated with farm capital investment is related to commodity price variability. Conventional wisdom indicates that unstable prices led to reduced investment and diminished output. Commodity programs, by reducing price and income variability, could be expected to increase aggregate investment in agriculture. Robinson suggests an alternative hypothesis: increased investment with more unstable prices as a result of farmers' increased investment (overinvestment?) when prices are unusually high (*15*).

Risk and Income Distribution

Economic theory suggests that, when a production process is risky, the management input contributes more to profits than when risk is low. Better management may earn a premium in risky production situations while poor management may fail. The return to management will increase relative to land when production is more risky. Likewise, when risk is diminished, the relative returns to land will go up and the relative returns to management will do down, and landlords gain relative to managers.

The landlord and the manager reside under one hat on owner-operated farms. But about 40 percent of U.S. farmland is operated by someone other than the owner, a ratio that has been nearly stable since the forties. The impact of shifts of returns from management to land may not have strong implications for the current welfare of producers; however, it may contribute to continued rapid increases in land prices and possible separation of ownership and operation of land resources in the future.

COMMODITY PROGRAMS, PRICE EXPECTATIONS, AND STRUCTURE

The knowledge that the price of a crop will be supported or supplemented through price and income supports during soft market conditions will raise the producers' expected return per unit for that commodity. This increase in expected returns can influence the decision about how much of each crop to grow and the decision to expand production capacity through investment in additional land and equipment.

Deficiency Payments and Planting Decisions

Preventing target prices from supplanting market prices as the basis upon which producers respond is a major consideration with deficiency payments. For example, if the market price expectation for a supported commodity were unusually low for the next crop year (well below the target price), the market signal would be to reduce production. But, if producers were to base production plans on the target price rather than the market price, they would tend to overproduce this crop relative to other crops. This could lead to continued uneconomic production, lower market prices, and higher deficiency (income support) payments the following year.

This problem can arise under the 1977 act because planted acreage is the basis used to allocate deficiency payments. Total payments can be increased by increasing the acreage planted to the crop. The producers know before planting that they will receive at least the equivalent of the target price. This knowledge may influence their decisions on allocation of land among competing crops, which would result in uneconomic production of crops with target prices.

Investment Decisions

Wheat, rice, corn, grain sorghum, and cotton have target price protection under the 1977 act; oats and barley may be included at the discretion of the Secretary of Agriculture. Crops not eligible for deficiency payments include soybeans, rye, flax, fruits, nuts, and vegetables. Knowledge that the price of a crop will be supplemented in depressed times by direct payments will raise the return expectations and influence a producer's decision to invest in additional inputs necessary to produce that crop.

Producers, expecting higher prices, will increase production either through more intensive methods and/or through acquisition of more land and equipment. This leads to capitalization of the higher expected prices into asset values. Although a return to land is not included explicitly in the target price levels for 1979 to 1981, a return to fixed capital, particularly land, may be implied for the more efficient producers. In effect, these producers receive a rent (or quasi-rent) on their resources that will be capitalized by the amounts that efficiently organized farmers are willing to bid for additional resources.

As long as direct payments are distributed to producers based on the eligible acreage of the specified crop, that payment eventually will get capitalized into the value of land. The landowner will capture the higher rents if deficiency payments increase, and he will also enjoy capital gains if and when the land is sold. Only to the extent that farm operators are also farm landowners do they receive the longrun benefits of deficiency payments (40 percent of U.S. farmland is not owned by its current operator). Two questions arise from increased asset values and ownership patterns:

- Are these results consistent with the objectives of the income support policy?
- Are there other ways to allocate deficiency payments to producers to shift the benefits toward operation of the farm and away from landownership?

DISTRIBUTION OF PROGRAM BENEFITS: CURRENT EVIDENCE

Commodity program benefits are unevenly distributed based on the number of producers. The largest share of payments go to the big farmers. Bonnen's analysis showed that the top 20 percent of farmers received over half the 1964 wheat, feed grain, and cotton program benefits (*1*). Schultze's work with the 1969 programs indicated that the largest farms in terms of sales accounted for about 7 percent of all farms but more than 40 percent of farm commodity program benefits (*16*, p. 29). Schultze further concluded:

- Because price supports are distributed according to farm sales receipts, large farmers who produce the largest share of agricultural commodities benefit most.
- Because larger farmers have higher outlays for purchased inputs, support payments raise their net incomes proportionately more than those of smaller producers.

Data for the 1977 and 1978 commodity programs reinforce the Bonnen and Schultze findings (tables 2 and 3). Payments for 1977 were based on historic allotments that, except for minor adjustments, had been in place for a quarter of a century. Almost 74 percent of the payment checks to producers were for less than $500, accounting for 15 percent of total payments (table 2). Less than 1 percent of the producers each received in excess of $10,000, yet these producers received nearly 9 percent of wheat program payments.

Table 3 data for producers participating in the 1978 commodity programs reveal that the:

- Smallest 10 percent received less than 1 percent of total program payments.
- Smallest 50 percent received less than 10 percent of total payments.
- Largest 50 percent received 90 percent of total payments.
- Largest 10 percent received nearly 50 percent of total payments.

The 1978 payments were based on current plantings of participating producers, rather than historic allotments. The basis for payment is still volume of production (acreage times yield), so it is reasonable to expect payments to remain concentrated at the upper end of the operation size scale. This is reinforced by data revealing that the largest 1 percent of 1978 program participants accounted for 13 percent of 1978 planted acreage of these farms (table 4).

Table 2—Distribution of 1977 wheat program payments[1]

Range of payment	Producers	Payments
Dollars	*Percent*	
Less than 500	73.8	15.2
500-999.99	14.8	19.2
1,000-4,999.99	9.3	38.6
5,000-9,999.99	1.6	18.2
10,000-14,999.99	.2	4.5
15,000-20,000	.2	4.2

[1] Preliminary estimate based upon 90-95 percent of the 1977 program payments for wheat.

Source: Agricultural Stabilization and Conservation Service.

Table 3—Distribution of 1978 program payments

Commodity	Percentiles of producers[1]							
	Smallest (pct.)				Largest (pct.)			
	10	20	30	50	50	30	20	10
	Percent							
Wheat	0.8	1.8	3.4	10.9	89.1	76.6	66.6	50.0
Cotton	.2	.9	1.4	6.2	93.8	83.3	72.5	53.3
Rice	.8	1.5	1.8	7.0	93.0	77.4	63.2	39.8
Feed grains	.5	2.5	4.1	13.3	86.7	70.0	57.1	39.5

[1] The percentiles are ranked by size of recipient's normal crop acreage (NCA). For example, the smallest 10 percent of producers simply refers to 10 percent of participants who had the smallest NCA.

Source: Derived from Agricultural Stabilization and Conservation Service 1978 program participation and payments data.

Table 4—Participation in 1978 farm commodity programs by size of producer

Size range of producer acreage[1]	Producers	1978 planted acres
Acres	*Percent*	
Less than 70	39.5	6.2
70-219	32.6	19.2
220-499	18.0	27.4
500-1,499	8.9	33.8
1,500-2,499	.8	7.6
2,500 and over	.3	5.8

[1] Size of producer is expressed by size of a producer's normal crop acreage.

Source: Derived from Agricultural Stabilization and Conservation Service participation data.

Policies to Control or Target Distribution of Benefits

Beginning with the Agricultural Act of 1970, efforts have been made to control the amount of a direct payment that any one producer could receive from participating in the commodity programs. Placing a limit on the size of an individual payment is aimed at redirecting program benefits from large to small and middle-sized producers. So far, payment limitations have had little effect on either the number of producers participating or on outlays saved. An analysis of the impacts of the $55,000 payment limitation indicated little effect on program participation. Only a few of the largest farms were affected by the limitation and most of these were participating in the cotton program (*17*).

Recent data on 1978 program participants indicate that amount equal to about 1 percent of total program payments, $24 million, was not paid to producers as a result of the $40,000 payment limitation in effect for 1978 wheat, feed grains, and cotton crops (rice had a separate limitation of $52,250). Producers with more than 2,500 acres of normal crop acreage accounted for about 90 percent of this cost savings. Even if all producers in this size category had been affected by the limit, this would have amounted to about 0.3 percent of the total number of program participants. The largest impact of the payment limitation occurred in the Plains and Northwest, areas with large farms.

PRICE AND INCOME SUPPORT POLICY AND STRUCTURE

By increasing expected returns and reducing risk, price and income support policies may encourage farm consolidation, diminish the number of farms, encourage crop specialization, increase land prices, and benefit landowners relative to operators and tenants. Much of this viewpoint is based upon experience of the fifties and sixties as already discussed; dissenting views exist (*15*, p. 778). Gardner suggests that historical policies have likely slowed the rate of struc-

tural change compared with change that would have occurred in the absence of programs (*6*). He argues that it will be difficult to develop hard evidence to accept or reject any particular hypothesis about the influence of policy on structure.

Until recently, the impacts of commodity price and income support policies on the ownership, organization, and control of agricultural resources were not considered explicitly in the political debates on agricultural policy. Structure of the farm sector seems to be moving onto the policy agenda and we are starting to formulate structural objectives. Examples are the actions by recent Congresses to require registration of land transactions by foreign interests and studies of the production and program impacts of prohibiting payments to certain corporate and other business interests (*4*).

Policymakers need to know how changes in the administration of the price corridor (loan rate and grain reserve release price triggers) and deficiency payments affect the risk situations and price expectations of producers. They also need to know how the structure of agriculture may change as producers respond to alternative levels of risk and price expectations.

Objectives and methods for allocating direct payments to producers need to be analyzed so that the political system may evaluate more fully the impact of direct payments on income distribution and resource allocation. Research is also needed to identify what shares of benefits from deficiency payments go to land, labor, and management. There is no experience in other methods of targeting program benefits such as:

- Using bases other than production of supported commodities to distribute income support payments (production of other commodities, income levels, size of operation, equity in the farm, or wealth position of the operator).
- Imposing downward, graduated levels of support payments on the basis of size, gross sales, net income, or wealth.

Research on these topics could provide the political arena with information necessary for informed choices on the design and management of agricultural policies.

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Issues Concerning The Level of Price And Income Supports

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INTRODUCTION

The U.S. Government has supported prices of major farm crops for many years. Current commodity programs also support farm income through deficiency payments, which vary inversely with market prices (*13*).[1] The main program parameters are the target prices used to determine the size of deficiency payments and the nonrecourse loan rate used to set a floor under prices and as a parameter in the farmer-held grain reserve program.

The previous article considered the question of how these programs influence the structure of agriculture. This article looks more closely at how the *levels* of the price and income supports are determined:

- The factors to be considered when deciding on the level of price and income support.
- Adjustments in the levels to reflect changes in market price levels and producers' costs.
- The structural impacts of alternative levels of price and income supports.
- The information needed to make the policy decisions.

While the primary emphasis is not specifically on structure, the issues addressed here remain critical to the farm policy debate. Their resolution will be an important factor in the impact of commodity programs on the structure of farming.

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

The role of production costs in setting target prices continues to be a thorny issue. Some policymakers view cost of production as the primary basis for commodity policy; others believe that other types of economic statistics are more useful. Several studies have described the shortcomings of cost of production statistics, along with problems associated with their use in setting target prices and price supports (*3-10* and *16*).

FACTORS AFFECTING LEVEL OF PRICE AND INCOME SUPPORTS

Target price and loan rate levels must accommodate a range of economic and political considerations. Furthermore, decisions on target prices involve different factors than decisions on loan rates and the associated grain reserve parameters. Tradeoffs among factors are necessary to arrive at the final levels. The eight factors listed in table 1 (and discussed in more detail below) summarize most of the major considerations that influence the levels of target prices and loan rates. Others are contained in a review of the debate on the 1977 Food and Agriculture Act (*15*).

Table 1—Factors to consider in setting target prices, loan rates, and grain reserve release prices

Factor	Target price	Loan rate	Release price
Economic well-being of farmers	Yes	No	No
Moderation of price fluctuations	No	Yes	Yes
World market conditions	No	Yes	Yes
Consumer price protection	No	No	Yes
Federal budget costs	Yes	Yes	No
Relative feed values	No	Yes	Yes
Cost of production	Yes	Yes	No
Structure of the farm sector	Yes	Yes	Yes

Economic Well-Being of Farmers

Although there is general consensus that the economic well-being of farmers should be the primary factor in setting income supports, there is no consensus either on how to measure well-being or on what level of well-being is equitable. Many measures of the aggregate well-being of the farm sector are available: net farm income, debt-equity ratios, capital gains, the return on equity for agricultural investments, price indices, and rates of farm business failure. The recent National Farm Summit task force discussed a number of such measures (*19*). Available economic statistics in the aggregate provide some indication of the farm sector's need for income support.

Examined separately, the statistics on the economic well-being of the agricultural sector sometimes give mixed signals. The limitations of parity as a measure of economic well-being are particularly well documented (*5*). The limitations are mainly due to parity's being based only on relative prices—no quantities are considered, and therefore no costs, returns, incomes, or profits. Also, parity and economic statistics often move in different directions (*5*, figs. 1-4). This circumstance highlights the necessity of considering all available statistics, rather than basing target price decisions on only one source of information about the economic condition of agriculture.

The aggregate measures are not too valuable in depicting the economic well-being of individual farmers. The income and financial situation of typical farms may better indicate economic well-being of individual farmers (*18*). As discussed in the last section of this article, more disaggregated data are needed to identify the specific groups of farmers in financial trouble and to develop programs to assist them.

Moderation of Price Fluctuations

To reflect consumer needs and to alert producers to what and how much to produce, market prices must operate with relative freedom. Extreme price movements, however, can cause wasteful production adjustments. Hence, the concept of reducing market price variability through a buffer stock is accepted. The 1977 act authorizes a farmer-held grain reserve to moderate extreme price fluctuations, with the loan rate as the lower bound for market prices and with upper bounds, the release prices, ranging from 140 to 180 percent of the loan rate.

The moderation of grain price fluctuations represents a tradeoff between the reduction of price uncertainty and the need to allow market prices to signal farm decisionmaking (*8*, p. 4). The current farm legislation dampens price variability by removing the extreme peaks and valleys, but allows market prices to guide farmers' production decisions. The need to moderate price fluctuations is an important factor influencing loan rates and release triggers. The range between the loan rate and the release prices determines the extent of moderation.[2]

Unfortunately, political pressure continues for using the loan rate specifically to support prices and increase agricultural income. The 1979 campaign of the American Agricultural Movement (AAM) therefore represents a conflict over the basic objectives of the loan rate. The AAM proposed that the loan rate be the main vehicle to support both prices *and* farm income. The farmer-held grain reserve, then, would not be a buffer stock—price moderation program but would become a storage mechanism for surplus stocks.

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[2] Note that this discussion assumes a complete separation between the target price (income support) and loan rate (price moderation) provisions of farm programs. Target price levels do not affect market prices under this assumption; this separation was clear in the 1973 Farm Act. However, for the 1977 act, the current-plantings provision transforms the target price into the marginal revenue of the producer and may elicit production that overburdens the reserve program. As discussed in the previous article, this provision complicates the relationship between loan rates and target prices.

World Market Conditions

Much of the price instability in U.S. grain markets stems from world market conditions rather than domestic conditions. Thus the grain reserve programs and the associated loan rate and release prices must bear a reasonable relationship to world market conditions. The probability of accumulating stocks at a specific loan rate depends upon the probability of a world surplus. Likewise, the probability of releasing reserves at a specific price is determined by the probability of shortages in the world market. World conditions thus determine whether expected stock acquisitions will balance expected releases over time. Deviations of the price corridor from the longrun trends in equilibrium world prices can lead to serious economic and political problems with the domestic reserve program.

The International Wheat Agreement that was debated until early 1979 contained provisions for an international buffer stock, defended by upper and lower world price boundaries. The stock was to be held in various countries, depending upon their role in world trade. The objective of maintaining such a stock was to keep world prices within a negotiated corridor. If an international stock existed, the U.S. domestic loan rate and trigger prices would need to be consistent with those in the international agreement.

Consumer Price Protection

The grain release trigger prices protect consumers against extremely high prices in the case of worldwide crop shortages. The trigger prices could reflect such considerations as the maximum percentage of disposable income consumers would be required to spend on food, or the maximum inflation rate in food prices that would be tolerated. The needs for consumer price protection were not an important part of the debate concerning the release triggers during the development of 1977 legislation. The need for consumer price protection may make many members of Congress reluctant to vote for high price levels in grain reserve programs.

Federal Budget Costs

One of the most important factors behind the target prices contained in the 1977 legislation was the cost of the program to the Federal Government (*15*). The amounts of payments to farmers are restricted by the Federal budget ceiling adopted by the Congress each year. Each 10 cent per bushel increase in the target price of wheat increases Government costs $200 million annually. Before the Conference Report for the 1977 Farm Act could be adopted by the Congress, pending budget bills had to be amended to increase the ceiling by $700 million to allow for the higher target prices contained in the Conference Report.

Increases in target prices increase Federal outlays, whereas increases in the loan rate decrease the potential Federal cost of deficiency payments because they are based on the difference between the loan rate (or market price) and the target price.[3]

Relative Feed Values

Price considerations arising from feed demands also influence the relationships among the loan rates of different commodities. At the loan rate, wheat should be able to move into the feed grain markets and feed grains should freely substitute for each other (*12*). Such price relationships are required to permit the orderly movement of grains into the reserve program at the loan rate and to prevent distortion of price relationships among feed grains by releases of reserves. Relative feed values also apply to target prices under the current-plantings provision of the 1977 act (*6*, p. 194). Because this provision encourages farmers to plant for the target price rather than the market price, production among feed grains may be distorted unless target prices also reflect relative feed values.

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[3] The set-aside provision of the 1977 act gives the Secretary of Agriculture an additional means of controlling program costs. Requirement of a set-aside acreage can reduce production and increase market prices, thereby reducing both deficiency payments and nonrecourse loans.

Cost of Production

Cost of production was a prominent factor in the debate over the 1977 act (*15*). The final legislation provided for 1978 target prices that covered national average direct production costs and provided a 4-percent return to land based on 1978 costs and land values. Cost of production is not an infallible guide to setting the level of target prices (*4, 8, 9, 10, 14, 16*). Using cost of production to determine target prices would appear to be most legitimate for a homogeneous agricultural sector where all farms have the same costs. The variety of costs among U.S. farms, however, makes it difficult to determine whose costs and what costs should be considered (*14, 16*). The rate of return to owned resources, primarily land, is crucial because incentives for land price increases can be built into target prices.

The 1977 act also provided that target prices for each commodity in years after 1978 be adjusted to reflect changes in the 2-year moving average of variable, machinery, and farm overhead costs. The validity of using costs of production will be taken up later in this article.

Structure of the Farm Sector

A continuing decline in the number of U.S. farms and the farm population, a growing number of large-scale and corporate farms, increasing financial risks, barriers to entry into farming, and changes in the ownership of farmland all signify continuing structural change in U.S. agriculture. In the 1977 act, the Congress expressed its concern about some of these structural issues in Title I, which states,"it is the policy and express intent of Congress that no such program be administered in a manner that will place the family farm operation at an unfair economic disadvantage" (*20*).

The major price and income support provisions of the 1977 act include nothing on any structural issues. Target price provisions do not differentiate among size of farms, different business organizations of farms, or the financial well-being of different farms. Income supports, however, which treat all producers of a specific crop as an amorphous group, fail to transfer income to those most in need (*14*). As a result, the income supports mandated by the 1977 act may be in substantial conflict with the family farm policy actually intended by the legislation.

MANAGING PRICE AND INCOME SUPPORTS

Recent legislation gives the Secretary of Agriculture broad authority to work toward the policy objectives just discussed. The legislation allows administration of the loan rate to be consistent with price stabilization objectives and deficiency payments to be consistent with producer income objectives.

The loan rate and the associated price corridor illustrated in the preceding article are used to eliminate the price peaks and valleys, but still allow the market price to signal production and consumption within this corridor. If the market price, moderated by the price corridor, does not provide a level of income to producers that is considered equitable, the difference between target price and the market price can be paid as deficiency payments. The level of the target price reflects a political determination of a minimum equitable income to producers and need not follow the trend in market prices. This strategy for managing price and income supports can accommodate tradeoffs among the factors listed in table 1. But the interrelationship of those factors needs to be more fully understood. The adjustment procedures must also be carefully chosen. As suggested by table 1, the procedures and data needs for determining loan rates and release prices differ substantially from those for determining target prices.

DETERMINING THE LOAN RATE

To successfully moderate price fluctuations, the price corridor must follow market price trends. If the loan rate is set too low, little grain will be accumulated in the reserves to use in future shortage years. High prices then could not be moderated without using politically costly export embargoes or price controls. If the loan

rate is too high, farmers will be given excessive production incentives, reserves will accumulate, exports will diminish, and Government farm program costs will grow. The problem is compounded by the fact that market price trends are difficult to identify until after they occur. If this year's market price is higher than last year's, is this due to an upward trend over time, or to factors unique to this year's market?

Loan Rate Adjustment Alternatives

How can the loan rate be indexed or adjusted to reflect these market trends? For the loan rate to move in concert with the longrun price trend, the adjustment procedure must be sensitive to factors that shift the longrun price trend—factors such as population, income, technology, prices of other goods, and exchange rates. For convenience here, these factors are divided into three categories: productivity, cost of inputs, and demand (*1*). Table 2 indicates if the adjustment method is sensitive to the factor. A necessary condition for an ideal adjustment mechanism is sensitivity to all three factors.

Any of the four adjustment methods shown in table 2 could be written into farm legislation, or legislation could give the Secretary of Agriculture the discretionary authority to make the proper adjustments.

A parity price is a price per unit sold for an individual crop that generates the same purchasing power as in the 1910-1914 base period (*5*). For over 30 years, parity was used to adjust price supports. Parity still appears in the 1977 act but its use is greatly diminished. Parity measures are based upon indices of prices paid and prices received for *all* items purchased and sold by farmers, not just those prices relating to the production and sale of the commodity in question. The correlation between parity and the ideal adjustment mechanism could therefore be weak because different crops can have different market trends. Also, parity measures do not reflect changes in productivity and respond slowly to changes in demand for individual crops.

Table 2—Sensitivity of adjustment methods to factors that shift the longrun price trend

Adjustment method	Productivity	Cost of inputs	Demand
Parity	No	Yes	No
Prices paid index adjusted by change in yield	Yes	Yes	No
Cost of production	Yes	Yes	No
Historical price trends	Yes	Yes	Yes
Discretionary authority of Secretary of Agriculture	Yes	Yes	Yes

An index of prices paid adjusted for yield changes (PPI/Y) was introduced in the 1973 act for adjusting target prices, but did not appear in the 1977 act. PPI/Y was defined in the 1973 act as the change in the index of prices paid for selected farm inputs adjusted for the change in the 3-year moving average of yield. As with parity, the indices used to compute PPI/Y are not commodity specific. These procedures imply that a major increase in the price of agricultural chemicals, for example, should have the same impact on the cotton loan (a heavy chemical user) as on the soybean loan (a light chemical user). But, as shown in table 2, PPI/Y is an improvement over parity because it is sensitive to productivity changes.

During the 1977 farm policy debate, average cost of production (COP) was the most popular candidate for indexing price supports. The 1977 act provides that the rice loan rate adjustments and target price adjustments for rice, wheat, feed grain, and cotton be based upon costs of production excluding that for land.

Cost of production, though enterprise specific, is complicated, expensive to measure, and politically vulnerable. It is difficult to estimate the cost of production for one farm because of uncertainties of: the yield to use; the value to be assigned to noncash inputs such as the operator's family labor, management and owned land; and the allocation of overhead and joint-product costs. Many arbitrary assumptions must be made to derive one per unit cost estimate for each crop. Also, production costs per unit of output vary greatly among farms due to differences in actual yield from expected yield, economies of size, management skill, differences in the value

of the crop from one region to another, and differences in the value of production resources in response to prices received. Notwithstanding these problems, it is possible to obtain one number that represents the cost of production averaged over all farms. That number, however, is vulnerable to pressure by producers who can demonstrate that, even by using the official assumptions, their costs were much higher than the official figure.

Basing the loan rate on cost of production can also bring up the problem of a loan rate-cost of production spiral. If a land charge is included in the cost of production, and if the loan rate is high enough to increase producers' expected profits, they will have an incentive to bid up the price of land, which will raise the cost of production and, thus, the loan rate. Higher loan rates will again boost land prices—in a never-ending cycle. This cycle can be partially mitigated by excluding a land charge when calculating the COP; however, some have suggested that a similar spiral effect can result from basing the loan rate on costs excluding land (*3*, *8*). Any increases in loan rates encourage production and greater input use. Through this increased use, farmers bid up the prices of inputs, prices that are then reflected in the cost of production, resulting in another increase in loan rates.

As shown in table 2, both PPI/Y and COP ignore changes in demand for the product. Both methods could therefore lead to eventual escalation of the loan rate relative to the longrun equilibrium price, chronically stimulating production, and inhibiting domestic and export sales.

Loan rates have also been linked to a moving average of historical prices. In both the 1973 and 1977 acts, the cotton loan rate is determined partially by a moving average of past market prices. Historical price trends reflect recent changes in all three categories, productivity, input costs, and demand. To the extent that recent trends reflect near-future trends, this method for price support adjustment should be capable of approximating the desired adjustment. But projected trends are likely to become out of phase with market prices when price movements are cyclical.

In addition to being sensitive to all factors that affect the longrun price trend, another desirable characteristic of a loan rate adjustment process is that it should not by itself be a source of uncertainty in the market. If market participants can anticipate adjustments in the level of the loan rate accurately, they can plan and use resources more efficiently. Those adjustment methods that are most objective—that is, calculated using a formula and data that are in the public domain—generate the least uncertainty. Based on the objectivity criterion, parity, price trends, and PPI/Y all rank equally high. However, market participants would have some difficulty anticipating COP because it is based on data that are not regularly in the public domain.

Any of the four adjustment methods described above could be written into law. Proponents of codified indexing argue that writing the loan rate adjustment procedure into law would (1) reduce uncertainty in the market and (2) reduce the probability that the loan rate will be changed in response to political pressures not related to price stabilization objectives. Skeptics point out, however, that no indexing rule could have been written beforehand to function properly during the extreme price fluctuations of the seventies.

The last method shown in table 2, the discretionary authority of the Secretary of Agriculture, could also be used to reflect all of these market and nonmarket forces. The level of the loan rate could be left to the Secretary's discretion, within specified limits, as for feed grain, wheat, and rice in the 1977 act. Or, the law could give the Secretary limited discretion with the limits indexed over time, as is currently the case for cotton. One of the strong points of this method is that the Secretary's authority could be used to give proper weight to all the factors that influence longrun price trends and maintain a loan rate that is consistent with these trends. One of the weaknesses is that the discretionary authority would be difficult for market participants to anticipate, and could therefore add to the uncertainty in the market.

Choosing an Adjustment Method

The above evidence suggests that, of the adjustment methods listed, only those based upon historic price trends have the potential for adjusting the loan rate over time in concert with market price trends. But even that has shortcomings as the loan adjustment would respond to recent events rather than longrun trends or cycles. Ideally, accurate year-ahead projections of price trends would avoid this problem. Use of weighted moving-average price trends and more sophisticated statistical methods may also help, but these procedures need further research.

If no adequate procedure is found, policymakers should resist writing loan rate adjustments into law and continue allowing the Secretary considerable discretionary authority. Though adding to market uncertainty, and subject to pressures to adjust the loan rate for a variety of shortrun objectives, such discretionary authority can be used to keep the loan rate from creating unacceptable longer run distortions.

DETERMINING THE TARGET PRICE

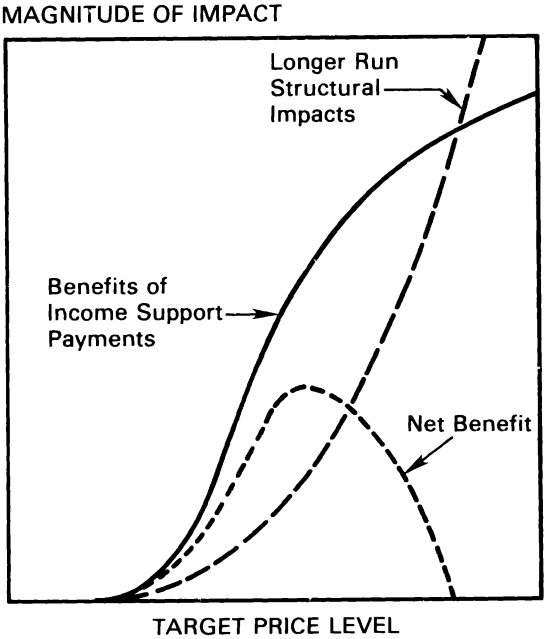
The objectives of deficiency payments, equitable levels of income support, and target prices need to be identified so that informed choices can be made. There are several reasons for deficiency payments. One is to reduce the longrun risks associated with farming. Several years of unusually low prices for grain, for example, might force many farmers into bankruptcy if there were no deficiency payments. The social cost of that adjustment process could justify a transfer payment to the farm sector.

Another justification for deficiency payments is that they compensate producers for losses incurred as a result of publicly financed technological change (*11*). In the past, producers' income was reduced with each technological advance because demand was inelastic. In the future, however, demand for U.S. grain may no longer be inelastic. Technological change could then improve grain producers' income and remove this justification for deficiency payments.

At the same time, deficiency payments have disadvantages. Two types of costs need to be considered: (1) the U.S. Treasury costs of deficiency payments and (2) the social costs of unintended side effects of alternative levels of deficiency payments—especially the impact on the structure of the farm sector. The first cost is much easier to estimate than the second. The possible unintended side effects of deficiency payments on the structure of agriculture are of critical concern. Structural side effects are that high levels of deficiency payments promote large-scale, specialized, low-equity farms financed from outside agriculture, which lessen the relative strength of traditional, moderate-sized, diversified, owner-operated, family farms.

The best target price level, then, would attend to both possible structural impacts and the shorter run income support benefits from target prices as shown in the figure. First, consider the benefits of income supports based on

TRADEOFF BETWEEN INCOME SUPPORT BENEFITS AND STRUCTURAL IMPACTS OF ALTERNATIVE TARGET PRICE LEVELS



deficiency payments. These benefits build up rapidly for lower levels of target prices but eventually level off as most farmers are covered. At the same time, the longer run structural impacts of higher levels of target prices become a factor, possibly increasing at even steeper rates past a threshold level, as shown in the figure. How these two different impacts compare depends, of course, on individual values. Those who feel that the impacts favor a less desirable structure of agriculture would portray the difference between the impacts as representing the net benefit of different levels of target prices. In the figure, the difference between these two impacts is shown by the dotted line. The optimal level of target prices is where these net benefits are greatest.

Alternatively, those who feel that increased structural change toward large-scale farming units is desirable would *add* the two impacts shown in the figure, suggesting that total benefits continue to increase with higher target price levels. The final choice of a target price level thus involves a tradeoff between these separate impacts, based on the collective judgment of society concerning alternative structures.

The Congress defines target prices for the eligible crops based upon the current political realities of that tradeoff. But as with the loan rate, constantly changing economic conditions may require annual adjustments in the target prices. The adjustment procedure could be rigid (tie the target price to an index like cost of production or moving average market price), flexible (let the Secretary of Agriculture make the adjustments), or a combination (such as specify an indexing procedure but give the Secretary authority to override under certain conditions).

The indexing procedures discussed for loan rates could all be candidates for adjusting the target price over time. But because the target price is associated with income support rather than price stabilization, it is not so critical that the target price move in concert with the market price trend. Structural problems may result, however, when the target price is substantially above the market price year after year.

The potential for a target price-cost of production spiral is more critical than with the loan rate. If land costs are included in the target price adjustment mechanism, increases in returns to land from higher target prices increase the market value of land, and thereby increase land costs. Even if land costs are not included in a codified indexing method, the potential still exists for a spiral as changes in legislation to increase target prices to levels higher than those required by the index are debated by the Congress annually.

Any adjustment mechanism that does not move up and down with market price trends has the potential for pushing target prices well above market prices. Responding to pressures to hold down Treasury costs, the Secretary's only recourse under current legislation is either (1) to increase set-aside or (2) to raise the loan rate. Either action reduces Treasury costs. By increasing the set-aside requirement, production is reduced, the market price is increased, and producer participation may be reduced. By raising the loan rate, the maximum potential size of deficiency payments is reduced. But raising the loan rate to reduce deficiency payments could misdirect the price corridor, leading to costly buildup of excess stocks. Such problems, if they occur, would suggest that the current target price adjustment process is too inflexible.

RESEARCH NEEDS: SUMMARY

The loan rate and the target price are designed to achieve different objectives. Different data are also needed to administer them. Some of the research needed to help with the administration of the price corridor are:

- More information on indexing methods.
- Research on stock substitution between wheat, feed grains, and soybeans.
- Information about the relationship between public and private stocks.
- Research on how the width of the price corridor affects market efficiency (*17*).

Alternative weighted moving averages of historical prices hold the most promise as a potential loan rate indexing device. Such procedures offer the possibility of including all the relevant market factors in the indexing process. Research should be continued in this direction.

Deficiency payment programs need a thorough examination. Can their objectives be stated clearly? Who should be assisted? When? How much? Once these questions are answered, the economic indicators can be constructed to identify who should be in the target group. Present aggregate measures indicate that the farm sector is in good economic health. Individual farmers, however, may be in financial trouble. Disaggregation of our economic indicators is needed to reveal them. Disaggregated data would allow appropriate methods to be developed to identify the intended target groups, measure their well-being, and estimate the impact on their well-being of alternative levels of deficiency payments and target prices. Such disaggregated data increases the understanding of the structural impacts of deficiency payments.

Unfortunately, little of the required economic and political information is now available to indicate specific dollar values for the target price scale in the figure. Some feel that the current levels of target prices are higher than the point where the net benefit is highest.

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Environmental Regulations: Impacts on Farm Structure

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INTRODUCTION

Social awareness and demands for improved environmental quality and human health have led to a series of regulations which affect farming activities, with important implications for farm structure.

Background

Crop and livestock production activities have frequently resulted in environmental degradation and health hazards. For example, approximately 95 percent of the Nation's hydrologic river basins have some degree of water pollution, with agricultural activities, in many cases, the major source (2).[1] Polluted waters can create hazards to fish and wildlife, recreation users, freshwater products, and agricultural uses of water, particularly in the case of salinity. In addition, pollution increases the cost of purifying water for municipal use.

Intensive farming is often a major source of water pollution and environmental degradation. Land and water are used intensively in crop cultivation and irrigation, frequently increasing runoff and soil erosion. Livestock production has become concentrated in a few production regions, and production units tend to be large. Pesticides, fertilizers, and other chemicals used more frequently and over greater areas are occasionally applied too much or misapplied. Applicators and others in direct contact with farm chemicals can be affected, including wildlife and livestock. Rainfall and irrigation runoff from the intensively used areas can carry soil, salts, animal wastes, nutrients, and farm chemicals into ground water or streams.

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

Who Pays and Who Benefits

Agricultural pollution occurs when waste loads from farming activities exceed the assimilative capacity of streams and lakes. Abatement of this pollution requires specific actions, time, and usually extra expense by farmers. Benefits accrue mostly to the nonfarm sector and are hard to measure. Thus, farmers concerned about the uncertainties of nature, fluctuating prices for products, and increasing prices of inputs give pollution control low priority.

ABATEMENT REGULATIONS AND PROGRAMS

Several existing legislative acts and implementing programs and actions to abate pollution affect farming operations. Early Federal laws include the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, the Water Quality Act of 1965, the Clean Water Restoration Act of 1966, the Federal Air Quality Act of 1970, and the National Environmental Policy Act of 1970, which established the Environmental Protection Agency (EPA) and requires environmental impact statements for all major activities that may have negative impacts on the environment. In 1972 the Congress passed the Federal Water Pollution Control Act and the Federal Environmental Pesticide Control Act, both of which gave new responsibilities to EPA. In 1976 came the Toxic Substances Control Act and the National Pollution Discharge Elimination System, and in 1977, the Clean Water Act. Farming activities primarily affected to date include pest control, large feedlot waste disposal, nonpoint pollution abatement, and soil and water conservation.

Pest Control

The 1972 Pesticides Act authorized EPA to regulate the use of pesticides. This includes cancellation of use and placing pesticides in a "restricted use" category, thus subjecting them to controls in distribution and limiting their use to

trained applicators. The new law provided substantial amendments to the registration procedures and the mechanisms for administrative hearings on refusals to register, changes in classification, and suspensions and cancellations of pesticide uses.

Use of a number of pesticides has either been cancelled or become suspect because of ties to adverse effects on humans, the environment (wildlife or its habitat), or because of lack of proven effectiveness. Compound 1080 for use in predator control was banned in 1972. Other early cancellations were minor use pesticides. Cancellations of major use pesticides—DDT, aldrin, dieldrin, chlordane, and heptachlor—came later.

Most recently, a number of uses of the nematicide DBCP and the herbicide 2,4,5-T have been suspended. The Environmental Protection Agency is also reviewing the registration of several other pesticides.

Control of wild animal predation on livestock is another issue. Not only is use of certain toxics prohibited or restricted, but application of other controls, such as aerial gunning and leg hold traps is restricted because of concerns regarding wildlife preservation and humaneness.

Large Feedlot Waste Disposal

Under authority of the Federal Water Pollution Control Act of 1972, EPA has established effluent guidelines to control surface water pollution from point sources, including feedlots and agricultural processing firms. Point source refers to a single, identifiable source of pollution, such as a sewer pipe or feedlot drainage. The National Pollutant Discharge Elimination System (NPDES) is a means of implementing point source guidelines.

A feedlot, generally defined as a "concentrated animal feeding operation," includes beef, dairy, swine, lamb, and poultry production. Feedlots were established as a category of industrial point source; final effluent guidelines for large feedlots were announced in early 1976. Although earlier EPA announcements affected all sizes of feedlots, the final guidelines applied only to large production facilities with one-time capacities of 1,000 or more animal units, and to certain smaller facilities discharging pollutants through manmade conveyances into streams passing through the facilities.

The EPA guidelines are performance rather than design standards. Feedlot operators can select from several different types of runoff control systems. The basic components of most systems include a diversion terrace to collect runoff from the feedlot, a settling basin to collect bedding and heavy materials, a holding pond, and a dispersal field or lagoon for final disposal or decomposition of the wastes from the feedlots. Operators have broad flexibility to select control systems appropriate to local hydrologic data, soils, weather, and usual waste management practices. Similarly, operators can choose any operating method that provides control of runoff in accordance with guidelines.

Nonpoint Pollution Abatement

Nonpoint pollution cannot be traced to a single point. In farming, it stems from rainfall or irrigation runoff which carries pesticides, fertilizer, wastes, nutrients, salts, and other substances into streams and lakes. While no mandatory controls on farming activities to reduce nonpoint pollution exist as yet, the 1972 amendments to the Water Pollution Control Act established a planning process at State and local levels to identify critical areas and plan environmental action programs. The 1977 amendments authorized a Rural Clean Water Program which when funded will provide cost sharing for farmers who voluntarily implement Best Management Practices (BMP's) for nonpoint pollution abatement. Other incentives being considered to stimulate voluntary participation include tax credits, Green Tickets (rights to special privileges), and cross compliance (participation in abatement programs required for participation in other Government programs).

If such voluntary programs fail to achieve the participation needed to reach environmental objectives, regulations may be imposed requiring mandatory BMP adoption or setting soil loss, pesticide, or fertilizer use restrictions. Some

States are already enacting such statutes as backups, but few have been implemented.

Soil and Water Conservation

USDA programs directed toward soil and water conservation have been voluntary, with cost sharing, low-interest loans, and technical assistance as incentives. Soil and water conservation and water quality programs are becoming increasingly meshed. Again, if voluntary programs fail, measures may become mandatory.

IMPACTS OF REGULATIONS

Impacts of environmental regulations on farming are: (1) economic—those on costs, profits,and levels of production; and (2) structural—those which affect numbers, types, sizes, locations, specialization, organizational forms and other aspects of farming, and entry or exit into farming. The economic impacts of regulations have been studied more than structural ones, although the latter may often be inferred from economic studies. Structural changes can result indirectly from economic impacts, especially when they are severe, or affect some producers more than others.

Effects on individual producers and the industry may differ, depending on demand/price relationships and the impacts on crops of certain producers compared with those of others. For many agricultural commodities, a reduced crop (whether because less was planted, growing conditions were bad, or pests could not be adequately controlled because of regulations) results in prices increasing by more than the drop in production. Thus, total returns to the industry (the total group of farmers producing that crop) increase. Producers affected by environmental regulations may be worse off due to production changes and cost increases.

Pesticide Regulations

The greatest economic impacts on agriculture to date are probably those from restrictions on pesticide use. Even so, the impacts appear to have been less than expected.

Many people feared that cancellation of DDT would initiate serious problems in controlling agricultural pests, with subsequent increased costs. Effects were not as severe as expected, primarily because there were acceptable substitutes, and because use of DDT had been rapidly declining due to pesticide resistance buildup by the target pests. Cancellation of the use of aldrin and dieldrin increased the cost of production to some producers (*11*), but the effects were not major. Some uses of chlordane and heptachlor have been cancelled and others are being phased out. It is too early to tell the significance of this action, though estimates suggest the impact to be relatively small except for the control of soil insects in certain areas (*8*, *9*).

More recently, EPA has questioned whether the use of a number of other pesticides should be continued. Various USDA/EPA joint studies have been done of potential impacts:

- Cancelling use of 2,4,5-T would lower the farm income of rice producers in Arkansas, Louisiana, and Mississippi Delta. Some timber and rangeland would be affected. Domestic marketing practices and U.S. dollar markets abroad could also be disrupted.

- Cancelling Diallate use would have moderate impacts on production of sugar beets in Minnesota, North Dakota, Montana, Idaho, and Wyoming. Other areas and other crops would be negligibly affected (*12*).

- Cancelling DBCP use would severely affect peach producers in the Eastern States, vineyards in California, and citrus producers in Arizona, Florida, and Texas. The impacts on pineapple, soybean, peanut, and vegetable producers would be moderate (*13*).

- Cancelling Pronamide use would severely affect lettuce producers in Salinas and Santa Maria Valleys, Calif. (*14*).

- Cancelling Trifluralin use would have major impacts on cotton production in the Southeast and Delta areas, and on producers of dry beans, peanuts, and selected fruits and vegetables (*15*).

- Cancelling Amitraz use would affect pear production in Washington, Oregon, and California (*16*).
- Cancelling Toxaphene would severely affect cotton production in the Delta region, and increase the costs of soybean, sorghum, peanut, and wheat producers (*17*).

Cancellation of individual pesticides would clearly affect producers of certain crops and some regions more than others. Some marginal farm operations might fail, and shifts in comparative advantage would occur. Cancellation of a number of pesticides together would likely have substantially greater impacts, with fewer possibilities for substitution. Cancellation of some 15 pesticides would have economic impacts of $1.5 billion from increased costs and output losses. EPA has further indicated it may consider nearly 100 additional pesticides for regulatory actions.

A recent Iowa State University study looked at what might happen to corn and cotton production if all insecticides were eliminated. The findings predicted some shifts in cotton production from the Southeast to irrigated areas of the West and increased corn acreage in the Corn Belt (*5*).

Predator Control Regulations

Wild animal predation on livestock, particularly by the coyote, has reduced net returns for about half the Nation's sheep producers and one-tenth of the cattle producers (*4 18*). Part of the losses due to predation could have been prevented by use of Compound 1080 and fewer restrictions on methods and quantities of control.

A 1976 study of predation losses found that reduced returns and mounting frustration over the predation problem were important factors in the exit of many producers from sheep production and served as psychological barriers to entry into the industry (*3*). Many sheep ranchers were switching to cattle, going into other lines of business, or selling operations to non-sheep raisers. As a result, sheep production is shifting away from areas of high predation.

Animal Waste Regulations

The National Pollutant Discharge Elimination System (NPDES) appears to have affected only about 3,000 operations, about 0.3 percent of the total in major producing States (*7*). Total cost outlays for these producers to come into compliance were estimated at about $25 million. Most operations complied by adding diversions, holding ponds, or some other waste holding system. Economic impacts for most affected producers have likely been small because they have had enough animals or have expanded their operations to spread additional costs. This suggests that actual structural impacts have been minor.

If the regulations originally proposed for livestock feeding facilities had been enacted, nearly 95,000 operations would have been directly affected, with significant increases in cost of production. Estimated construction and equipment costs would have exceeded $200 million, with more than 50 percent of this cost falling on small feeding facilities with less than 100 animal unit capacities. Such a regulation would have accentuated the already existing trend toward larger operations, and thus directly affected the structure of the industry (*1, 19*). EPA modified these regulations, however, before implementation.

Nonpoint Pollution/Soil Erosion Control

Programs to reduce soil erosion and abate agricultural nonpoint pollution are voluntary. Cost sharing, technical assistance, and in some cases, low-interest loans are some incentives to participate in these programs. Economic and structural impacts to date are thought to be minor.

Potentially, the programs could become more restrictive in terms of soil loss, pesticides, and fertilizer use. Using a national model, an Iowa State University study predicted that regulations requiring either minimum sediment or reduction in soil loss to T values (to the point where soil productivity is just being maintained) would cause sizable economic and structural impacts

(*20*). U.S. agricultural production would shift significantly. Western regions with low soil loss would gain comparative advantage, particularly over the Southeast. Substantial costs would be incurred for large-scale terracing, contour cropping, and reduced tillage. An alternative policy of reducing sediment outflows from each subbasin by 20 percent would penalize producers in areas of already low erosion, such as the Western States.

An Illinois study using a Corn Belt model found that arbitrary soil loss restrictions would severely reduce income of farmers in high erosion areas, while significantly benefiting those in nonerosive areas (*6*). Limitations on fertilizer use and mandatory conservation tillage were predicted to severely affect producers on low-quality soil, even though total returns to all farmers would increase (again, price increases more than production decreases). The study concluded that it was *not* economically feasible for an individual farmer to control soil erosion unless he has an extremely long planning horizon and assumes a low discount rate.

Some States are passing regulations to back up Federal programs for water quality improvement. A study of the implications of Pennsylvania's Clean Streams legislation predicted reduced incomes for affected dairy farms, particularly when terraces, diversions, or other structures had to be implemented (*21*).

Programs without such potentially severe impacts will probably evolve. However, it does appear that many more farmers will be implementing reduced tillage practices, perhaps in conjunction with some integrated pest management. These measures require more sophisticated management of farming operations to avoid or minimize production drops. Older, less educated, and often smaller scale producers would be disadvantaged.

CONCLUSIONS

Overall, environmental regulations have not had severe economic or structural impacts to date on farming. However, few *ex post* analyses have been made, and few studies have examined structural impacts in any detail. A notable exception are the USDA studies of predator control and the sheep industry (*3*). The potential for increased environmental restrictions on farming, with substantially greater economic and structural impacts, suggests the importance of USDA's anticipating environmental actions, initiating *ex ante* studies, and developing information for policy decisions. Research is needed on:

- The extent to which economic incentives such as cost sharing, tax credits, and technical assistance reduce structural as well as economic impacts.
- The structural impacts of widespread use of integrated pest management, reduced-tillage practices, and other pollution abatement activities.
- *Ex post* evaluation of the impacts of waste handling regulations and pesticide use restrictions.
- Alternative strategies for abating pollution for agriculture and their implications for structural change in agriculture.
- The benefits and costs of economic incentives, regulations, and other alternatives.

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Energy Use and Energy Policy

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INTRODUCTION

The critical importance of energy in U.S. agriculture was forcefully brought to the attention of U.S. citizens in 1973 by the Arab oil embargo. This action was followed by natural gas delivery curtailments in 1975, 1976, and 1977. The disruption of oil supplies from Iran in 1979 contributed to shortages of diesel and gasoline supplies in the United States. Other oil-exporting countries also raised prices sharply. Sharply rising prices and increased uncertainty of fuel availability have significantly affected U.S. agriculture in recent years and will continue to be an important influence.

Energy has had a major but little noticed role in shaping the structure of agriculture. Prior to 1973, few people thought that the economy could be strained so severely by changes in the quantity and price of an input they had viewed as a small, rather stable part of U.S. agricultural production and transportation. The agricultural economy was developed using low-cost fossil fuel and the earnings were transferred to labor, capital,and land. From 1960 through 1970, diesel fuel, gasoline, and natural gas were plentiful and inexpensive. During this period the price of gasoline increased only 40 percent while wage rates climbed 73 percent and machinery prices increased 46 percent. New and larger machines using gasoline and diesel fuel were brought into agriculture to offset the increasing cost of labor. This new equipment reduced the demand for labor and encouraged increases in farm size and declines in farm population and employment. Production shifted to geographic areas that, because of the amount of land involved and its quality, allowed large-scale mechanization and crop specialization. As a result, farm numbers and land in farms declined in the Northeast and Appalachia, regions that could not adopt these practices.

Rapid expansion of irrigation in the Southern High Plains, for example, was possible because of the ready supply of low-cost natural gas, which was used to fuel the pumps. The shift from dryland to irrigated agriculture sharply increased the output of grain and proved to be a major factor in tremendous growth of cattle feeding in the area.

In addition, increased use of energy for irrigation,crop drying, and refrigeration reduced the risk of crop failure or spoilage. Waste was reduced in the marketing channels and a greater variety of food became available. Availability of energy also facilitated regional specialization in commodity production.

Following the rapid expansion of anhydrous ammonia production capacity in the late forties and early fifties, prices of nitrogen fertilizers fell sharply. Improved technology in the sixties led to further expansion in anhydrous ammonia production, which used low-cost natural gas as the feedstock. With nitrogen prices low relative to commodity prices, fertilizer use rose rapidly. This increased the relative advantage of highly productive areas such as the Corn Belt and irrigated agricultural areas, because of greater yield response to fertilizer, while it hastened the decline of agriculture in the Northeast and Appalachia, which have less productive soils. Thus, areas of specialized production developed.

Completion of the national interstate highway system and advent of large tractor-trailers allowed agricultural products to be moved long distances at relatively low costs, which reduced reliance on the rail system and enhanced regional comparative advantages and specialization of production.

In addition to being specialized in production, major areas have become more dependent on particular energy forms. Natural gas (primarily used for irrigation) ranks first as an energy source in the Southern Plains and Mountain States, accounting for 44 and 31 percent of the energy used in these areas, respectively (table 1). Gasoline accounts for over 50 percent of the total energy used in the Corn Belt, Lake States,

and Northeast regions. Diesel fuel use ranks high in the Northern Plains, Delta States, and Southeast. Electricity, a primary source of energy for irrigation in the Pacific States, supplies nearly as much energy to agriculture as is consumed in diesel fuel. One-fourth of the irrigated land in the Nation relies on low-cost hydropower to supply water.

In each region, farmers have balanced their energy consumption with the availability and cost of fuel, choosing that with the lowest relative price. Regional energy use data strongly suggest that changes in the relative prices of fuels in the past few years may sharply shift the competitive position of major agricultural production regions. For example, higher natural gas prices are causing some producers in the High Plains to return to dryland farming as the cost of irrigation rises rapidly. Irrigation may also decline in the Northwest if prices of electricity rise sharply.

Data from the U.S. Department of Energy show that the average world price of crude oil on August 24, 1979, was $20.75 per barrel—up from $13.80 on January 1, 1979. In 1972 the price per barrel for imported crude oil was about $3.

In agriculture, higher fuel prices mean higher production costs. Direct energy in corn production cost $5.72 per acre in 1975 and represented 6.3 percent of variable production cost. In 1979, energy costs per acre averaged $11.10 and accounted for 10.6 percent of production costs (table 2). Energy as a percentage of wheat production costs rose from 10.4 percent in 1975 to 16.5 percent in 1979. For cotton, energy accounted for 5.9 percent in 1975 and 9 percent in 1979. Such cost increases can affect the income of marginal farmers dramatically and could hasten their departure from agriculture. However, because energy represents a small proportion of total costs for raw agricultural products, a 10-percent increase in energy cost raises total production costs by an estimated 0.6 percent. In the long run, higher energy costs in the farming and in marketing sectors will be translated into higher food prices. Even so, a 10-percent increase in energy cost would increase the consumer food bill an estimated 0.5 percent.

AGRICULTURAL DEMAND FOR ENERGY

The United States consumed 79 quads of energy in 1978 (a quadrillion is 10^{15} Btus). Nearly half this energy was in the form of refined petroleum products. One-fourth came from natural gas, slightly less than 20 percent from coal, and 3 percent each from nuclear and hydropower.

The U.S. food and fiber system (including farm production, processing, marketing, and consumption) consumed about 6.4 quads of

Table 1—Agricultural energy use by region, as a percentage of total Btus provided by type of fuel, 1976

Region	Gasoline	Diesel and fuel oil	Liquid petroleum gas	Natural gas	Coal	Electricity	Percentage of U.S. total
				Percent			
Northeast	54.0	29.0	7.0	0.5	*	9.0	4.4
Lake States	58.0	26.4	8.7	*	*	6.7	9.6
Corn Belt	50.1	29.8	15.8	*	*	4.2	19.7
Northern Plains	30.3	41.7	10.5	14.0	*	3.5	15.5
Appalachia	33.7	39.1	22.5	.2	0.5	4.4	6.6
Southeast	26.5	56.3	12.5	.6	.2	3.8	7.2
Delta States	26.4	51.6	15.8	3.0	0	3.2	5.2
Southern Plains	22.0	20.6	9.2	43.6	0	4.7	13.8
Mountain	23.8	23.5	3.3	31.4	*	17.9	9.4
Pacific	23.2	36.5	2.9	2.7	*	34.7	8.6
U.S.	35.3	33.7	10.9	11.6	*	8.4	100.0

* = Insignificant.

energy in 1978, about 8 percent of all energy used in the United States (tables 3 and 4).

Farm production costs of $98 billion in 1978 included approximately $6 billion for energy used directly in the production process. Another $1 billion was spent for energy in the production of fertilizer and pesticides.

Table 2—Average fuel cost per acre and variable cost per acre, 1975-79

Year and crop	Fuel cost/ acre	Total variable cost/acre	Fuel as a share of variable cost
	— — — *Dollars* — — —		*Percent*
Corn:			
1975	5.72	91.21	6.3
1976	6.00	86.39	7.0
1977	7.89	96.41	8.2
1978	8.41	98.27	8.6
1979	11.10	104.80	10.6
Wheat:			
1975	4.72	39.50	10.4
1976	4.55	36.20	12.6
1977	4.80	37.24	12.8
1978	5.19	37.64	13.8
1979	6.85	41.35	16.5
Cotton:			
1975	8.43	143.99	5.9
1976	8.98	152.17	5.9
1977	11.45	168.21	6.8
1978	11.98	162.54	7.3
1979	15.81	175.61	9.0

Table 3—Energy consumption in the food and fiber system and total U.S. consumption[1]

Energy type	Food and fiber system	U.S. total	Food and fiber system as a share of U.S. total use
	— — — *Quads*[2] — — —		*Percent*
Petroleum[3]	1.8	38.0	4
Natural gas	2.9	19.8	15
Coal	.1	14.1	1
Electricity	1.6	6.1	26
Total energy	6.4	78.0	8

[1] Includes direct energy used in farm production, food processing, transportation retailing, and home consumption.

[2] One quadrillion (quad is 10^{15} Btus).

[3] Includes liquid petroleum gas derived from natural gas production.

About one-third of all energy used came from diesel fuel and fuel oil; slightly more came from gasoline. Electricity, LP gas, and natural gas supplied 8, 11, and 12 percent, respectively.

Direct Energy Use

Direct energy use in farm production amounts to 1.2 quads or about 1.5 percent of total U.S. energy consumption. When energy used in pesticides and fertilizer are included, total consumption approaches 2 quads or 2.6 percent of the U.S. total. Fertilizer alone accounts for more of the energy used in agriculture than any other direct farm operation. Irrigation uses more than any other production practice, one-fifth of the total direct energy in agriculture. Corn production alone accounts for about one-fourth of the total used directly while corn, wheat, cotton, and soybeans together consume over half. About 45 percent of the energy used in agriculture is concentrated in seven States—California, Illinois, Iowa, Kansas, Minnesota, Nebraska, and Texas. These States account for about the same proportion of cash receipts from farming.

Although agriculture uses only a small proportion of the total fuel consumed in this country, fossil fuels are a vital input in the production of food and fiber. Delays in planting or harvesting may mean that no crop is produced or that yields are seriously diminished. A farmer often must have one-third to one-half of his total fuel needs for a year's production in a span of a few days or weeks. During that period he would pay as high a price as necessary to get the fuel to plant or harvest a crop. Over the long run, the farmer can respond to price changes and will look for ways to conserve energy and reduce production costs. Farmers' decisions on changes in size or scale of operation, changes in cropping pattern,or changes in machinery complements will be based partly on the effects of energy on net farm income and production risk.

Farmers' demand for energy as an input is derived from the demand for their products. Those farmers whose possibilities for substituting nonenergy inputs for energy inputs (conserving energy) are extremely limited will have diffi-

culty adjusting to higher energy prices. Farmers tend to choose combinations of energy and nonenergy inputs that minimize costs of production. In cases where energy and capital are substitutes, higher priced energy will increase the farmer's demand for additional capital goods. However, if energy and capital are complementary, higher priced energy will decrease the demand for new equipment.

In an industry where the substitution between energy and nonenergy inputs is limited, energy shortages will produce cutbacks in output in the long run unless new technology evolves. In the farm sector, producers operating on the margin may be forced off the farm. The composition of farm output would shift away from energy-intensive crops, which could cause significant changes in regional production.

Energy Prices

Input price forecasts give little hope for easing pressure on prices. Over the next 5 years, the prices of oil, natural gas, and electricity are forecast to rise at 17, 21, and 12 percent per year, respectively (fig. 1). This assumes continuation of current decontrol legislation and rising prices for imported crude oil. Nonenergy input prices are expected to rise about 6 percent, slightly less than the projected annual inflation rate of 8 percent.

Energy's share of agricultural production costs has decreased, from 5 percent in 1960 to just over 3 percent in 1972 (fig. 2). During that period, the cost of capital increased from 5 to 7 percent of production costs. Between 1972 and 1979, however, energy costs rose from 3 to 5 percent of production costs, a rise of 60 percent as energy prices tripled. Cost shares of machinery declined slightly from 7 to 6 percent during this period.

Structural Impacts of Trends

The 1960-72 period was one of relatively low costs for capital, energy, land, and fertilizer. As a result, an agricultural production structure

Table 4—Energy requirements in the food and fiber system, 1978

Sector	Gasoline	Diesel fuel	Fuel oil	Liquid petroleum gas	Natural gas	Coal	Electricity	Total Btu
	Million gallons				*Billion cu. ft*	*Thousand short tons*	*Billion kWh*	*Quadrillion*[1]
Agricultural inputs[2]	3,527	2,706	271	–	728.5	150	13.5	0.8
Agricultural production:								
Crops	2,833	2,327	286	1,017	134.9		21.9	1.0
Livestock	582	347	10	382	4.9	34.6	9.8	.2
Food processing	–	–	1,240	–	446.4	3,357.9	39.8	.9
Marketing and distribution:								
Supermarkets			24	–	20.3	–	40.9	.2
Transportation	411	3,303	--	–	–	–		.5
Preparation:								
Restaurants and cafeterias	–		714		645.0	–	75.9	1.0
Home prepared meals	–				798.0	–	274.7	1.8
Total	7,353	8,683	2,545	1,399	2,778.0	3,542.5	476.5	6.4

– = insignificant quantity used.

[1] One quadrillion (quad) is 10^{15} Btus.

[2] Includes farm machinery, livestock feeds, fertilizers, and pesticides.

based on intensiveness of capital, energy, land, and fertilizer evolved. Demand for agricultural output increased steadily because of increasing population, incomes, and demand for exports. The new production technology was characterized by increasing returns to size resulting in lower costs per unit of output for the larger producers. Given the generally stable demand for output and the productivity increases resulting from the evolving technology, the number of farms declined 2.2 percent per year while acreages planted remained stable and farm incomes rose.

Increases in energy prices appear to have solidified the position of large farms in American agriculture since the energy cost per unit of output is lower for large firms. Farm enterprises most capable of absorbing input price changes through input substitution or product transformation will survive the price increases. Farm enterprises least capable of switching output will not survive. This trend could be slowed by energy conservation methods that shift the enterprise mix to less energy intensive operations.

Given the relative price changes forecast from 1979 to 1984, particularly relative energy price changes, agricultural production is likely to use capital and land more intensively but energy, fertilizer, and labor less intensively. These changes imply that, with increasing economies of size of operation, continued pressure will exist for farm size expansion. Fewer and larger farms will be concentrated in areas most suitable for the type of mechanization which uses energy the most efficiently. This trend will increase barriers to entry to agriculture.

Large energy price increases relative to the price of agricultural output will tend to decrease net farm income. The result could be larger and fewer farms plus increased off-farm employment.

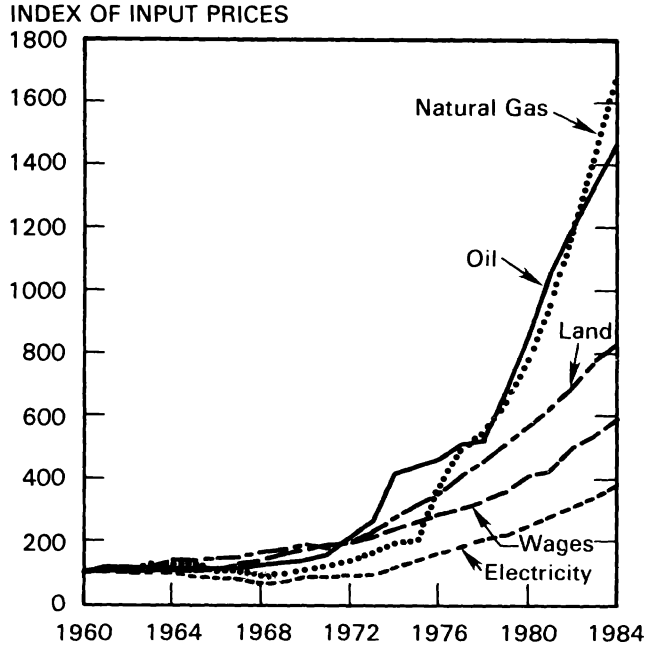
Except for irrigation in the western regions, regional differences in fuel prices and resulting energy costs are not likely to induce changes in production patterns among U.S. regions. Higher energy costs for irrigation could shift production regionally because energy accounts for a much larger percentage of the total cost of production.

The transportation industry is particularly vulnerable to higher fuel prices and fuel shortages. The relationships among commodity production costs, transportation costs, and fuel prices, however, preclude any major shift in regional production patterns resulting from higher fuel prices. In most instances, differences in transportation costs are far outweighed by regional differences in production costs. Since fuel costs represent between 5 and 10 percent of rail costs and 15 to 20 percent of trucking costs, even large increases in fuel costs are not likely to cause significant changes in regional production patterns.

The impact of fuel shortages on regional transportation services would be difficult to predict because the regional distribution of fuel shortages would depend largely on allocation policies and priorities. However, as there is no

FIGURE 1

PRICE OF SELECTED INPUTS IN AGRICULTURAL PRODUCTION



SOURCES: FOR OIL — REFINED PETROLEUM PRODUCTS PRICE INDEX, 1960-1978, U.S. DEPARTMENT OF ENERGY, FORECAST 1979-84; GROWTH RATE FOR REFINED PETROLEUM PRODUCTS, DATA RESOURCES, INC., FOR NATURAL GAS AND ELECTRICITY — INDUSTRIAL FUEL PRICE INDICES, 1960-1978, U.S. DEPARTMENT OF ENERGY, FORECAST 1979-84, DATA RESOURCES INC., AUGUST, 1979.

reason to expect allocation plans to explicitly favor some regions over others, it is unlikely that fuel shortages will affect regional production or consumption patterns.

ENERGY POLICY

Efforts to develop a comprehensive energy policy for this country have been underway since 1973 and a broad set of energy goals has evolved. The goals can be stated briefly as the desire to lessen our dependence on imported fuels through: (1) conservation of oil and natural gas, (2) the expansion of coal and oil shale development, and (3) conversion to renewable sources of energy such as solar and biomass.

For rural America and the food and fiber system, the primary goals in relation to energy, as currently stated, are these:

- To assure adequate supplies of energy to the food and fiber system and to rural America.
- To conserve fossil fuel, particularly petroleum and natural gas.
- To develop technology for production and use of renewable energy sources, such as direct solar energy, wind, and biomass.
- To shift to renewable energy where possible.
- To develop abundant resources such as coal and oil shale with minimum adverse impacts on agriculture and rural America.

These goals must be met with policies that will help maintain the abundance of the food production system while conserving energy and converting to new energy sources.

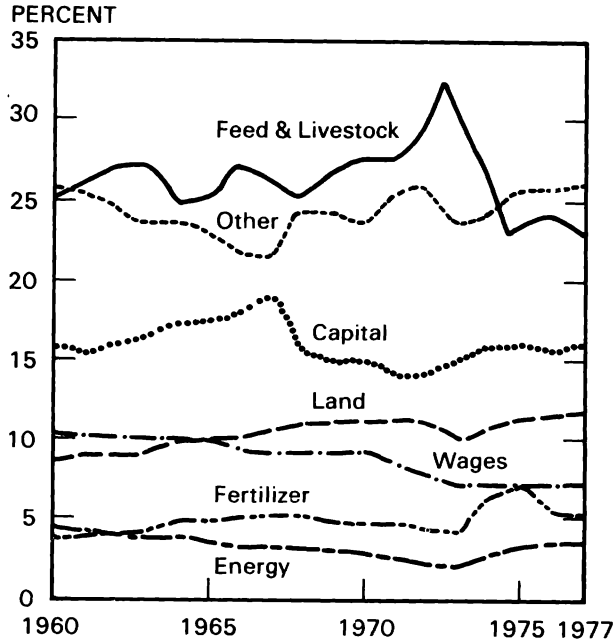
Rising energy prices mean higher costs of production and, at least in the early years of higher prices, lower net income. Some of the price impact may be offset by conservation efforts that will allow production of the same quantity with less fuel. Some of the effect may be passed through to the consumer or offset by improved technology that will reduce total energy requirements in agriculture.

Although the impact of rising prices can be severe, shortages of fuel would severely disrupt the agricultural sector, the food delivery system, and food prices. Assuring energy supplies to the farm sector and rural America in the short run can be accomplished through allocations. In the long run, energy prices must be at a level that will induce industry to continue production. Or, there must be a subsidy to industry if reasonable returns cannot be achieved with a free market.

Development of new technologies is a high-risk venture that requires some form of public subsidy through the stage where the process is commercially profitable. These subsidies can be applied either through direct funding from the Treasury or by taxing the use of fossil fuels and diverting funds to research and development of new technology.

The exemption of gasohol from the 4-cent-per-gallon Federal excise tax on gasoline subsidizes the production of gasohol. In some States, this exemption rises to 10 cents per gallon because State taxes are not applied either. As long as gasohol consumption is a small part of total fuel use, the impact is insignificant. Under a major gasohol program, Federal and State highway trust funds would be rapidly depleted, and

FIGURE 2
COST OF SELECTED INPUTS, AS PERCENTAGE OF AGRICULTURAL PRODUCTION COSTS



major problems could develop in highway maintenance. Deterioration of rural highways because of lack of funds could substantially change transportation costs for agricultural products.

Rising energy prices worldwide may influence the demand for U.S. agricultural exports. Higher energy costs severely reduce foreign exchange which developing countries use to purchase food and feed grains and reduce their ability to produce their own food.

A major policy debate concerns the priority of agriculture during periods of short supplies of fuel. Until recently, agriculture was entitled to 100 percent of its current operating needs. Currently, agriculture has priorities only for natural gas and LP gas. Gasoline is now allocated on a base year and diesel fuel is not allocated at all. Large farms that can afford to purchase and fill storage tanks are in a more favorable position with respect to fuel availability than are small farms that must rely on the local service station.

Fuel shortages can be expected to increase barriers to entry because fuel suppliers may give preferential treatment to established farm customers. The threat of fuel shortages also will encourage risk aversion by farmers investing in energy production technologies. Such technologies will require additional capital investment, thus favoring larger operations.

ENERGY CONSERVATION

Current national energy policy places a heavy emphasis on conservation of fuel and substitution of fossil fuel with renewable resources. Higher energy prices will compel farmers to conserve as much energy as is economically feasible and to search for alternative energy sources by:

- Changing the combination of inputs.
- Technological shifts which tend to make energy use more efficient.
- Increases in output resulting from more favorable weather conditions or other factors.
- Increasing returns to size (less energy used per unit of output as the size of a production unit increases).

Farmers have already adopted many conservation practices, such as increased insulation in buildings; minimum tillage; and better management, such as closer regulation of ventilation in buildings, proper maintenance of tractors and other motor vehicles, and correct matching of tractor size to implement size. Some of the energy conservation efforts, such as improved management practices, decrease energy consumption per unit of product output. Other practices, such as minimum tillage, use less motor fuel but more insecticides, fertilizers, and other inputs, which require energy both as a raw material and in the production process. Much of this energy demand is met by natural gas.

AGRICULTURE AS AN ENERGY PRODUCER

Resources exist in rural America to provide significant quantities of alternative energy for use in the agricultural sector or elsewhere in the economy. These are all renewable resources, available either directly from the sun and wind or indirectly from the sun through biomass-type crops and residues.

Although technology exists for energy production from agriculture, it is currently not economically feasible relative to energy from conventional sources. However, one objective of national energy policy is to reduce consumption of depletable fossil energy sources by substituting renewable energy sources and by energy conservation efforts. Alternative sources of energy may become economically feasible as prices of conventional energy rise and as inducements through policy decisions (tax subsidies, direct funding, or other measures) are adopted.

One possible structural change in agriculture which could be averted by the economic use of alternative energy sources relates to irrigation in the West and Southwest. Because irrigation is essential for most crops in these regions and constitutes a large portion of the total costs of production, additional significant fuel price increases or lack of available supplies could decrease western and southwestern agricultural production. The structural implications of such

reductions in irrigation are that much of the crop production would shift out of these regions. This would likely be followed by a similar shift of parts of the livestock industry—that is, a reversal of the regional shift in cattle feeding over the past two decades.

Minimizing the economic problems does not address possible repercussions to the food and fiber system. Significant structural shifts of a large energy production program, however, would likely be inevitable as much of the potential energy production would involve collecting and processing various forms of biomass. Growing the biomass would in many cases compete directly with many of the livestock and crop products currently produced for human consumption. Each successive part of the complete worldwide food and fiber system would undergo a ripplelike effect resulting from the change introduced by a large energy production effort.

Energy production from agriculture will be influenced strongly by research efforts during the coming decades. If research indicates that small-size fermentors, anaerobic digestors, or other energy-producing devices are as cost efficient as larger ones, energy production and consumption will likely occur locally. If large units produce energy less expensively or in the forms needed for the particular uses, rural agriculture will continue to be extremely dependent on outside sources for energy. With large-scale technology, farmers would produce and deliver products to an energy production site. They would then purchase fuel output and byproducts, such as dried distillers grains, and also residues for fertilizer use. The energy producers could be private individuals, corporations, or cooperatives. Agricultural cooperative type of ownership of such energy production facilities could enhance the position of farmers by allowing retention of control over energy inputs (including price and availability) for agricultural production purposes. Large-scale production could require development of a different network of energy-supplying systems. It could also reshape the livestock feed production and distribution industry.

Data limitations on differences in the costs of producing energy from alternative energy sources do not allow specific analyses of possible changes in the average size of farm, number of farms, or type of farm ownership in the future. Generally, however, if large units have lower costs of producing energy, the historical trend toward larger farms could be continued by the adoption of alternative energy sources. Likewise, larger firms normally have access to large amounts of capital at lower interest rates. Thus, they can buy the equipment needed for energy production.

SOURCES OF ALTERNATIVE ENERGY

Sources of significant energy production potential include:

- Bioenergy available from different forms of biomass. Processes used to release energy from biomass include direct combustion (heat), fermentation (liquid fuel), anaerobic digestion (methane gas), and pyrolysis (oil, char—charcoal or carbon—and low Btu gas).
- Direct solar energy—both passive and active systems.
- Wind energy including direct application and wind-generated electric.

These are all renewable resources, available either directly or indirectly from the sun through biomass, crop residues, or waste materials from processing. Although each is a source of energy, if any are to replace fossil energy currently used in agriculture, they must be in the correct form. Space and hot water heating, crop drying, and irrigation can utilize various energy sources. However, replacing gasoline and diesel fuel must be more specific in form to avoid having to redesign the motors of tractors, trucks, and other motorized equipment.

Biomass

Energy policies encouraging biomass production have been pursued because of the renewable, relatively large potential source of energy and the form of energy which could be readily used in current mechanized agriculture. Biomass

production would have a major impact on cropland, fertilizer, machinery, and labor. Production of biomass in arid regions would compete for water supplies. Utilization of livestock waste and crop residues for energy could lower soil fertility. Small-scale biomass technology for farm use would increase farm labor requirements and divert farm resources from the production of food and fiber for human use.

Agriculture could achieve self-sufficiency in energy by producing two quads of energy from alcohol produced from corn, which would require 90 million acres of 100 bushels per acre. (This assumes 85,000 Btus per gallon of alcohol and 2.6 gallons per bushel.) The acreage required is larger than the entire acreage planted to corn in 1979.

Regardless of the crops chosen or the methods used, a return to self-sufficiency in energy is likely to be very costly in terms of capital,labor, and other input requirements. And, increases in capital intensity suggest major pressures to increase farm size.

A major biomass production effort by agriculture could affect the environment significantly. Expanded areas of crop production will expose more land to soil erosion, which would make it a greater source of nonpoint water pollution. As the quality of land brought into production decreases, environmental impacts will become greater. Residues, which would be harvested for energy production, are normally left on the land to return nutrients to the soil and maintain organic matter content. Their presence reduces erosion, enhances water-holding capacity of the soil, and minimizes transport of nutrients, pesticides, and organic matter by runoff. Thus, a continuous energy production program from agricultural land could have a detrimental effect on its quality and future production potential.

Direct Solar and Wind Energy

Although direct solar and wind energy could assist in attaining agricultural energy self-sufficiency, much of the derived energy would be specific to a particular site and substitutable for almost none of the motor fuels. Therefore, these sources could displace propane, some natural gas and fuel oil, and limited quantities of electricity.

Like other alternative energy producing technologies, solar energy is technically feasible, but not economical. The primary reason is that many uses, such as grain drying, space heating, and water heating are seasonal so the large fixed costs of solar equipment, plus auxiliary backup systems, become prohibitively expensive. Current efforts are underway to identify collection and storage systems plus combinations of enterprises which will allow use of the equipment over a large portion of the year. Such efforts should somewhat stabilize a portion of the total energy cost to farmers and allow more certainty for future supplies of energy.

Structural impacts of adopting a large direct solar or wind energy program for agriculture would be minimal. Possible changes in size and enterprise combinations are the most likely. Changes in combinations of enterprise or times of the year for livestock production would allow a better use of alternative energy production. These changes, however, would be subject to seasonality, marketing process, weather, biological process, and labor and capital availability. Changes in size, number, and ownership of farms would be minimal unless costs are significantly different for small or large operations.

Micro and Macro Impacts of Energy Production

The impacts of a large energy production effort on the structure of agriculture should be addressed at the farm level and at the national level.

At the individual farm level, two basic issues will determine the combination and size of enterprises each farmer will operate: the goal for net farm income over time and the degree of risk aversion desired. Other related issues that will influence farmers' decisions are: seasonal farm labor availability; quantity and type of energy which can be produced; additional capital expenditures; and age of individual farm operators.

If farmers want to minimize risk, energy pro-

duction either on farms or in local areas would be an important consideration. This, however, would require adequate seasonal labor and capital for investment in energy producing equipment. In many cases these two inputs are already in short supply, especially seasonal labor. Farm structure could be affected by additional labor requirements, a change of crop mix, and changes within the input-supplying and product-marketing sectors.

The average age of farm operators could be important with respect to farm size changes, shifts in types of crops produced, and perhaps regional shifts in production of certain crops as a result of energy changes. If, on the average, farmers in a particular region are older, they are less likely to invest in alternative energy production technologies. This could make them less competitive with other producers and eventually force them out of business.

Perhaps even more important longrun considerations lie unanswered at the national level. The key issue is whether the agricultural resource base has the capacity and the flexibility under changing conditions to produce both food and energy. If adequate physical resources are available, then it becomes a matter of developing the resources along the lines of an overall U.S. energy policy. Additional research is needed to measure the technical feasibility of alternate energy systems and to measure the complete economic effects on the food and fiber system of a national energy production program.

A policy of high levels of energy production from agriculture would probably alter significantly the structure of contemporary agriculture. Farmers may grow a different mix of crops and utilize new feed rations. They would likely undergo a new education in management strategies and would spend more time obtaining their energy inputs. Traditional feed processing industries could be affected adversely. If the energy produced is consumed on farms, the structure of the petroleum marketing system in rural areas could be affected adversely. Conversely, centralized processing and blending with gasoline supplies for the general economy could require a new gathering and marketing system.

Farms have been increasing in size and in specialization; should economies of scale in renewable technologies predominate, these trends could be reinforced. However, if farmers seek energy self-sufficiency by developing a complement of on-farm energy production facilities, it is conceivable that small, diversified farm enterprises could fully occupy and sustain family units. More families in rural areas leads to an increased demand for the services expected in today's society. Per capita energy consumption would increase because these families would have to travel farther to obtain such services. Increases in the proportion of single-family residences instead of multifamily residences would increase such energy use.

If larger energy production units are more economical, teams of specialists might form cooperative enterprises of much greater acreage. For example, one could specialize in maximizing the output of field and forage crops. An energy specialist could manage the operation of solar collectors, distillation units, and methane digestion, as well as match the output with the uses. The livestock manager would design efficient ration mixes from the available feed and forage crops, as well as the energy processing byproducts. If most of the farm's output is shipped for processing, a marketing specialist would have a key role in the success of the operation. Currently, an individual operator must have all these talents. If agriculture becomes an energy producer, the agricultural system could change, perhaps become vastly more complex, to the extent that an individual operator could no longer keep pace with all the technologies and physically perform the wide variety of operations at an economic level.

IMPACTS OF COAL AND OIL SHALE MINING

The mining of western coal and oil shale has direct impact on the land that is strip mined. In terms of overall agricultural structure or production, the impact is small. As coal mines are developed in the southern Corn Belt, the impact on farmland and production will be substantially

greater. The impact on land depends on how the coal is utilized. If it is hauled by rail to eastern markets, the land impact is slight. If slurry pipelines are used, the impact on land is slight but the impact on water supplies would be large.

Steam generation and conversion to electricity at the mine mouth require more water than slurry pipelines. One estimate is that 4 tons of water are consumed per ton of western coal in an efficient steam generation plant. This would amount to 12,000 to 15,000 acre feet of water per 1,000 megawatt plant. In an area where water supplies are already scarce, the impact on irrigated agriculture could be severe. In addition, with major energy developments occurring in sparsely settled areas, competition for labor would be strong and sharply higher farm wage rates could be expected. The influx of new people to an area would place great burden on rural communities to provide housing, schools, hospitals, roads, and sewage disposal. Local and State budgets would be affected severely by the initial financing of such services.

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Transportation Policies And Farm Structure

FSCS Staff

INTRODUCTION

This article examines the role of transportation in agriculture and indicates the importance of various modes by commodity and region. The relationships between transportation and farm structure are discussed and examples given of how specific policies have contributed to structural change. Finally, the current and emerging issues in transportation are presented and their implications for structural change briefly summarized.

THE TRANSPORTATION OF AGRICULTURAL PRODUCTS

The specialization of U.S. agricultural production, by commodity and geographic region, requires major movements of agricultural commodities among farms. Feed grains move to livestock farms and cattle may move several times before final marketing. Inputs such as fertilizer, fuels, and other manufactured products must be transported from production points to farms. In addition, about 30 percent of U.S. grain production is exported and must be moved by rail, barge, or truck to ports.

Railroads and barges haul most of the grains and oilseeds. Railroads carried 4 billion bushels in 1978 in contrast to 1.6 billion bushels carried by barges. Preliminary data for the first 6 months of 1979 indicate railroads will exceed their 1978 volume. Barges service the export demand at ports on the Gulf. Most barged grain originates along the upper Mississippi River system.

The transportation system also transports a broad range of perishable products including fresh fruits, vegetables, red meats, poultry, eggs, and dairy products. Fruits and vegetables may be field packed and then shipped to wholesalers and retailers, while poultry and milk may be assembled and hauled to processing plants before the finished products are moved to distribution channels. Beef production normally requires that feeder cattle or finished cattle be shipped before slaughter; after slaughter, the final meat products are moved into the food distribution system.

Trucks haul practically all the milk, poultry, eggs, and livestock, more than 85 percent of the fresh fruits and vegetables, and 85 percent of the meat. Truck rates for long haul are generally higher than rail rates but trucks are more flexible in moving among production areas as seasonal harvests begin and end. Truck service is usually faster and more reliable than rail, a critical factor for products with a short shelf life.

Trucks hauling fresh fruits and vegetables and other nonprocessed agricultural products are exempt from some regulations. Regulated motor carriers may use agricultural products as a backhaul. But, because of the seasonality of production and the net flow of agricultural products moving from country points to urban areas, the backhaul potential is limited. Exempt truckers that are able to shift operations as harvests change among production areas are essential in transporting fresh fruits and vegetables.

TRANSPORTATION POLICY AND FARM STRUCTURE

Transportation policy influences farm structure by changing the economic environment within which farmers operate, but the results of changes in transportation policy are sometimes difficult to isolate. For example, transportation policies may be a result and not the cause of structural change. In other instances, the effects of transportation policy on structure may be insignificant when compared with other influences on farmers.

Number and Size of Firms By Commodity and Location

Policies that expanded the transport system and made it more efficient helped to open up new production areas and to increase the number of farms. In subsequent years, the system

encouraged increases in farm size. Assuming farmers are price takers, the cost of transporting inputs and products influences the firm's cost of production. Thus, changes in transport costs also influenced prices received for farm products and farmers' net returns.

Returns to farm firms affect the return to land (economic rent) and thus, the price of land. Farm firms located farthest from the market (or input source) generally earn a lower return than firms closer to the market. Impediments to the transportation system, such as shortages of railcars, obstructions in the waterway system, and deteriorating rural road systems, tend to raise per unit transportation costs and, hence, reduce returns to some farmers.

Grain provides the best example of changing market location. Lower rates for multicar grain shipments have tended to place more emphasis on the country subterminal and less emphasis on the traditional terminal market. As a result, country elevators are being bypassed by farmers who truck their grain longer distances to subterminals. The small country elevators are becoming obsolete because their services (drying and storing) are no longer needed by farmers and because of railroads' abandoning rail branch lines.

The development of subterminal elevators capable of loading 25 to 100 cars in unit-trains may have indirectly contributed to the increase in farm size. With reliable shippers capable of handling large volumes at reduced freight rates, farmers may be more inclined to expand operations.

Degree of Specialization of Production by Firms

The adequacy of the transportation system determines to a large degree the specialization that can exist in agricultural production. In the absence of a means for transporting goods, all areas have to be essentially self-sufficient, producing most of the goods they need. Railroads opened up eastern markets to western grain and cattle producers and a system of roads provided access to the railroads where necessary. Later, the increased size and speed of trucks, combined with construction of the interstate highway system, allowed trucks to compete in long-distance hauling.

Transportation policies have, therefore, allowed production and market locations to change. The inland water and rail systems, for example, are partly responsible for the heavy concentration of and specialization in the production of corn and soybeans in the Midwest. The recently instituted rail-barge tariff will also be a factor since it allows farmers in western Iowa to pay a lower rate for shipping grain by rail to the Mississippi River and then by barge to Gulf points than they would pay by shipping the grain all the way by rail. Some of the grain would likely have been fed locally without the rail-barge rates. Western Iowa farmers may, in the future, receive a somewhat higher price for corn and soybeans if the rail-barge traffic endures and if it reduces rates for all-rail movements.

The policies promoting the rail network and the interstate highway system also promoted the development of specialized production areas for fruits and vegetables. Such products, once produced close to major consumption centers, are now concentrated in Florida, California, and Texas. Another factor encouraging production specialization has been the exempt status of raw agricultural products which enables unregulated truckers to lower rates between certain regions by picking up products to backhaul. As a result, more fresh products are available throughout the year, but farmers are more dependent on the transportation system.

Transportation facilities also give certain regions advantages in agricultural production. The introduction of the Big-John hopper car with lower multicar rates lowered the cost of transporting feed ingredients to feed manufacturers. Those changes favored large volume businesses that could more easily take advantage of volume discounts. One result, relatively lower feed ingredient transportation rates to the Southeast, was a significant factor behind the shift in poultry production from the Northeast to the Southeast. Since the Northeast had higher transportation

rates, percentage rate increases widened differences between the Northeast and Southeast over time. In addition, due to the good roads, trucks were able to haul ice-packed broilers from the Southeast overnight to markets in Washington, D.C., New York, and other cities on the East Coast at lower unregulated rates.

Ownership and Control of Productive Resources

Transportation policies affect the availability and price of inputs used in production. Improved rural roads and the highway network, for example, enhance the value of land in certain areas for other than commercial agricultural uses. Thus, full-time farmers may find it more difficult to acquire or pay for land. In some cases, tenancy and land rental may be encouraged by these higher land prices.

Barriers to Entry to the Farm Sector

Providing transportation services to farmers and others has been a major component of the Nation's transportation policy, so that the lack of transportation would not be a barrier to farming in most major areas. As new markets were opened, however, through improvements in transportation facilities, the older areas were placed at a cost disadvantage. Specialization in production raised economic barriers in regions formerly able to compete and produce. Large-scale abandonment of rail lines that once encouraged production could, however, become a barrier to certain types of farming and further affect the relative costs of production among regions.

CURRENT AND EMERGING TRANSPORTATION ISSUES

A number of current transportation issues can potentially affect the structure of the farm sector and its product and input markets. Most of the issues result from changes in previous policies or from problems not now being adequately addressed.

Railroads

Many of the current problems and issues facing the railroads, and the shippers they serve, may have been caused by policies that did not permit adequate economic returns to the railroads. A partial list of these policies include ratemaking, inequity of modal subsidies, and work rules that resulted in inefficiencies. For whatever reason, these railroad issues could affect farm structure.

Railcar supply.—The shortage of railcars is associated primarily with cars for hauling grain and, in particular, the regular hoppers cars or boxcars that can be accommodated on low-density branch lines. In times of peak demand, at harvest or for export, there is a shortage of all grain cars but the need is greater for the cars that service small-volume shippers on lines that cannot handle the large hopper cars. At these times, shippers with the least economic power may be at a disadvantage if larger shippers have cars tied up through long-term lease arrangements.

Branch line abandonments.—Many branch lines are scheduled for abandonment and others may be abandoned. Abandonments might mean that farmers will be forced to truck their grain to elevators with viable railroad lines. Since the grain would normally have to be trucked farther than at present, farmers' transportation costs would increase. On the other hand, many producers, already bypassing grain facilities on abandoned lines, have benefited from lower multiple-car rates. Rail abandonments have not yet caused any severe adverse effects for producers, though some farmers have had to alter their operations after the abandonment. Producers, though, could be adversely affected if there were extensive abandonments and alternative railheads were not available.

Social implications of rail abandonment have been varied. Some rural communities located on abandoned lines have been severely affected: employment was reduced resulting in lower tax revenues and income; population declined; ship-

ping costs increased. Most communities, however, continued to maintain their economic vitality. Some firms were forced out of business, but most firms survived by making adjustments in their operations.

Motor Carriers

Trucks haul most of the perishable agricultural products because they provide the needed special services more reliably than other modes. Trucks are subject to economic regulation on some processed agricultural products, such as meat, and, therefore, must meet all safety requirements regardless of the product being transported.

Deregulation.—The ICC is considering regulatory reforms that would reduce barriers to entry, introduce considerable flexibility in ratemaking, and deregulate various types of specialized hauling. Most of the effects of these proposals on agriculture would be of a general nature such as lower rates and expanded service for inputs and manufactured farm products. However, the deregulation of specialized hauling could increase the opportunity for some exempt haulers to obtain a loaded backhaul. Without regulation, transportation of less-than-truckload lots would probably be more expensive for rural areas, but truckload lots of goods should be cheaper. If exempt truckers can more easily obtain loaded backhauls, truck rates and services should be lower for agricultural producers. The overall effect of regulatory reform in trucking should be of some benefit to small producers but, as with most cost savings, larger firms would probably benefit the most.

Size and weight restrictions.—Federal legislation now allows truck loads up to 80,000 pounds on interstate highways but weight restrictions have not been raised in all States. Gross weight limits in several States along the Mississippi River are below 80,000 pounds, forming a restrictive barrier for East-West shipments. Pennsylvania, New Jersey, and Maryland have also retained lower limits, thus holding shipments from the Southwest to New York and New England to less than the maximum allowable Federal gross weight.

Uniform size and weight restrictions equal to the Federal limit would lower truck transportation costs. The impact of these restrictions on structure is unknown, but there could be minor adjustments in farming areas if weight, size, and other restrictions were made uniform.

Condition of rural roads.—The quality of rural roads, rather than the extension of mileage, is the primary concern. Only 23 percent of all surfaced rural roads have a surface that can withstand a high-load capacity. A realignment of the Federal-aid highway system recently reduced the amount of rural mileage eligible for Federal funds. A large number of deficient bridges connecting the affected roads were also removed from the Federal-aid system. As a result, State and local government will have to allocate more funds for road construction, highway improvements, and bridge replacement.

Farm income, the combination of farm enterprises, and farm structure in some areas could be affected if rural roads deteriorate and cannot carry the traffic generated from rail line abandonments.

Water Carriers

The Federal Government has financed construction, maintenance, and navigation projects on U.S. waterways since 1824. Recent legislation by the Congress imposed user charges for commercial transportation on inland waterways; the charge is in the form of a fuel tax that will be assessed at a rate of 4 cents per gallon in 1980, and increase to 10 cents per gallon in 1985.

Research conducted on the potential impacts on agriculture from the initiation of waterway user charges suggests that traffic diversions from barge to rail or truck would be slight unless substantial user charges were implemented. Thus, most shippers would not divert agricultural com-

modities to alternative modes. Changes in transportation costs due to user charges would appear to have little impact on the location of crop production. However, some crops would be shifted to production locations closer to waterway shipping points. This relocation would have the effect of slightly lowering prices of some commodities while slightly increasing prices of others.

IMPLICATIONS FOR STRUCTURE OF THE FARM SECTOR

The possible implications of transportation policy on structural change are summarized under three headings—capacity of the transportation system, energy availability, and deregulation. The indicated changes are tentative; little research has been directed specifically toward measuring the effects of transportation policy on farm structure.

Capacity of the Transportation System

The transportation system appears adequate for current needs but there have been delays in grain transportation during peak harvest or unusual demands for export. Transport capacity may be affected by energy availability, equipment shortages, waterway maintenance, storage capacity, and by coordination among all modes and facilities. With agricultural demand expected to increase, policies should encourage an increase in the system's capacity or better management. Government policies not directly related to transportation may place a temporary strain on capacity. Grain may be called from farmer-owned reserves at a time when harvest demands for transportation services are at a peak, for example.

Inadequate capacity most affects grain farmers, who must move large quantities in a short period of time. If the grain does not move, the farmers' cash flow will be reduced, which would affect most seriously the smaller farms with less storage capacity and less credit available. Seasonal shortages of transportation are not likely to cause changes in location of agriculture or result in less specialization but could cause changes in marketing facilities for grain and possibly some shifting of markets.

Energy Availability

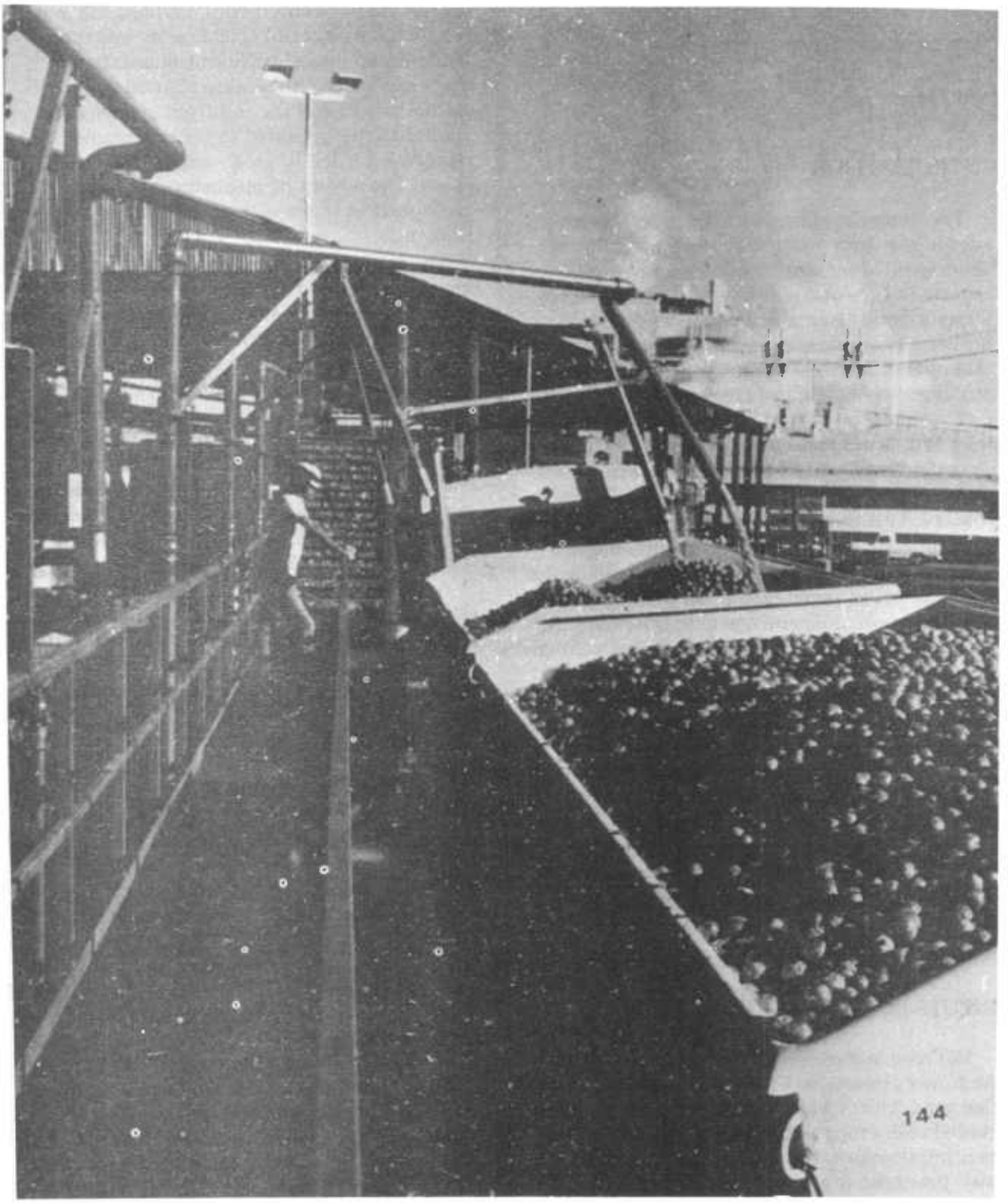
Prospects for a longrun shortage of petroleum-based fuels will require many policy decisions that affect the transportation of agricultural products. Unless fuel for transportation is available at costs comparable to those in the past, changes in transportation might affect the regional production of some commodities such as fresh fruits and vegetables. Other possibilities would be a shifting in the location of the broiler industry or in the structure of the livestock growing and processing industry.

Energy sources for transporting products will have important policy implications of their own. New energy sources such as alcohol made from agricultural products may have important policy implications for transportation since subsidies in the form of tax relief on "gasohol" reduce money available for building and maintaining the road system.

Deregulation

Policymakers have considered deregulation of transportation for years and, through exemption and other changes, some deregulation has occurred. The exemption from controls of trucks hauling unprocessed agricultural products was a factor in shifting many perishables from rail to truck, for example. The Carter Administration has sent a message to the Congress asking for considerable deregulation of the trucking industry and bills to that effect were introduced in both Houses of Congress. This would be a dramatic change in policy which, most studies conclude, would lower the costs of transportation and maintain a level of service equal to or better than that under a regulated industry; transportation costs could, however, be higher in remote areas where volume is small and there is little competition. The effect of such a policy change on farm structure is not yet known.

Marketing



Farm Inputs Industries And Farm Structure

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INTRODUCTION

The dramatic changes of the past few decades in the farm production sector have been accompanied by significant changes in other aspects of the food and fiber economy, particularly in industries which supply inputs to farmers. This article examines such changes and attempts to identify the forces that portend structural change in the farm sector.

The composite effects of farm input industries' structures and behaviors have partially caused a trend toward the separation of ownership and management of farm production resources. This trend has roots in the use of inputs over time. The pricing, procurement, and research strategies of specific input industries also can have pronounced effects on the organization of production units and thus, on the numbers, size, type, and location of farms. These strategies may change farm ownership and management patterns, possibly erecting significant barriers to entry into farming. In addition, most farm input industries are structured so that broad economic forces like energy cost and availability and inflation elicit behavior in these industries which induces structural change in farming.

The following analysis concentrates on the links between changing input mix, specific industry strategies, and general macroeconomic forces, and the changing patterns in farm ownership and management.

INPUTS IN PERSPECTIVE

For almost a century, the typical American farm was a nearly self-contained, highly diversified unit. The diversification which often included cash crops and livestock had two important implications. It assured more stable income over time, and it allowed for the integration of complementary enterprises. Perhaps the most significant aspect of typical farms was their tendency to be self-sufficient in energy and plant nutrients. Crops were planted to "fuel" animal power and the sod from grasses and animal wastes provided the basic organic plant nutrients needed to grow crops or feed for livestock. The advent of mechanical power began a basic shift in the input use patterns of American farmers.

The trends for nonpurchased and purchased input use have moved with equal velocity in opposite directions since 1940. Nonpurchased inputs include unpaid family and operator labor, owned real estate, and capital. Purchased inputs are those not produced on farms, such as petroleum, equipment, and chemicals. The quantity of nonpurchased inputs in 1977 had declined to half that used in 1940 (table 1). Purchases of inputs more than doubled. Thus, in the last 40 years, farmers have become increasingly reliant on nonagricultural firms and industries for their basic production needs.

Agriculture also underwent one of the greatest institutional upheavals in our Nation's history. Farm production doubled (table 1) at the same time as a mass exodus of labor occurred. Many small, diversified farms were consolidated into larger, specialized farms. Labor use declined much faster than did the use of nonpurchased inputs, which implies that remaining farmers were buying additional land.

For the most part, farmers replaced labor with capital—machinery and chemicals. Mechanical power use increased dramatically (table 1), but not as rapidly as the chemical use. The largest increase in purchased inputs was for chemical fertilizers. The use of pesticides and herbicides has also increased dramatically, but more recently. Currently, rapidly increasing fuel prices are encouraging increased use of reduced-tillage and "no-tillage" farming practices. Mechanical energy and labor used in crop cultivation have all but been replaced by herbicides. Yet these techniques require extensive use of increasingly expensive, petroleum-based chemicals, and they may be in conflict with societal environmental goals.

The price trends for purchased farm inputs indicate that producers adopted reduced-tillage strategies to remain profitable. In the past 12 years, tractors and fuel prices have more than doubled (table 2). The increases in the last 3 years have been especially great. Relative to those for fuel and power, prices of agricultural chemicals have not risen as much. Prices for purchased feed and fertilizer have actually declined in the past few years. In the aggregate, the prices farmers pay for purchased inputs have more than doubled in the last 12 years, faster than those produced by farmers themselves.

Most purchased inputs are bought with borrowed money. As borrowing is common in all economic segments, farmers must bid against farm and nonfarm firms. No off-farm input price has increased more rapidly than the cost of money (table 2); thus, not only are today's farmers having to buy more inputs but also the prices of purchased inputs are relatively high and increasing rapidly.

In the past, the single largest financial commitment of most producers was debt servicing for their land. They owned most of their capital equipment. In times of low farm incomes,

Table 1—Indexes of farm output and farm input purchases, 1940-77

Year	Output	Inputs					
		Nonpurchased[1]	Purchased[2]	Farm labor[3]	Mechanical power and machinery[4]	Agricultural chemicals[5]	Feed, seed, and livestock[6]
				(1967 = 100)			
1940	60	159	58	293	42	13	42
1950	74	150	70	217	84	29	63
1960	91	119	86	145	97	49	84
1965	98	103	93	110	94	75	93
1970	101	97	102	89	100	115	104
1975	114	92	107	76	113	127	101
1977	121	88	118	71	116	151	110

[1] Includes operator and unpaid family labor, and operator-owned real estate and other capital inputs.
[2] Includes all inputs other than nonpurchased inputs.
[3] Includes hired, operator, and unpaid family labor.
[4] Includes interest and depreciation on mechanical power and machinery, repairs, licenses, and fuel.
[5] Includes fertilizer, lime, and pesticides.
[6] Includes nonfarm value of feed, seed, and livestock purchases.

Source: (*8*, pp. 56-57).

Table 2—Indexes of prices paid by farmers, 1965-77

Year	Production items with farm origin	Production items with nonfarm origin	Feed	Fertilizer	Agricultural chemicals	Fuels and energy	Tractors and self-propelled machinery	Interest[1]
				1967 = 100				
1965	94	94	97	103	98	98	92	79
1970	111	113	101	88	98	104	116	134
1975	169	198	187	217	160	177	195	262
1978	205	238	183	180	147	212	259	396

[1] Interest on indebtedness secured by farm real estate.

Source: (*20*, pp. 14-23).

farmers' cash receipts were usually enough to pay their debts. They absorbed deficits by postponing purchases of replacement equipment and deferring repairs and improvements.

However, as farmers substituted more off-farm inputs, their financial commitments to others became larger. Now they must generate enough cash flow to repay production loans, equipment payments, and land debt. In hard times, many no longer have "owned" resources to fall back on. Thus, some producers may be forced to liquidate capital and/or land to make up for deficit cash receipts. This has caused many people to question the organization and performance of the input supply industries.

TRENDS IN FARM INPUT INDUSTRIES

Each supplying industry has unique structural and behavioral characteristics. Generally, little information is available on individual industries. Both public sources, which tend to be outdated, and private sources, which tend to be superficial and inconsistent over time, have been used to sketch a few key input-supplying industries.

The Feed Manufacturing Industry

The largest agricultural input industry, feed manufacturing,is probably the most competitive and the one about which we have the most public information (*22*).[1] In 1975, there were 6,340 feed manufacturing establishments, of which 26 percent were cooperatives. Concentration of production seems to be only a concern in isolated local and regional areas. The industry seems to be providing farmers with the mix of services they need. The fact that producers can integrate into certain aspects of feed manufacturing (on-farm grinding and mixing) has probably helped regulate industry performance.

Feed manufacturers' vertical integration into the poultry industry demonstrates the structural impacts of input industries. By using various ownership and contracting devices, feed manufacturers transformed broiler production from a scattered, diversely organized sector into a highly specialized, regionally located system. In return for guaranteed input supplies and product markets, farmers relinquished many managerial freedoms. The ownership and management responsibilities of broiler producers were dramatically altered. Although resource control has shifted to nonfarmers, consumers are generally pleased with the more standardized, consistently available, and less expensive product. Most of the structural influences of farm input industries tend to be less dramatic and more gradual than those experienced in the broiler industry.

The Fertilizer Industry

General overcapacity characterized the fertilizer industry in the late sixties, followed by shortages in 1973 and 1974, and falling prices as crop production declined in 1976 and 1977. Nitrogen production has become more competitive as the industry has grown rapidly. In 1975, the top four producers had only 23 percent of the market. Cooperative firms now produce 20 percent of the U.S. output. Concentration in the potash industry has been stable since 1960, and in 1976, the top four firms controlled about 53 percent of the output while cooperatives had 3 percent. Concentration in the phosphate fertilizer industry has fluctuated. Generally, the concentration in the top four firms averaged about 50 percent. Cooperatives control about 25 percent of phosphoric acid production.

Conglomerate firms with interests in many products are found in all segments of the fertilizer industry. Petroleum, both producers and refiners, and chemical firms are heavily involved.

Generally, the fertilizer industry has performed well. As fertilizers are chemically identical (homogeneous) products, conglomerate firms' proclivity to differentiate their products through advertising and promotion is difficult. Fertilizer manufacturers have therefore tended to develop excess retail outlets and distribution patterns which foster differentiation of their

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

products through service packages (*14*, p. 679). Because large accounts are desirable, the biggest producers can usually bargain with manufacturers for special services (custom application equipment, delivery schedules, and the like). As these service packages have economic value and their distribution is skewed toward the largest producers, fertilizer manufacturers are helping to increase concentration in agricultural production.

Agricultural Chemicals

Highly diversified chemical firms manufacture and distribute agricultural chemicals. These firms tend to have or be part of conglomerate operations. One trade source indicates that concentration is high. In 1978, the 4 leading brands of corn insecticide garnered about 84 percent of the market (table 3). As with most oligopolies, nonprice competition predominates. The chemical industry has stressed the development and marketing of new products, which is raising advertising expenditures rapidly. Excluding ads in farm and trade journals, chemical companies spent $10.5 million on advertising in 1978, up from $5.9 million in 1976 (*12*). Prices for agricultural chemicals have been lower than for other inputs, and the firms seem able to provide effective new products as needed. Therefore, producers express little concern about the agricultural chemical industry's performance.

Table 3—Purchases of farm inputs by selected producers by brand manufacturers, 1973-78[1]

Top four brands	Producers purchasing inputs in—					
	1973	1974	1975	1976	1977	1978
	Percent					
Seed corn	59.5	58.8	59.1	61.6	57.3	55.6
Corn insecticide	N/A	59.7	72.9	83.5	83.4	83.5
Two-wheel-drive tractors	72.8	79.9	N/A	77.6	76.3	79.9
Combines	86.2	88.0	N/A	86 8	84.4	88.8

Note: N/A means not available.

[1] Data presented represent actual purchases of randomly selected samples of producer-subscribers of *Feedlot Management, Dairy Herd Management*, and *Hog Farm Management* published by the Miller Publishing Co., Minneapolis, Minnesota. Nearly all producer-subscribers of these publications are Class I farms. Therefore, these data tend to reflect the purchase patterns of only the largest farm firms. Variation between years can be expected with this sampling procedure. These numbers do indicate the relative concentration and trends in concentration for these farm inputs.

Source: (*13*).

The Farm Machinery and Equipment Industry

Two segments exist in the fairly concentrated conglomerate of the farm machinery and equipment industry. Full-line tractor and equipment manufacturers, although fairly concentrated, have been stable the past few years in their market share (table 3). In 1978, about 80 percent of 2-wheel drive tractor and 89 percent of combine sales were made by 4 companies. Concentration is much lower in the specialized tillage, irrigation, feed and grain handling, and storage equipment industry segment.

RELATIONSHIPS BETWEEN FARM SIZE AND INPUT COSTS

A 1970 study characterized each input market as having (1) decentralized its manufacturing operations; (2) integrated manufacturing and distribution; (3) undertaken rather aggressive merchandising and service differentiation programs; (4) become increasingly systems conscious; and (5) continued production diversification through new product development, mergers, acquisition, and joint ventures (*14*, p. 678). The largest farmers seem to prefer concentrated systems, service, and diversification-oriented input manufacturers. These farms often have managers willing to experiment with new ideas. Other farms monitor the techniques and practices used by the largest commercial producers. These large farmers may purchase inputs in big quantities and/or provide their own services, such as hauling. Because of these factors, suppliers will often grant price/service concessions to the largest growers.

Research in 1970-71 demonstrated that the largest farmers can buy most off-farm inputs at significant savings (*10, 11*). When large-scale corn production units of 1,000, 2,000, and 5,000 acres were compared to a one-person viable, family-sized unit with 500 acres, input costs were lower for the large units. The actual reduction in the cost of seed, fertilizer, chemicals, fuel, machinery repairs, machinery depreciation, and interest when compared with a 500-acre unit was about $5.60 per acre for 1,000-acre units, $10.50 for 2,000-acre units and $14 for 5,000-acre units (*10*, p. 755). The largest units incurred higher costs for labor and management than did the family farm but these higher costs were not enough to overcome the input procurement advantages. If these basic relationships hold under current conditions, it is obvious why the largest commercial farms continue to prosper and expand.

No study has attempted to examine input cost savings to see whether they arise from technical economies or pecuniary economies of size. If fewer resources are required to service large accounts or large farmers can provide ancillary services cheaper, public policy may not want to discourage the resulting farm consolidation and concentration. If these savings result from the willingness of suppliers to sell to large accounts below cost to increase their market share and improve their cash flow, society might not want higher levels of farm concentration. Research on input procurement cost advantages of large farm units should be initiated.

Farm service and supply cooperatives provide many "private label" farm inputs. Purchases by farmers of certain inputs from cooperatives have in the past reflected (1) small annual amounts per purchaser, (2) smaller average quantities per purchase,and (3) larger numbers of purchases per farm at slightly higher prices (*14*, p. 684). If this pattern prevails, cooperatives provide smaller producers access to inputs at only slightly higher costs than their large neighbors. Thus cooperatives are a countervailing force to increased producer concentration caused by large farmers' procurement advantages. In addition they provide a competitive price check on oligopolistic input suppliers. These positive forces should continue as long as cooperative suppliers do not adopt the pricing and service/merchandising tactics used by the conglomerate input suppliers.

STRUCTURAL CHANGE CAUSED BY SUPPLY INDUSTRY REACTIONS TO MACROECONOMIC FORCES

Changes in the general economy are having significant impacts on farm supply industries that will continue to influence the structure of farm production. The most significant forces are petroleum prices and inflation. Large numbers of farm inputs are petroleum derived or use petroleum, or both. Public policies influencing energy prices and availability have immediate bearing on farm input costs. Increased costs will be passed through. Over time the farm production sector will shift away from inputs which are relatively more energy intensive. Other shifts will probably occur as each input industry tries to move its product mix away from petroleum-based ingredients.

The structural impacts of energy policies on farm production are just beginning. American farms, once nearly totally self-sufficient in energy, may have to rapidly develop technology to move toward that self-sufficiency again.

One of the most insidious economic forces affecting farm structure is inflation. Many input industries,as highly concentrated oligopolies with large, mature firms,have discretionary power to affect their products' prices. These firms tend to have strong unions. They also often experience slow productivity growth. Inflation is quickly bid into input prices through wage adjustment clauses in labor contracts. Other price increases (in energy, raw materials, and so on) are also added into the firms' cost calculations and farm input prices go up. If higher prices reduce demand, oligopolistic firms tend to cut back production rather than lower prices. Even when demand falls during low farm income years, many farm input prices do not fall but continue to rise.

Farmers observing this behavior buy in anticipation of a price increase, even though they are uncertain if their incomes can justify increased expenditures. Current demand for equipment (especially tractors) may be greater than that justified by current farm income. Excess equipment purchases exacerbate the need for more land purchases and/or rentals, which affects their prices. The anticipatory purchase pattern can also occur in procurement of nondurable production items, such as chemicals and seeds.

Basic macroeconomic forces when filtered through conglomerate, oligopolistic input industries create economic incentives and a behavioral pattern for the production sector. This behavior pattern is not structurally neutral. Farm firms which had adequate land resources before rapid land price inflation have, with proper debt management, been able to keep pace with rising input prices. The same study that documented purchased input cost advantages also contained the following observation: "The after tax advantage of operating a large unit with lower equity is very pronounced during periods of rising land values" (*10*, p. 756). Thus, the largest producing units, if properly leveraged, could continue to grow larger at the expense of smaller units.

Well-capitalized, efficient, well-managed farm firms will prosper. Many smaller, efficient operations may, because of inflation, have to survive without owning land. Their equity and cash flow positions may allow only for machinery and equipment debt servicing. Smaller producers increasingly will be forced to farm land owned by others. Thus, the trend separating farm resource ownership and management will probably continue.

STRUCTURAL IMPACTS OF INPUT INDUSTRIES

Unique combinations of land characteristics, water resources, climatic conditions, and market factors primarily determine the location and specialization of agricultural production. New technology helped to define the efficient farm units in each crop. Only in a few cases did contractual, overt, or tacit actions of input manufacturing industries directly affect the structure of agriculture; the broiler industry structure is the best known example. More recently, however, the influences of input suppliers may be more important.

Only those large producers with adequate resource bases will be able to purchase the majority of their land and capital needs. Inflation may tend to foreclose many producers from owning farm production resources. Another relatively new but possibly significant development for farm structure is the advent of equipment and building leasing arrangements. If inflation precludes ownership of capital, producer managers can lease these inputs.

The farmer of tomorrow may be a professional farm manager profiting by using other peoples' resources. This farmer may lease tractors from tax-sheltering corporations and rent land from nonfarm individuals, corporations, and foreigners. These would be fundamental changes in the structure of agriculture. Separation of the ownership and management of farm resources creates different sets of interests, the necessity for all groups to have economic returns, and the need for fundamentally different policy tools. Clearly, the actions of input suppliers would be only partially responsible for these structural trends.

STATUS OF KNOWLEDGE

Little direct research exists on the effects of input market structure on farm structure. The Krause and Kyle studies are the only ones which address the issue of pecuniary economies.

Dahl (*3*) addressed the relationship between farm structure and input industry structure. He saw farm production structural changes as causing the structural changes in farm input industries. In the last paragraph he acknowledged that structural change might be running in the opposite direction (p. 85). The supposition here is that input industries' actions influence farm structure.

No references examined linked macroeconomic forces operating through oligopolistic supply industries with farm structure. In the short run, policy decisions on input industry/farm structural change issues will be made without benefit of research.

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Manufacturing And Food Retailing

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INTRODUCTION

This article explores the effects that imperfect market structures in the food manufacturing and food retailing industries may have on agricultural production. It is based on what is known about the structures of each of the three stages of food production and on the predictions of industrial organization theory. Few studies have explored the topic of structural interrelationships. Knowledge available comes largely from case studies of the specific subsectors of marketing.

In what way and to what extent do structure of manufacturing-retailing and their structural changes influence producers? Specifically, do the small number and the large size of food manufacturers reduce the number of farms and skew their size distribution? Does demand for farm products influence the degree of onfarm commodity specialization, the geographic concentration of production, or the uniformity of the production process? Does vertical integration by food manufacturers affect the ownership and control of agricultural resources? Do the purchasing methods of manufacturers and retailers promote barriers to entry or exit in farming? Finally, is the pattern of large-scale corporate ownership in food manufacturing and retailing compatible with the smaller scale farmer-operator production pattern typical of the family farm?

None of these questions can be answered with certainty for all types of farms or for all geographical areas. However, a set of predictions based on economic theory can be offered to suggest how oligopoly[1] in the later stages of the food system can lead to a parallel movement in the structure of agriculture.

LITERATURE REVIEW

It is ironic that the literature on the economic development of agriculture in poor countries provides the best source for understanding the structure of U.S. agriculture. A major concern in poor countries has been the impact of foreign ownership on the structure of indigenous tribal or peasant agricultural systems (*2*, *7*, and *11*).[2] The issues addressed here are analogous: the displacement of smallholder farming by large plantations, the imposition of monocultural practices on a diversified farming system, the monopolistic pricing of inputs (by a single producer) and monopsonistic procurement of agricultural production (by a single buyer), the dominance of large food firms in providing credit and new technology, and the creation of a class of dependent agricultural employees.

One reason for the lack of empirical studies on U.S. agriculture is that food manufacturers and retailers usually have only indirect commercial contact with farming. Raw agricultural output normally passes through the hands of one or more sets of brokers or first-handlers before being sold to manufacturers or retailers. The principal exceptions are direct ownership of farms by some food manufacturers, their vertical integration through production or purchasing contracts, and the dwindling practice among food retailers of buying fresh produce seasonally from local producers. The extent of direct contact varies considerably from product to product (*15*).

The Effect of Oligopsony[3]

The main impacts of the business decisions of food manufacturers and food retailers on farm-

[1] Oligopoly refers to a market in which each of a few producers affects but does not control the market.

[2] Italicized numbers in parentheses refer to numbers in the References at the end of this article.

[3] Oligopsony refers to a market situation in which each of a few buyers exerts a disproportionate influence on the market.

ing are felt through the demand for farm products. Where there are few buyers (oligopsony) for certain agricultural commodities and many sellers, an imbalance in information is likely to result because a situation exists in which there are markets with only a few transactions for which the terms of trade are known or announced publicly.

Burnett and Clodius, in a study of Wisconsin dairy farmers (*3*), have shown how incomplete farmer knowledge can be. Dairy processors tried to confuse farmers about prices as a strategy to ensure patron loyalty through nonprice factors.

Even when farm goods are not purchased by food manufacturers directly, the existence of only a few manufacturers who use most of the output may bring about a corresponding small number of first-handlers. This occurs because in bulk purchases only a few sellers can reduce the total transaction costs associated with continual bargaining.

Economic theory suggests that an atomistically organized sector wedged between two oligopolistic ones will pay monopolistically inflated prices for its inputs and receive relatively lower, less flexible prices for its output. Or, as Lanzilotti says, ". . . leading (food processing and agricultural inputs) firms possess considerable market power and are included to utilize such power to manage or administer their market situation" (*10*, pp. 1240-41). He concludes that the two sectors make adjustments in farm prices and incomes less likely.

When there is a high level of buyer concentration in a given local market for agricultural produce, price-fixing, price leadership, price discrimination, and other forms of collusive pricing are likely to occur. Moore and Clodius have shown that such pricing behavior occurs among Wisconsin fluid milk processors (*16*). Farris demonstrated a tendency among country grain elevators to coordinate prices in two counties, and he showed a tendency for prices within each county to be closely grouped together in spite of day-to-day fluctuations (*6*). One reason was the lack of accurate grading. Finally, Love and Shuffet documented changes in producers' hog prices following the emergence of a monopsonist (single buyer) on the Louisville terminal market (*12*). Prior to the exit of other buyers, farmers received 10 cents per hundredweight more than the Chicago price, but after exit they received 27 cents less for a specific grade of hogs. However, a small number of buyers does not automatically mean soft competition in procurement. Other factors, such as the number of alternative uses for a given agricultural product and the presence of strong farmer cooperatives, can lead to vigorous price competition (*9*).

The Impact of Diversification

The increasing diversification and conglomeration of large food manufacturers make them freer, that is, they can more easily absorb losses resulting from closing and selling processing plants in a given region. The size and anonymity of such corporations may make decisions to close plants easier than formerly when companies were single-plant, family-run operations. Writers on the less developed countries have frequently stressed this problem (*7*, *11*).

The Impact of Product Differentiation

Growing diversification appears related to two other increasingly common situations: product differentiation and product proliferation. Food products are increasingly characterized by multiple ingredients, many of them nonfood ingredients. To this physical differentiation must be added advertising and promotion that differentiate the final consumer product. The continual development and introduction of allegedly "new" food products changes the mix of farm input. Farmers producing one set of crops or animals gain at the expense of farmers producing another set of crops or animals. Thus, product differentiation can affect the relative size of commodity classes of farms as well as their geographic distribution.

Barriers to Entry

The investment and risk strategies of food manufacturers clearly affect the location of farm

production. Although investment decisions are guided partly by the desire to minimize the costs of multiplant operations, locational decisions involving processing facilities are also affected by the oligopolistic strategies of firms. An example is the attempt to maintain or create barriers to entry. Excess capacity may be built up to discourage the entry of rival firms into a given region. Padberg found evidence of this behavior in the mixed feeds industry (*20*). Similarly, the decision to close manufacturing facilities may not be made strictly on a cost-minimizing basis. Plant closings often encourage the formation or expansion of farmer cooperatives that provide an outlet for farm products. The threat of plant closings can be used as a bargaining device to discourage the formation of producer bargaining groups.

THE INDUSTRIAL ORGANIZATION OF FOOD MANUFACTURING AND FOOD RETAILING

In 1975, approximately 66 percent of the value of U.S. marketed farm output was utilized by the U.S. food manufacturing industries; most of the remainder was exported or consumed in unprocessed forms. Grocery retailers, in turn, account for nearly two-thirds of consumers' expenditures on food products. The remainder of the consumers' food dollar is largely spent in restaurants, where national chains are increasingly being controlled by large food manufacturers. Clearly, food manufacturing and food retailing together form the major market channel for agricultural products.

For even the smaller U.S. crops, there are usually several hundred producers; for major crops, there are tens of thousands. Farmers face powerful sellers when purchasing inputs and nearly as powerful buyers when selling their products.

Food Manufacturing Concentration

The food manufacturing industries have the potential for inordinate market power in several ways. Just 50 corporations accounted for nearly two-thirds (64 percent) of all food manufacturing corporation assets in 1978 (see table). One hundred firms accounted for 74 percent and 200 firms for 82 percent. The top 50 food manufacturers conducted 75 percent of total media advertising and 90 percent of network television advertising. Comparable data for the 200 largest firms are 85 percent and 100 percent, respectively (*4*).

Aggregate concentration of food manufacturers is increasing. In 1963-78, the 50 largest firms' share of food manufacturing assets increased by more than half (from 42 to 64 percent). This 1.5-percentage point annual increase is an acceleration of an upward trend; for the previous decade and a half (1950-63) asset concentration increased at only half a percentage point annually. If the current trend continues, 50 firms will account for all of food manufacturing assets by the year 2000.

Food manufacturing ranks fourth among the 20 major manufacturing groups regarding average industry concentration. Average four-firm sales concentration in food manufacturing rose from 47 percent in 1958 to 52 percent in 1972. Concentration was particularly high in industries marketing differentiated products, such as breakfast cereals, beer, candy, and soft drinks (*4*).

Aggregate asset concentration among the largest food manufacturing firms, 1963-74[1]

Size	1963	1969	1974	1978
			Percent	
50 largest	42.0	52.7	56.5	63.7
100 largest	53.5	67.4	68.5	74.4
200 largest	67.9	73.4	76.7	81.1

[1] Figures are lower bound estimates made on the assumption that each firm in a size class of a minor industry is of equal size; each concentration ratio is constructed so as to maximize the ratio consistent with this assumption. Data for 1978 supplied by the Financial Statistics Program of the Federal Trade Commission.

Source: Internal Revenue Service, *Source Book of Corporation Income Tax Returns*, various years.

Numbers of Firms

This trend toward increasing concentration is profoundly altering the structure of the U.S. food processing industries. It is strongly associated with a trend toward a drastic decline in the number of food firms, mostly local or regional enterprises. Behind these trends are three main causes: increasing merger activity, increasing plant sizes, and rising barriers to entry for new firms.

In contrast to other areas of manufacturing where the number of companies has been increasing, the number of companies in food manufacturing declined during each census year since 1947. The rate of exit has been increasing. In 1947, there were just over 40,000 companies in food manufacturing. In the 1972 census, this number stood at just over 22,000. Between the two earliest post-World War II censuses, the rate of decline averaged a little less than 0.9 percent annually. Over the most recent decade, 1963-72, the rate of exodus averaged 3.2 percent annually. If this trend continues over the next decade, nearly half the current number of food manufacturers will disappear.

Mergers and Acquisitions

The principal reason for the decline in company numbers in the early post-World War II period was the elimination of inefficient-sized plants operated by small firms. The exodus was particularly rapid in the dairy industry and other local market industries. However, later in the postwar period, declines in company numbers were widely distributed among food industries regarding average establishment size. Inefficiency due to small plant size does not appear to have been the primary cause of the increasing rate of company exodus (*21*); instead, mergers have become the primary cause of company disappearance.

From 1948 to 1977, 217 large food companies (over $10 million in assets at time of acquisition) were acquired. These represented 11 percent of all large manufacturing mergers for 1948-77. Most acquisitions have occurred since 1965. After 1965, the number of large food companies acquired yearly increased not only in absolute terms but also as a percentage of all large manufacturing companies acquired (13 percent since 1965 compared with 9 percent before). Many acquiring companies are not only large food manufacturers but also conglomerate enterprises whose activities include the manufacture of nonfood grocery products, distribution of grocery products,and services related to these areas.

In 1963, prior to the increased frequency of large mergers, a special census tabulation for the National Commission on Food Marketing showed that just 50 food manufacturers controlled nearly 70 percent of the top four market shares in the 40 food manufacturing industries (*19*). Control of top market positions by the largest food manufacturers was much greater in concentrated industries than in less concentrated industries. The increase in large firm acquisitions since 1965 has doubtless tightened the grip of the largest food manufacturers on important positions in specific food product areas.

Barriers to Entry

The huge expenditures required to launch new consumer food products represent the principal barrier to new entry by regional and local firms. Initial-year advertising costs for a new product often exceed $20 million. It is estimated that, in 1978, a total of $13 billion was spent on all forms of advertising of food products in the United States: media costs, point-of-purchase displays, direct mailings, free samples, and coupons (*4*). These same expenditures were only $2 billion in 1950. Food manufacturers spend more on advertising and promotion than does any other major industry group. Because advertising expenditures have risen faster than sales, the intensity of advertising in food products more than doubled during

1950-75, which makes it more difficult for smaller firms to acquaint consumers with their products.

The trend toward concentration has changed competition in the processed foods markets. The largest companies have become increasingly conglomerated, selling scores of products in dozens of domestic and foreign markets. Grocery products have proliferated, with as many as 6,000 "new" items introduced in a single year.

Food Manufacturing Performance

Market power in the food manufacturing industries is reflected in high profitability on venture capital, in recent years averaging three to four times the after-tax returns earned in agriculture. The market power of food manufacturers gives them some latitude in raising wholesale prices above what they would be if the food industries were perfectly competitively structured. One estimate is that processed consumer foods are priced about 10 percent higher as a result (*4*). In recent years, such price elevation would imply a (deadweight) loss in manufacturing-level production of about $600 million; this, in turn, would lead to a reduction of about $300 million in the annual derived demand for farm goods.

Food Retailing Market Structure And Performance

The food retailing stage also shows increasing signs of market imperfections. Concentration among grocery store and supermarket chains has risen over the last two decades (*14*). Average metropolitan concentration was 52 percent in 1972. It is likely that those strategies that market power gives some retailers are directed more at food manufacturers and consumers than at the farm sector itself, with the exception of the areas of fresh produce and a few other unprocessed foods that are purchased directly from farmers. (For a contrary view see (*19*).)

THE EFFECT OF OLIGOPSONY ON FARMING: SOME THEORETICAL PREDICTIONS

Procurement and Pricing Behavior

The power of oligopsony is exercised in several ways (*22*). When there are a few strong buyers for a particular product, large and irregular purchases to exact price discounts from suppliers are not uncommon. Food manufacturers may employ such strategies against assemblers of agricultural products or against other manufacturers of commodity-type inputs. Such devices work particularly well when price and inventory information is in the hands of the buyers or when demand is relatively weak. The credibility of buyers is further enhanced by the threat of a buyer to vertically integrate. Even partial vertical integration (often called tapered integration) can offer several advantages to buyers. They can transfer the risk of demand fluctuations to the remaining independent suppliers and gain useful information on production costs.

The exercise of oligopsony power by food manufacturers is most likely to occur where agricultural production is already highly concentrated among a few hundred producers or less (as in the case of mint) or is geographically restricted (as in the case of head lettuce); where producers are organized into weak bargaining units; or where the markets for agricultural products are "thin" and market price data are unreliable. Under these conditions, purchasing unprocessed or slightly processed farm products involves constant bargaining by food manufacturers. To reduce the transaction costs of their purchasing activities, large food manufacturers and retailers generally prefer to deal with a few (perhaps 3 to 10) large suppliers. Too few suppliers carries the risk of supply interruption or of granting selling power to input suppliers; however, too many suppliers increase total trans action costs to a buyer. In the case of semiprocessed inputs being bought from other manufac-

turers, such purchasing patterns have already emerged.

Product Differentiation Strategies

Over time, the exigencies of a successful marketing strategy often require food manufacturers to supply highly standardized agricultural products. One of the claims often made for highly differentiated food products is that they are of a consistent quality—not necessarily "superior" to that of rival brands, but less variable from batch to batch. Standardization, most obvious in marketing of fruits, vegetables, and poultry, often leads to vertical integration by contract or by ownership. If, as is likely, the costs of negotiating a production contract with one farmer are largely fixed costs, then it is more advantageous for a food manufacturer to negotiate with a few large farmers than with many small ones. Assuming that such contracts contain real economic advantages for farmers (such as higher average profits for contractees relative to noncontractees), one can expect a longrun shift toward larger farms. The terms of the contracts offered to farmers often obligate them to accept credit and to adopt specific technologies offered by processors. In some areas, once the contracts are signed some preferential treatment may be given to larger or more pliable farmers. Such treatment may mean the granting of optimal timing in harvesting or leniency in rejecting products that do not meet the quality specifications set forth in the contract. The incipient arbitrariness of contractual procurement can be used to reward cooperative farmers and to resist the formation of collective bargaining groups.

The product differentiating strategies of food manufacturers require the development of physically differentiated products. Minor differences in shape, color, flavor, or assortment are often used to create consumer loyalty, particularly when these differences are reinforced by advertising. One result of physical product differentiation is that a food manufacturer can often substitute ingredients more easily in highly formulated products than in the more standardized products; this, in turn, can enhance the manufacturer's bargaining power for inputs. A frozen pie manufacturer with a line of 10 different fruit pies, for example, can easily shift purchases away from tart cherries to peaches without losing many customers. In this situation, a bargaining cooperative of tart cherry producers would be weaker facing a full-line processor than facing a cherry pie processor.

Physical product differentiation and product proliferation also affect the geographical, and possibly the size, distribution of agricultural production. One of the aims of product formulation is the substitution of products that are more expensive or in variable supply for ones that are cheaper and more reliable. For example, since the turn of the century, several U.S. brewers have partially substituted the traditional barley grain for rice, corn, or other grains, as barley and rice are grown in different geographical areas. Another example is the substitution of soybean oil and synthetic flavorings for butterfat. Margarine has also replaced butter partly because of health considerations, partly because of changes in the prices of each, and partly because margarine is more easily differentiated. As dairy farms are generally smaller and more geographically dispersed than are soybean farms, this substitution has led to greater size and geographical inequality among farms. That is, some marginal producers of milk in the Northeast, for example, may have been forced out of business and replaced by corn-soybean producers in the Corn Belt. Thus, the national dispersion of farms geographically is reduced, and if the Corn Belt corn-soybean farms as a group are somewhat larger than dairy farms, the size distribution becomes more skewed. Whether all such substitutions have the same net effect on farm structure is difficult to determine.

Product and Process Development

Developing differentiated products may involve the food manufacturer in persuading farmers to adopt new varieties of crops, new machinery, or new cultural practices. An ex-

ample is the trend toward varietal wines. To ensure an adequate supply of certain grape varieties, some vintners had to persuade growers to replace traditional blending varieties with new ones. The special corn varieties required for Mexican-type chips represent another example of product development. In both cases, food manufacturers might have approached leading growers both because they were perceived as being able to supply the large quantities required for national distribution and because large growers are believed to be more willing to assume risks and to be more innovative. If innovators receive more profits for risk, the skewness of farm size distribution will increase. The desire of a given food manufacturer to foreclose supply of inputs to rivals by using long-term supply contracts will further reinforce this tendency.

In some cases, food manufacturers have developed (or instigated development of) varieties of farm products that have been tailored to their use. Several fruits have been adapted for canning or freezing. As these varieties are no longer as marketable as fresh produce, the marketing options of farmers growing them are reduced. An extreme example of such dependence is the development of an especially small almond nut intended for use in flat chocolate bars. Growers who have planted new trees have three or four customers at most who are willing to pay a premium for this special almond variety.

Economies of Scale in Processing

Most food processing industries have experienced increases in the scale of production. For most nationally distributed processed foods, three to five plants at most are needed for all multiplant economies of scale in the United States.

For frozen peas, an optimal risk-reducing strategy would involve plants in three areas: the Northwest, the North Central, and northern New York areas. In the past few decades, growing peas for frozen processing has largely disappeared from New Jersey, the South, and some other areas. Dairy production is becoming concentrated more in the upper Midwest (*25*). Such geographic consolidation may be a cost-minimizing decision, but it has led to further geographic concentration of production for most farm commodities used by manufacturers.

Vertical Integration by Ownership

The direct vertical integration by ownership of farmland by food processors is currently limited and accounts for less than 5 percent of agricultural output. Head lettuce, eggs, nuts, sugar, tropical fruits, poultry, mushrooms, and tuna fish are leading examples. Furthermore, a few food manufacturers have begun producing leaf lettuce hydroponically and farming shrimp by aquaculture. However, in those few cases where this type of vertical integration has occurred, the size distribution of farms has almost always become more skewed as the food manufacturers tend to establish units which are among the largest of their type. The application of large scale, assembly line techniques to aquaculture or fishing is not always successful, sometimes for management reasons and sometimes because product differentiation is not feasible.

CONCLUSIONS

Several oligopolistic features of food manufacturing and food retailing can affect the structure of agriculture. Using their oligopsony power, producers can resist organizing by agricultural sellers. Generally, large firms prefer to buy from other large suppliers or at least from a small number of suppliers. Product differentiation, product proliferation, and the tendency toward high formulation of foods in some instances lead to larger agricultural units and to geographic concentration. Finally, direct vertical integration contributes to unequal farm size, and vertical integration by contract has a similar potential for altering the structure of farming.

If farming is becoming more tightly integrated into the food manufacturing-food retailing process, the traditionally independent decision-making role of the farm operator is likely to be

altered. Greater dependence on fewer and fewer marketing outlets, more insistence on tight quality specifications, and greater reliance on food manufacturers for capital and proprietary technology are all likely to impose on farmers the employee mentality required by industrialized agriculture. As titular owners of farm resources or as direct employees, farmers will share symbiotically the economic rents of an increasingly centralized food system. The recognition of mutual interest by both parties may lead farmers to defend the food system against change and to devise ways to exclude new entrants into farming. Although this represents a marked shift in the traditional antipathy displayed by farmers towards "middlemen," the changed structure of farming may provide economic incentives for such an attitudinal change.

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Coordination And Exchange Influences On Farm Structure

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INTRODUCTION

The general issue considered in this article is how existing coordination and exchange arrangements for farm products affect farm structure. Specifically, do they favor large farms over small farms? Do they promote specialization and capital-intensive technology? How do they affect who owns and controls the production resources? Do the exchange arrangements themselves make entry into farming ventures easier or more difficult?

BACKGROUND

A key to understanding exchange arrangements is Adam Smith's observation that specialization is governed by the extent of the market. Changes in coordination and exchange arrangements, through which further specialization can proceed, are accommodations to market growth.

New opportunities in farming have been generated by the emergence of new or improved ways of dividing up enterprise responsibility for larger scale, more modern ways to produce crops and livestock. The products are distributed according to the terms of voluntary contractual ties among different interests. A wide range of special contractual instruments has come into use:

- Marketing contracts are confined to the price, quantity, and other specifications of the commodity exchanged.
- Production contracts place some of the responsibility for detailed production decisions in the farming operation in the hands of input supplier or product buyer.
- Resource-providing contracts also include responsibility for supplying one or more inputs, such as fertilizer, feed, or seed, by the product buyer.

The exchange process coordinates economic activity with price mediating among the claims of the many economic units. All contracts must be negotiated, and the machinery for negotiation becomes a critical factor in how well the economic coordination system performs.

The pricing system that has emerged for farm products has been shaped by the characteristics of farm products, the needs and character of the modern processing and distribution sectors, and the economics of the pricing systems themselves. Large processors require a steady supply of particular farm products—vegetables, fruits, cotton, and so on. Where there is little assurance of supply, such firms have actively generated one by entering into contracts with farmers and sometimes by owning production resources. A large firm may find it easier to coordinate economic activity through a command rather than a price system, with decisions once made in the marketplace shifting to the firm as the nature of firms changes.

Although farm products may seem unchanging, modern technology has, in effect, made products less perishable and more transportable. The advent of economical transport has had at least two major effects on agricultural markets. The first impact was the enlarged size of food-manufacturing plants, with the plants obtaining supplies from a wider area. This promotes more efficient manufacturing, but as plants grow fewer and larger, they can exert more buying power—both in prices paid and in tightened purchase specifications.

The second impact of relatively economical transport was to rearrange the physical delivery system. The rise in direct dealings caused a decline in the terminal markets and a change in their roles. The terminal markets used to be the centers for price information. Prices were openly established and spread widely by press and radio.

In addition, as prices of labor and management rose relative to capital, incentives existed

for moving away from the time-consuming negotiation of prices for each transaction. It is more economical, in many cases, to negotiate a general pricing formula and place specific orders by telephone. The formulas developed, however, often use prices established in terminal markets as the base prices in the formulas.

The validity of the system of pricing is being increasingly questioned. That is partly because of the thinness (small volume) of trading at wholesale markets, which suggests the possibilities of abuse. But more important, the uneasiness is based on the difficulty of trying to report prices in a market that is widely dispersed and that gives advantages to some market participants.

The hope for improvement in the pricing systems for agricultural products lies in several directions. It no longer makes economic sense for all commodities to be present physically when buying and selling occurs. Nor is it necessary. As long as one can describe a commodity to the reasonable satisfaction of traders and assure delivery, payment, and redress of grievances, a satisfactory exchange can occur. The commodity need not be in existence when the transaction is negotiated. In such a context, different techniques for forward trading, futures trading, and electronic marketing can be understood and evaluated.

The picture is somewhat different for the pricing of farm inputs. Farm labor prices are increasingly affected by Federal and State labor laws and by the spread of union bargaining. This tends to increase the rate of capital substitution for labor and thereby to hasten increases in the scale of farming. In a few places, farmers can rely on custom services (such as combining of wheat in the Great Plains), but generally the dispersion of agricultural production and the coincidence of critical timing of field operations in a region make the extensive development of a farm service market unlikely.

Fertilizers, feeds, fuel, fenceposts, and fence wire are relatively homogeneous commodities; therefore, their pricing arrangements theoretically could be like the pricing of most farm products. However, where important economies could be realized by increases in scale of manufacturing and distributing plants, locational oligopolies tend to arise, together with some price rigidities and possibly discriminatory pricing. Such a market situation creates a milieu in which information about prices is more costly for farmers to obtain.

THIN MARKETS, FORMULA TRADING, INTEGRATION

With the decline of terminal markets and negotiated prices, two potential problems emerge. First, the small volume of publicly reported trades reduces the quantity and perhaps the quality of information available. Consequently, prices may be determined less precisely; that is, individual transactions prices may be more dispersed about the warranted level. Second, if a marketplace has a small volume, prices are potentially more subject to deliberate manipulation. A single transaction or a few transactions can have a large effect on price.

The foregoing problems increase if the terminal market prices are used as base prices in formulas, because a large number of transactions may then be priced from a narrow base. Formula pricing is popular because it is relatively inexpensive and a known price is established; there is less uncertainty than in negotiation. The movement of a commodity through a terminal is likely to be more expensive than direct marketing. Thus, the base of negotiated prices tends to shrink.

Formal production contracts between farmers and processors and backward integration of processors to the farm level have also reduced volume through central marketplaces. Such integration might increase the market power of processors and depress farm prices below warranted levels. According to Mighell and Hoofnagle, about 22 percent of agricultural output in 1970 was produced under production contracts or vertical integration. The 1970 level, however, was up just 3 percentage points from 1960s, according to their estimates. Of course, integrated production varies greatly by product;

production of broilers, for example, is highly integrated but production of feed and food grains is not.

The thin market problem is a particular problem with livestock and livestock products and fresh fruits and vegetables. The pricing of carcass beef has received much attention recently. The majority of beef carcasses are priced using formulas based on published quotations in the *National Provisioner*, the so-called yellow sheet. A number of questions can be raised. Is the volume of negotiated prices adequate to price beef carcasses accurately? Does the yellow sheet obtain an adequate sample of negotiated prices as a base for its market report? Does the yellow sheet accurately interpret the information obtained from its telephone sample? Do respondents deliberately provide false information to the market reporters?

Electronic pricing is one possible solution to the problem of thin markets, at least for some commodities. Electronic pricing, technically feasible, could bring dispersed transactions into one information system. But it is not clear whether buyers and sellers would view an electronic pricing system as an economical substitute for formula prices. Buying through an electronic system might be more costly and more time consuming than formula pricing. Although computers are fast and their costs are decreasing, their use resembles the process of negotiation, while formula pricing is automatic once the formula is set.

FORWARD SELLING IN CASH AND FUTURES MARKETS

Traditionally, except for vegetables for processing and fluid milk, most farmers waited until their crops and livestock products were ready to be delivered before selling them. The highly unstable prices in commodity markets of recent years have increased farmers' interest in forward selling at fixed prices. More farmers now plan their selling strategies in the light of current forward prices and the prospects for later price improvement. Forward prices for farm products are increasingly quoted by local dealers and processors who are likely, in turn, to hedge some or all of their forward purchases by selling futures contracts. The presence of futures markets has an important although usually indirect bearing on forward selling opportunities of farmers.

Larger commercial farms sometimes use futures markets directly to price their anticipated output. The ease with which one can move into and out of a futures commitment at prevailing prices enables one to use a futures contract purely as a pricing instrument, with no need to deliver the product to the futures buyer. Most farmers do not use futures directly—because they seem to be too strange an instrument (presenting basis risk and requiring margin deposits and possibly margin calls) or require too large a minimum size of futures positions. Selling forward to merchants or processors using cash contracts usually is more familiar and often more suitable to farmers. Yet there are problems; contractual misunderstandings and contractual defaults, for example, arise more often in cash dealings than in futures markets. However, both methods of forward selling are a strong force in the division of U.S. agricultural production into specialized operations.

A major question about futures trading is whether speculative activity in futures affects cash prices adversely. This question has been raised most recently for wheat, cattle, and potatoes.

There are two separate issues here. First, does speculation in futures anticipate needed price adjustments and, therefore, smooth out the price shocks arising from other sources, or does it exacerbate price changes? Most studies of this concluded that futures prices have not adversely affected cash prices; they found either no discernible influence or a tendency to stabilize prices.

Second, are pricing aberrations injected into cash prices during each delivery month, when outstanding futures contracts must be liquidated? There is good evidence that congestion and manipulation occur at such times. Squeezes are an incipient feature of almost all futures contracts in commodities. One way to mitigate

such aberrations is to improve the design of futures contracts; another is to constrain the size of positions that may be held until the last day of trading in a contract.

IMPLICATIONS FOR THE STRUCTURE OF AGRICULTURE

Pricing arrangements are a less important factor in determining farm structure than are other factors, such as technological change and tax laws. Changes in pricing arrangements have occurred because the farm sector has needed to accommodate economic instability and economic growth. One response to economic instability is for the Government to stabilize prices by legislative fiat. Another response is for the individual farmer, merchant, processor, or other commodity interest to arrange commitments to better moderate the adverse consequences of fluctuating commodity prices. In such a context, both enterprise diversification and forward trading will continue to thrive in some form.

The accommodation of pricing arrangements to economic growth is a related matter. Economic growth is manifested in a cumulative upward movement over time in income and employment, resulting in ever-larger markets for goods. The traditional methods of supply may be undermined by new needs, which increases stress on the system for economic coordination. While the demand for market information is increasing, the supply of public information about prices has not kept pace. Fewer prices are negotiated; public markets are used less. Consequently, transactions prices may form a wider range around the warranted price. Perhaps prices, on average, equal the warranted level, but a wider distribution of pricing errors may occur. Finally, prices may be biased by manipulation or poor information.

Pricing mechanisms tend to serve the mainstream of commercial interests. Small farmers outside the mainstream may not be well served. In addition, as part of the adjustment process, inequities and imperfections may occur, and the major forces determining new pricing arrangements may stem from narrow private benefits. The public interest may not be reflected fully in the exchange systems that are developed.

For example, substantial evidence demonstrates the income enhancing and stabilizing roles of hedging in commodity futures, and active futures markets have developed in response to unstable prices. With unstable spot prices and large debts, commercial farmers can benefit from hedging. The use of futures or forward contracts can, in principle, benefit a wide range of farmers, but smaller farms are less likely to use these arrangements. Larger farmers, therefore, may gain the major benefits from forward-contracting arrangements. If futures trading introduces imperfections into the behavior of cash prices—there is little or no evidence that they do—all farmers, large and small, would be influenced adversely.

If, as a consequence of the changing pricing arrangements, market information is declining or the cost of obtaining a given level of information is increasing, small farmers are probably more seriously disadvantaged than large ones. A large firm, in the market more frequently, is automatically exposed to more information. The large farm can also spread the cost of search for information over more sales units.

Thus, even if price levels on average are not biased, small farmers may get below-average prices. To the extent that average prices are biased, all farmers are affected, but, again, the small producer seems likely to be on the lower side of the distribution.

WHAT IS KNOWN AND UNKNOWN?

We know much about the history of changes in pricing and coordination systems and about how farm products are priced. The literature provides a conceptual basis for explaining observed economic organization and change. (See References at the end of this article.)

But important gaps exist. It is not known, for example, whether vertical integration—the common ownership of two or more sequential pro-

duction stages—has been increasing in agriculture. The broiler sector is highly integrated; the egg sector, somewhat less so. Some meat processors have integrated back to beef feedlots. Yet there has been a trend toward specialized grain production, rather than integrated livestock-grain farms, and the marketplace for feed grains may be a more important coordination mechanism today than in the past. Most dairying is still done on small family farms.

Moreover, one needs to distinguish between the effects of fully integrated (ownership and control) operations and of integrated (ownership only) firms with relatively independent operating units. A soybean processor that owns a feed-manufacturing plant may sell relatively little of its output to the plant, and the plant may not be obligated to buy soybean meal from its parent processor. In such a case, the market remains important as a coordination mechanism even though the two operations are under common ownership.

Too little is known about thin markets, especially their price performance. Thin markets may be good or poor, according to their ability to establish a price that best represents competitive valuations at the margin of adjustment. Careful statistical studies are needed of markets in their larger setting (in relation to formula trading, internal transfers within the firm, and so on).

The impact of futures trading on cash prices is insufficiently understood. There is a two-way causal relationship between cash price behavior and futures price behavior. The quality of speculative judgments rendered in futures, as opposed to cash dealings, needs to be understood better before one can judge whether futures improves or distorts economic adjustments. Also we need more information on the business uses of futures trading to judge their effectiveness. Most of the data from earlier surveys are no longer current.

Finally, there is little in the literature that addresses empirically the question of the effect of pricing and coordination institutions on farm structure. Much of the concern about pricing institutions is related to price behavior under different mechanisms.

WHAT POLICIES CAN INFLUENCE THE ISSUES?

Potential public policies can be divided into two groups: those to make existing pricing institutions work better and those designed to change institutions. The objectives of such policies include improved pricing efficiency, improved economic welfare that is closely associated with pricing efficiency, and other social goals such as a desirable farm structure.

As to pricing mechanisms, policies include those designed to improve information and decisionmaking and to reduce fraud and manipulation of prices. It is already Government policy to provide data on prices and quantities. Official grades and standards are another type of information. It is, however, difficult to evaluate the types and quantity of information that public agencies should provide.

Existing laws related to market manipulation, say on futures markets, must also be enforced vigorously. The adequacy of existing laws about giving false information and about defaults on forward contracts should also be determined.

Public policy also should encourage the development of pricing institutions. A consensus is needed about the public benefits and costs of particular pricing institutions. For example, formula pricing may be an economical pricing method for private traders, but may not reflect the loss of public information. If electronic pricing, for example, has advantages in providing accurate information, a policy to provide incentives for the development of electronic pricing for particular commodities might be justified. Likewise, if it is thought important to maintain public terminal markets, subsidies can be considered. Legislation, of course, could be used to prohibit certain mechanisms that are thought to be undesirable—formula pricing of beef carcasses, for example. Incentives for positive actions, however, are likely to be better alternatives than prohibitions.

SUMMARY

The structures of farming and of exchange arrangements tend to be determined simultaneously. As firms become more complex, more decisions are made within firms rather than in the marketplace. A major change in marketing is the increased use of direct sales from farmers to processors, associated contracting, and the decline of terminal markets. This has reduced marketing costs, but also the amount of public information. Direct marketing and forward contracting are best adapted to large, specialized farms. Small farmers probably cannot take advantage of the full range of marketing alternatives. Poor information and lack of marketing alternatives may also constitute barriers to entry into farming.

Government policy can help improve pricing and marketing arrangements, and small farmers can be aided in using such arrangements.

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Cooperatives And the Structure Of U.S. Agriculture

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INTRODUCTION

Farmer-owned cooperatives have a unique role in American agriculture. Cooperatives represent a strategy employed by farmers to alter the structural characteristics of the agricultural system to redress inadequacies and inequities within that system. Cooperatives are business organizations formed and owned by farmers to integrate their farm businesses, through limited investment, horizonally or vertically, forward or backward. The combined investment of many farmers facilitates integration that likely could not be accomplished by an individual farm operation.

Cooperatives range in size and scope from small bargaining associations formed by a few farmers, to large, diversified, multiproduct cooperatives with thousands of members. Regardless of the form, the primary impact of cooperatives is to alter the relationship at the points of exchange between farmers and the nonfarm components of the agricultural sector. Horizonal integration through bargaining and supply-purchasing cooperatives allows farmers to deal in volumes that place them in a more equal position in negotiating with parties at the farm-level exchange points. Vertical integration through marketing and supply-manufacturing cooperatives allows farmers to bypass the farm-level exchange points and extend control to exchange points one or more levels removed from the farm, possibly capturing some value added in the process.

Basic questions arise that involve the relationship between cooperatives and the structure of U.S. agriculture: Did the historical structure of U.S. agriculture require that cooperatives develop? Do cooperatives influence the structure of the agricultural sector? If so, how, and how will they influence future structural developments?

Embedded in these basic questions are a number of subordinate issues that should be considered. Among them:

- Do cooperatives, by nature of their family farm orientation, slow the trend toward increased concentration and corporate farming?
- Has the cooperative role changed as product and supply markets have become more concentrated and divergent from the perfectly competitive standard?
- How successful have cooperatives been in achieving the general goals of increased farm income, price stability, provision of markets, and provision of reliable inputs?
- What impact does the present farm and cooperative structure have on the vitality of rural America?
- Is the future economic well-being of the independent farm operator enhanced by the presence of a strong cooperative system?

THE DEVELOPMENT OF COOPERATIVES

In the past, farmers faced several problems that resulted from the development of farms out of their traditionally independent and self-sufficient structure into one characterized by increasing interaction with and dependency on nonfarm elements in the U.S. agricultural system. These problems included inequities in pricing power in both the product and factor markets, lack of dependable sources of high-quality input supplies, lack of available farm support services, price instability, exploitative grading practices, and lack of access to markets. The growth of these problems threatened farmers' control over their farm businesses and their continued ability to own the resources required to maintain their livelihood.

Recognizing that individually they were powerless to counter these pressures, farmers pooled their resources to form cooperative associations.

Early efforts were chiefly directed at equalizing bargaining power at the factor and product pricing points through the pooling of purchases and marketings by many small farmers. Two general strategies were employed by cooperatives. The first involved attempts to gain a monopoly position in product markets and extract significantly higher prices. Lack of production controls and the voluntary nature of cooperative associations doomed these attempts. The second and more successful approach involved development of efficient marketing, processing, and distribution systems to effect a more orderly flow of farm products to the intermediate and final markets. Ownership and control of these systems enhanced the bargaining position of farmers, ensuring them more competitive farm-level prices and allowing them to influence the form of structure in which they operated. Modern cooperatives have followed this second approach and have been reasonably successful in providing a more stable economic environment for many farmers.

Farmer cooperatives are organized around three basic principles: democratic member control, service at cost, and limited return on investment. Each of these principles distinguishes the cooperative enterprise from other business organizations and has a direct bearing on the structure of the U.S. farm system.

Democratic control gives each member an equal say in the decisionmaking processes of the cooperative. Thus the cooperative cannot take actions that benefit a small segment of farmers at the expense of the majority. Large farm operations cannot so easily disregard the needs of their smaller neighbors and the small farms may provide continuing input into the system upon which their longrun economic success depends. As cooperatives grow and the dichotomy between small and large farms increases, the issue of democratic control of cooperatives becomes more complex and increasingly important.

The second principle of the cooperative organization, operation at cost, dictates that cooperatives obtain the highest prices for products and lowest input costs possible for producers while retaining only that amount of money necessary to ensure the longrun success of the organization. Farmers, knowing cost by their cooperative presence in a market, thus have a competitive benchmark by which to judge noncooperative firms. A strong cooperative presence in a market will reduce the extraction of monopoly profits by other firms by making profits dependent on superior performance and efficient operation. Likewise, the presence of investor-oriented firms in an agricultural market tends to prevent cooperatives from becoming lax in their management practices and from straying too far from operating at cost. The net result is greater efficiency and more responsive performance with benefits to both farmers and consumers.

The principle of limited return on investment relates to the issue of control and cooperative accountability. By having limits on returns to investment in cooperatives, pressure on cooperative management to maximize investor returns is reduced, allowing the cooperatives' objective of service to all members to remain dominant. Small farm members with small amounts of equity invested in their cooperative can maintain the same amount of control as larger farmers with larger investments.

COOPERATIVE ROLE IN THE AGRICULTURE SECTOR

Farmers held 5,906,379 memberships in 7,535 marketing, farm supply, and related service cooperatives in 1976 (most recent year for which complete data are available). Total memberships have declined by about 1.1 million since 1951, reflecting the national decline in numbers of farms.

Marketing cooperatives accounted for 47.6 percent of total membership in 1976—a decrease from their 58.1-percent share in 1951. Farm supply cooperatives accounted for 51.7 percent of total memberships in 1976—up from 40.6 percent in 1951. Related service cooperatives accounted for 0.7 percent of total memberships—down from 1.3 percent in 1951.

Five of six farmers are members of at least one cooperative. Many farmers are members of

two or more cooperatives. On the average, farmers held memberships in 2.6 cooperatives. Typically, a farmer holding multiple memberships will not be associated with more than one cooperative of the same general category, although there are numerous cases, particularly in the marketing category, where farmers have memberships in two or more competing cooperatives.

Marketing, farm supply, and related service cooperatives together grossed $55.9 billion in 1976 (table 1). Net business, which excludes trade between cooperatives, amounted to $40.1 billion. Marketing cooperatives accounted for 74.3 percent of the combined net business, while farm supply and related service cooperatives had 23.4 percent and 2.2 percent shares, respectively.

From this business volume, cooperatives obtained net savings of $1.1 billion for distribution to members and patrons. Net savings are distributed in cash and some form of equity certificate. Cooperatives must pay minimum of 20 percent of net savings in cash, if they elect to maintain their limited tax status, but may distribute in cash up to 100 percent of net savings. Most cooperatives pay between 20 and 40 percent of net savings in cash.

The majority of farmer cooperatives are relatively small businesses (table 1). Almost 82 percent of all cooperatives had revenues of less than $5 million in 1976; more than 92 percent had revenues of less than $10 million. Only seven less than 0.1 percent of all cooperatives, had, revenues more than $1 billion.

Cooperatives had a 29-percent share of the marketing activity at the farm level in 1976, up 9 percentage points from their share in 1951 (table 2). Farm supply cooperatives handled 18 percent of the farm supply business in 1976, 6 percentage points more than in 1951.

Cooperative shares at the farm level vary widely among commodity and supply categories. Marketing cooperative shares ranged from 74 percent for dairy cooperatives to 8 percent for poultry product cooperatives. Farm supply cooperative shares ranged from 36 percent for fertilizer and lime to 8 percent for miscellaneous supplies and equipment.

The cooperative share of business activity at the farm level is considerably larger than at subsequent levels of the food system. For example, while local cooperatives handle 40 percent of the grain moving off the farm, only 21 percent of the initial volume moves to the next step in the cooperative marketing system, the regional cooperative. By the time the grain leaves the export elevators, the cooperative share is down to about 5 percent of the initial off-farm volume. The story is similar for other commodities.

Table 1—Farm marketing, supply, and related-service cooperatives, by dollar volume, 1975-76

Cooperatives' sales	Cooperatives		Gross sales[1]	
	Number	*Percent of total*	*Dollars*	*Percent of total*
Less than $100,000	1,497	19.9	74,672,873	0.1
$100,000-$999,999	1,660	22.0	815,390,607	1.5
$1 million-$4.9 million	2,998	39.8	7,176,876,337	12.9
$5 million-$9.9 million	796	10.6	5,454,965,401	9.8
$10 million-$24.9 million	355	4.7	5,298,669,753	9.5
$25 million-$49.9 million	129	1.7	5,540,915,916	9.9
$50 million-$99.9 million	18	.2	1,574,236,311	2.8
$100 million-$199.9 million	34	.5	4,706,649,572	8.4
$200 million-$249.9 million	15	.2	3,474,438,022	6.2
$250 million-$499.9 million	18	.2	6,964,973,293	12.4
$500 million-$999.9 million	8	.1	5,404,670,912	9.7
$1 billion and over	7	.1	9,378,834,258	16.8
Total	7,535	100.0	55,865,293,255	100.0

[1] Includes intercooperative volume.

Cooperative gains in marketing agricultural products at the farm level, particularly for dairy, cotton, fruits and vegetables, and grain and soybeans, have come about largely because of the adoption of new technologies and development of innovative techniques for marketing, handling, processing, and distributing farm products. The result has been to reduce costs, to increase the efficiency of product movement, and partially to insulate the marketing system from costly disruptions.

A good perspective on cooperative size in agricultural product markets may be gained by comparing the total sales of the largest four cooperatives in commodity markets with the sales of the largest four noncooperative firms. Table 3 makes such a comparison for dairy, fruit and vegetable, and poultry products. While total sales for the largest four cooperatives in each of these groups increased significantly, so did the sales of the top four noncooperatives. In value of products sold, the largest four cooperatives are considerably smaller than their noncooperative counterparts.

Table 4 highlights even more of the differences between the largest four cooperatives and noncooperative firms, by comparing the proportion of total firm revenues attributable to sales within the agricultural product categories. Noncooperative firms' revenues from the sales of these commodities are of less and decreasing importance relative to cooperatives' revenues in terms of overall firm operations. Cooperatives tend to concentrate their efforts in their original

Table 2—Number of cooperatives and percentage of U.S. cash receipts for products marketed and farm supplies purchased[1]

Item	1950-51		1960-61		1965-66		1970-71		1975-76	
	No.	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*
Products marketed:										
Cotton and products	550	12	561	22	572	32	528	26	519	26
Dairy products	2,072	53	1,609	61	1,273	65	847	71	579	74
Fruits and vegetables	951	20	697	21	577	32	475	26	436	30
Grain and soybeans[2]	2,864	29	2,787	38	2,696	36	2,741	35	2,713	40
Livestock and products	1,011	15	816	14	692	11	817	11	654	10
Poultry products	760	7	567	10	396	9	226	10	151	8
Other[3]	510	16	421	22	348	21	264	15	214	16
Total	7,276	20	6,548	23	5,842	26	5,515	25	4,840	29
Farm supplies purchased:										
Feed	4,406	19	4,412	18	4,301	18	4,078	16	3,819	19
Seed	3,636	17	3,912	19	3,942	19	3,871	16	3,526	15
Fertilizer and lime	3,352	15	4,276	24	4,363	30	4,134	30	3,949	36
Petroleum	2 677	19	2,798	24	2,733	27	2,704	32	2,983	28
Farm chemicals	NA	11	3,014	18	3,330	16	3,556	20	3,597	33
Other supplies and equipment[4]	5,937	5	4,558	7	4,810	6	4,663	8	4,432	8
Total	7,409	12	7,016	15	6,568	15	5,906	16	5,538	18
Total number of cooperatives	10,051	NA	9,163	NA	8.329	NA	7,995	NA	7,535	NA

NA = Not applicable.

[1] Revised. Cooperative data for a fiscal year compared with average of data for 2 U.S. calendar years involved. except for dairy products where only first calendar year was used.

[2] Includes rice, dry beans, and peas.

[3] Includes tobacco, sugar products, peanuts, tree nuts, seed, and other specialty crops.

[4] Includes building materials, farm machinery, farmstead equipment, containers, and general farm supplies.

commodity, while noncooperatives tend to diversify their operations into other areas.

The differences in investment and operating behavior between cooperatives and noncooperatives may be explained in terms of different goals and objectives. Noncooperative firms' diversification out of a single product category is well justified in terms of their objectives to increase their stockholders' returns. However, cooperatives' objectives of service to members limit diversification efforts. Cooperatives are more committed to and supportive of the peculiar needs of producers in their product areas. They will continue their efforts on behalf of their member-producers even during extended periods when economic and financial conditions would call for exit by noncooperative firms.

Technological improvements and commodity specialization have significantly altered the needs of producers for purchased farm supplies. Farm supply cooperatives, responding to these needs, have increased in size and changed their operations. Early farm supply cooperatives concentrated their efforts on obtaining price discounts on volume purchases of farm inputs. Capital requirements were low and procurement and distribution costs minimal. Savings to producers were solely attributable to volume discounts.

Mechanization increased the volume of purchased farm supplies. As the cost of supplies rose, farmers faced an ever-increasing cost-price squeeze. This problem was compounded by a decrease in competition as many noncooperative suppliers left the farm supply business. Farmer-owned cooperatives, attempting to assure reliable sources of production supplies at lower costs, expanded their role in the farm supply industry by moving into complex and capital-intensive activities. These activities led to cooperative ventures in drilling for oil, operating refineries, mining and manufacturing fertilizer, formulating feed and farm chemicals, and building factories to make items such as steel buildings, customized farm equipment, and assorted automotive accessories.

Although they provide only 18 percent of farmers' total production supplies, cooperatives provide 36, 33, and 28 percent of farmers' needs for fertilizer and lime, petroleum, and farm chemicals, respectively. Benefits to the farmers are real, as exemplified by the behavior of fertilizer manufacturing cooperatives in the high cost period of 1975. While fertilizer prices rose rapidly, cooperatives priced below market charging an average $31 per ton less than noncooperative suppliers, saving farmers nearly $200 million.

Table 3—Value of sales of the four largest cooperatives and the four largest noncooperatives for selected commodity groups

Product and year	Sales of four largest cooperatives	Sales of four largest noncooperatives	Cooperatives' sales as percentage of noncooperatives' sales
	— — *Million dollars* — —		*Percent*
Dairy products:			
1960	555	2,613	21.8
1965	675	2,890	23.4
1970	1,793	3,604	49.8
1975	3,197	5,829	54.9
Fruits and vegetables:			
1960	368	879	41.9
1965	439	1,164	37.7
1970	561	1,634	34.3
1975	981	2,308	42.6
Poultry products:			
1973	351	524	67.0
1975	521	1,032	50.5

Source: *Growth of Cooperatives in Seven Industries.* USDA, ESCS,Cooperative Research Report No. 1, July 1978.

Table 4—Product group sales as percentage of total sales for the top four cooperative and noncooperative firms for selected commodities

Product and year	Four cooperatives	Four noncooperatives
	Percent	
Dairy products:		
1960	95.0	75.0
1965	90.0	62.5
1970	87.5	50.0
1975	84.8	39.0
Fruits and vegetables:		
1960	100.0	90.0
1965	100.0	90.0
1970	100.0	88.0
1975	100.0	75.0
Poultry products:		
1973	20.4	10.1
1975	23.4	17.3

Cooperatives have continued to seek new ways to stabilize and increase farmers' incomes. They have recently begun the development of extensive distribution systems, including truck, railcar, and barge fleets with storage facilities strategically located to make efficient use of their fleets. Additional steps taken to promote longrun farm security have included providing insurance protection, financial services, management services, product testing and research, production services, and specialized education and training.

CURRENT AND FUTURE COOPERATIVE ISSUES

The role of cooperatives in U.S. agriculture in the future depends, in part, on the resolution of three complex and interrelated issues relating to cooperative control and objectives: large versus small farms; cooperative impact on agricultural exchange points; and cooperative objectives from the differing perspectives of management and members.

Large versus Small Farms

The rapid development in agriculture of basically two types of producers, the small, generally part-time farmer and the large farmer, presents a particular challenge for cooperatives. Cooperatives have considerable obligation to serve both groups. In attempting to serve both types, the cooperative encounters problems relating to equitable treatment of all members and de facto control of cooperative decisionmaking. The costs associated with serving the two types of farmers are different. Small-volume transactions are costly to the cooperatives, as they are to noncooperative firms. Large volume transactions with large farms cost less per unit. Thus the cooperative must decide whether it should reflect fully these cost differences in the charges to members of the two groups, or if costs should be pooled and assigned to all members equally.

Small-farm members benefit from the cost savings associated with large-volume transactions. Equal sharing of costs enables small farmers to obtain inputs and services at costs comparable to those of large farmers, thus helping them to maintain profitable operations. Small farmers strongly favor the pooling of costs for this reason and strive to implement and maintain such a program through the democratic control mechanism of the cooperatives.

Large farmers recognize the lower costs involved in their high volume transactions and favor pricing programs that reflect those lower costs. From a business standpoint, they have no interest in subsidizing the operations of smaller farmers by paying higher prices than they could obtain from noncooperatives specializing in dealing with larger farmers. The importance of large transactions to the continued success of a cooperative, including its ability to serve small members, confers upon large farm members tacit control through economic strength that is greater than their voting power. Some cooperatives have adopted a limited program of voting based on patronage to recognize differences in member size.

Cooperatives are frequently faced with reconciling the desires of their small member majorities with their needs to hold on to the business of large farms. A less frequent problem, though not less important, is how cooperatives may effectively serve small farmers in those cases where large farmers constitute a majority of the cooperative's members.

Special pricing programs for a large farm minority would help maintain efficient cooperative operation, but could also increase the advantages to large farms thereby promoting their continued growth. Failure to adopt special pricing programs might result in the loss of large-farm members, leaving cooperatives to serve only small members with possibly diminished effectiveness. Providing high-cost programs to support the needs of a small-farm majority could create membership problems for cooperatives with a majority of large-farm members. Yet failure to do so would surely cause these small-volume farms to disappear more rapidly.

Cooperatives' Impact on Agricultural Exchange Points

Cooperatives have undertaken various forms of vertical and horizontal coordination to balance economic power at the exchange points and to ensure the orderly functioning of markets.

Horizontal coordination has been approached primarily by farm bargaining and supply-purchasing associations. The association represents its members in negotiations with handlers, processors, and input suppliers over price and other terms of trade. The combined volume of the cooperative members is used to establish a countervailing power at the raw product pricing points and to obtain maximum pricing leverage in dealing with input suppliers. Through bargaining activities, farmers can retain a better degree of control in the marketplace to ensure that prices paid and received are more nearly consistent with actual supply and demand conditions.

Vertical coordination has been employed by farmers forming marketing, processing, and supply-manufacturing cooperatives. Vertical coordination enables farmers to bypass exchange points at which they are at an economic disadvantage and to deal at points more removed from the farm level and from a position of greater economic strength. The farm level exchange process is internalized by the cooperative, which results in a more orderly product flow and improved market development.

Cooperatives' success in their efforts at vertical and horizontal coordination depends on the degree of control they can obtain over members' volumes. This control can range from informal agreements to use the cooperative as much as the member desires, to arrangements that limit volume to the cooperative's processing capacity. Farmers then must give up some of their decisionmaking prerogatives to the cooperative in return for higher possible returns and less marketing risk or maintain full decisionmaking independence and accept higher level of market risk.

The impact of cooperatives' horizontal and vertical activity on the functioning of exchange mechanisms and farm structure is unclear. The trend toward increased interlevel coordination by both cooperatives and noncooperatives has diminished the product volumes being traded in open or at central markets. Thus the accuracy of price information provided by these markets is becoming suspect, putting more pressure on cooperative and noncooperative firms to limit uncertainty by using more market coordination.

As coordination expands, unaffiliated and unorganized farmers become increasingly vulnerable to changes in the agricultural markets. Their access to markets and their ability to obtain reasonable prices for their products may be eroded.

Coordination does have some positive benefits in the form of increased price stability. Dairy and fruit and vegetable producers, through their cooperatives, have integrated vertically to a greater extent than producers of most other commodity groups and have generally benefited from a more stable price situation. To accomplish this stability, producers had to relinquish control over their marketing prerogatives to the cooperatives' management. Cooperatives establishing marketing pools in other commodity areas are attempting to obtain similar results.

Cooperatives have shown increasing interest in electronic exchange mechanisms that provide better market price information and tend to minimize the effects of size differences between buyers and sellers in exchange at the farm level. The implications of widespread use of electronic exchange techniques are not well understood. Yet it seems clear that marketing costs can be decreased and small farmers will be better able to gain access to markets and obtain a fair market price for their products.

Differences in Management and Member Objectives

As cooperatives strive to survive and grow in an increasingly complex agricultural environment, serious problems can arise in organizational objectives between cooperative members and management. Steps deemed necessary by management are frequently not understood or appreciated by the cooperative's members and

the desires of members often appear to management not to be in the best long-term interests of the cooperative.

The differences between cooperative management and membership are frequently focused on the issue of patronage refund distribution. Cooperative members generally prefer a high proportion of the refund to be paid in cash so that the benefits of their investment will be more tangible and can be put to immediate use in their farm operations. Cooperative management generally prefers that a small proportion of the refund be paid in cash so the noncash portion may be fully used as a source of much needed capital. The distribution of refunds tends to become more of an issue as a cooperative becomes large with many of its operations and capital requirements beyond the appreciation of its members.

Cooperative diversification is another issue that may divide cooperative management and members. Cooperative members frequently view investment in other areas as being in conflict with their best interests, particularly when substitute commodities are involved. They feel that the cooperative should restrict its activities only to those areas that benefit them directly. Cooperative management frequently views diversification as a necessary step to spread operational risks and to insulate the cooperative from being fatally damaged by unfavorable circumstances in a particular area of operation. Management believes that failure to diversify across geographic and commodity lines will leave the cooperative vulnerable and its members subjected to the possibility of losing the cooperative and its services.

Product coordination and commitment is a third area of dispute between cooperative management and members. Management, aware of the costs and inefficiencies of having uncertain sources and volumes of commodity, wants to reduce these uncertainties, often by using marketing and production agreements and contracts. Cooperative members, desiring to hold on to their decisionmaking prerogatives, prefer to avoid such commitments and retain the flexibility to shop around for the best market opportunities.

If the economic environment increasingly eludes the understanding of cooperative members, some control of the cooperative may slip out of their hands. While this possibility may be viewed as inevitable, to ensure the long-term success of the cooperative, active steps must be taken to maintain member input into the cooperative decisionmaking process. Failure to do so will result in the erosion of the loyalty of the cooperative's membership base. To maintain their position in agriculture and to continue providing service to family farm members, cooperatives must take steps to educate and involve all members in the decisionmaking process.

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Marketing Orders And Farm Structure

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INTRODUCTION

Marketing orders administered by the U.S. Department of Agriculture (USDA) are unique among Federal regulatory programs for at least two reasons. First, they are initiated at the request of producers rather than by the regulatory agency. Second, unlike most Federal regulations affecting structure and competition, which are directed against concentration of market power, marketing orders tend to increase the market power of producers to equate more nearly the bargaining position of producers and processors (*2, 20*).[1] Despite the fact that orders have been used for over 40 years, little is known about how they affect farm structure other than their being the core of the exchange mechanism that establishes prices and terms of trade for commodities regulated (principally Grade A milk, fruits, vegetables, and nuts).

The following questions highlight some current issues pertaining to marketing orders:

- Have marketing orders generated desirable prices and terms of trade?
- Have the consequences of orders differed within a group and among groups (producers, processors, consumers)?
- Have orders influenced the sizes of producer firms or processors and the degree of specialization in production?
- Do orders pose additional barriers to entry for producers or processors?
- Do orders influence the ownership and control of production resources and the coordination of activities between production and marketing?
- Should the use of marketing orders be expanded to other commodities?

BACKGROUND

The statutory authority for marketing orders is the Agricultural Marketing Agreement Act of 1937 (AMAA). Its purposes include obtaining parity prices for producers, assuring adequate supplies to consumers, and promoting orderly marketing. Orderly marketing is pursued by using one or more of the authorized marketing strategies which, upon implementation, are binding upon all handlers of the affected commodities.[2]

The dairy and fruit and vegetable industries are characterized by relatively atomistic producers of perishable products that are sold to buyers who are highly concentrated. The ability to control or influence supply or price is a key element in obtaining market power and increasing producer returns in both industries. Small changes in supplies of perishable commodities will normally result in wide price adjustments because of the relatively fixed demands of consumers for the fresh product and the limited possibility of substituting other foods in the processed form. The dairy industry faces a relatively inelastic demand for fluid milk and a more elastic demand for manufactured products; thus, it can use classified pricing.

Milk Marketing Orders

Milk marketing orders stratify the prices that processors are required to pay depending on the use they make of the milk purchased:

- Class I use includes milk for fluid milk products (such as whole milk, low-fat milk, and flavored milk drinks).
- Class II includes milk used in perishable manufactured products (such as cream, yogurt, cottage cheese, and ice cream).

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

[2] The AMAA definition of a handler of a commodity is broader than those who process commodities. The term processor as used in this article refers to regulated handlers.

• Class III includes milk used in storable manufactured products (such as cheese, butter, and nonfat dry milk).

The Class I price in each Federal order is competitively determined by the Minnesota-Wisconsin manufactured grade milk price (M-W price), plus a fixed Class I differential.[3] The Class II price is the M-W price plus 10 cents in most orders, and the Class III price is the M-W price. Blend prices (prices paid to producers) are the weighted average of class prices times the use (percentage) of milk in the classes. The orders prescribe rules to define processors that are to be regulated. Producers are not regulated, but the prices they receive are affected by the order when they ship to a regulated processor. In sum, Federal milk marketing orders establish a system of classified pricing and set rules for distributing the proceeds from the sale of milk among producers.[4]

Approximately 80 percent of the fluid grade milk (Grade A milk) produced in the United States is now priced administratively under one of 47 Federal milk marketing orders. In 1978, 116,000 milk producers delivered milk to the 1,200 processors regulated by orders. The farm value of milk regulated by orders was $8.4 billion.

Producer cooperatives are responsible for marketing most (92 percent) of the milk sold to processors who are regulated by milk orders (*2*). Dairy producers have thus relied heavily on their cooperatives to perform marketing functions and to represent their interests in establishing prices and terms of trade. Concentration in the dairy industry is high, but fairly equal between cooperatives and processors. For example, in 1975, 87 percent of the producers marketing milk under an order were members of the four largest cooperatives (*2*). The average percentage of Class I sales for the four largest processors was 75 percent.

Most dairy producers have herds of 30 to 100 cows. The size of the farm has been increasing rapidly during the last decade, and farms have become much more specialized. The average farm size increases in areas more distant from the upper Midwest.

Fruit and Vegetable Orders

In contrast to Federal orders for milk which establish prices directly, Federal orders for fruits, vegetables, and nuts contain provisions that directly affect supply and thus indirectly influence price. The AMAA authorizes the use of several techniques to control quality and quantity, such as:

• Minimum shipping standards for grade, size, and maturity.

• Seasonal supply management techniques, including establishment of a reserve pool, administered allocation to separate markets, and individual producer allotments.

• Controlling intraseasonal flows by assigning periodic handler prorates or prohibiting shipments during certain times. Further, for some commodities, orders impose the domestic quality standards on imported commodities.

The fruit and vegetable industries commonly use grade, size, pack, and container regulations to improve the uniformity and appearance of their products. The regulations in most orders impose a minimally acceptable level of quality. In a few cases, grade and size standards were changed frequently to control supply.

Stronger provisions of market orders in controlling supply include market allocation, producer allotments, flow to market, and reserve pools. Producer allotments are the strongest form of supply management permitted by Federal market order legislation. Allotments control the activity of individual producers and

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[3] The milk support price program greatly influences the M-W price. Support prices place a floor under the M-W price, which in turn directly affects all Federal order prices. When increases in the support price cause the M-W price to rise, the support program policy dominates Federal order policy (*18*).

[4] Federal milk orders contain many other provisions that affect terms of trade, such as (1) dates on which producers must be paid, (2) butterfat differentials, (3) location adjustments applicable to prices, (4) shipping requirements that plants must satisfy to qualify for pooling, and (5) optional deductions to promote the sale of dairy products.

theoretically permit order administrators to act as monopolists. Market allocation and reserve pools affect the distribution rather than the supplies; the difference lies in the identification of secondary markets. Market allocation specifies the portion of production going to the primary and secondary markets at the start of the marketing period. Reserve pools specify the portion going to the primary market with the remaining portion allocated by the administrative committee. Market flow provisions promote stability by leveling out shipments based on the administrative committee's perception of demand.

Within the fruit and vegetable industries, 46 Federal orders regulate marketing of 31 separate commodities having an estimated farm value of more than $3 billion annually. Practically all fresh citrus, and nearly all U.S.-produced nectarines, fresh prunes and plums, fresh pears, and papayas are marketed under Federal orders. Federal orders cover most U.S. production of major tree nuts (almonds, walnuts, and filberts), dried fruit (raisins, dates, and prunes), and hops. Coverage of vegetables is less complete; only potato, onion, celery, and tomato production are affected significantly. The only processed items marketed under Federal orders are tart cherries, cranberries, and olives.

Each of the 31 commodity subsectors influenced by Federal fruit and vegetable marketing orders possesses unique market structure characteristics—it is not possible to define a typical industry. Further, within each subsector, substantial diversity with respect to firm size and other structural variables precludes delineation of typical producing or handling operations.

IMPACTS OF MARKETING ORDERS

Marketing orders help to equalize the market power between a large number of small producers and a small number of large processors (*2, 20*). The market power of producers is strengthened further by the importance of the cooperatives that market the regulated commodities. The orders appear to increase the role of and to foster the development of cooperatives.

In large part, marketing orders set terms of trade. Terms of trade are developed openly and can be viewed by the public. The orders tend to improve trade practices and prohibit unfair practices. Providing information for all parties affected by regulation, they improve communication and coordination among parts of the production-marketing system. Orders may also improve grades and standards and make them more uniform which in turn, facilitates trade.

Economic efficiency can be improved through orderly marketing provisions which smooth the flows of commodities to outlets and uses and reduce marketing and transportation costs.

Orders help stabilize the prices of regulated commodities, greatly reducing risks for producers. This is especially important for perishable commodities. Without orders, prices would have to be stabilized some other way. Contracting, vertical integration, or other coordinating mechanisms would probably be more extensive than they are with orders in effect.

Orders have increased prices received by producers and prices paid by consumers, although orders may not be the sole cause for prices above competitive levels. Given the concentration of processors, one would expect prices to be above competitive levels. Orders and cooperatives redistribute the gains from such price enhancement, which would exist without the orders. In any case, price enhancement under the orders is limited because of public involvement and mandates of the regulatory agency.

As with most other agricultural programs, orders benefit recipients in proportion to their volume of business. That is, large producers benefit more than small producers. Likewise, conforming with the regulations is more of a burden for small processors. Producers and consumers in one region may realize more benefits and cost than those in another (*6, 12*). And costs may not be distributed equally among persons in the same group; for example, costs may fall more heavily on consumers whose con-

sumption of fluid milk is high than on those who eat large amounts of cheese.

Milk Orders

Probably less variation exists in the price received by dairy producers of different sizes than for any other major commodity. The orders establish uniform prices for volume sold. Further, cooperatives do not differentiate among producers of different size in making payment, a situation unlike that for other commodities, where large producers receive higher prices than do small producers, which encourages increases in farm size. Dairy production is probably less concentrated, due to the price uniformity, than it would be without orders.

Except for dairy farmers who have integrated forward (producer-distributors and a form of direct marketing), decisionmaking concerning dairy production does not involve other sectors. Ownership and control in the production sector are in the hands of dairy farmers, more so than would probably be the case without orders.

There is less concentration in dairy farming than in other types of farming, but orders have not affected concentration greatly. On the contrary, because orders stabilize prices and reduce risk, they may favor expansion of farm size. Changes in technology have been much more important, however. Compared to grain farms, capital gains are less important to total returns and provide less incentive to expand. Especially outside the upper Midwest, land is a less important requirement for dairy expansion.

Orders are initiated, in part, as a result of the high degree of specialization and perishability of commodities; they are not a major determinant of specialization. But, given the high risk of specialization in perishable commodities (in the absence of orders, long-term contracts, or integration), orders have undoubtedly increased specialization on dairy farms.

Orders pose no barrier to entry to dairy producers (they are not regulated); the stabilizing impact of orders probably reduces entry barriers. As much of the capital needed for dairy farming has little or no value in other uses, the entry decision is conditioned by expectations about the long-term outlook and price stability.

Because land is less important for dairy production than for many other types of farming, benefits of the order program are less likely to be capitalized in land than in other assets, such as cows and dairy facilities. Whatever the price enhancement benefits that may be generated by orders, such benefits have declined. During the seventies, the Class I differentials remained constant, and as a percentage of the M-W price, they declined from 48 to 22 percent. Any change in price enhancement during the seventies was caused by the support price program rather than by marketing orders.

Fruit and Vegetable Orders

Vertical integration in the fruit and vegetable industries is more extensive than for dairy production and processing. Integration is most extensive in vegetable processing although the dominant arrangement is for contracts between processors and growers. Without orders, some increase in vertical integration, especially in the production of fresh fruits and vegetables, would likely occur.

Fruit and vegetable production has become more concentrated over time, but orders have not affected concentration greatly. Changes in technology and the economies of large-scale production have been more important influences. However, the need for close supervision and management provides a strong incentive to maintain commercial, but family size, enterprises in most fruit and vegetable production. Orders may favor expansion of farm size because they stabilize prices, reduce risk, and provide incentives for firms best able to meet order provisions such as grade, size, and pack requirements.

Producers in nonmarket order areas may benefit substantially from market orders. These firms, although not constrained by market order regulations, can benefit from the higher returns

resulting from the supply controls imposed by the orders.

Higher returns, improved price stability, and reduced risk will provide incentives for the entry of new firms and prolong the exit of marginal producers. Conversely, to the extent that handlers may be adversely affected, marginal firms may leave the industry, increasing the concentration of the handler firms that remain. Market quotas can constrain firm growth and expansion and inhibit entry. Research and development or higher returns can bring about innovations and new technology, which will affect producers and handlers differently; it will reward those able to take advantage of innovations.

The benefits of marketing orders vary, depending on producers' ability to take advantage of or to meet regulatory constraints. Different impacts of order regulations will occur and will significantly affect income. Quality regulations fall more heavily on producers of poor-quality commodities. Low-income consumers may suffer from the disappearance of cheaper commodities; most consumers, however, may prefer the quality of the regulated items. Grade and size regulations and classified pricing reward some producers and punish others, with different impacts in different production areas. Larger producers may be more efficient and effective in adjusting to market order regulations.

STATUS OF KNOWLEDGE

There is essentially no information on how marketing orders have affected farm structure. Many reports, however, describe the structure of the producing and processing sectors for the commodities regulated. A considerable amount of research has been conducted concerning the consequences of orders, especially milk orders. The focus of that research was on price enhancement and market power aspects of orders.

These conditions apparently have contributed to the effectiveness of marketing orders:

- Low supply elasticities.
- Differences in demand elasticity among two or more uses of the commodity.
- Ability to separate the uses of commodities.
- No unregulated commodities that are close substitutes.
- Specialized resources used for production or large capital investments.
- Production confined to compact regions and specialized farms.
- Small number of processors to be regulated (administration is easier).
- Active role in marketing for cooperatives.

These conditions are not as prevalent for other commodities as they are for commodities already regulated by orders. That does not mean that orders could not be used effectively for other commodities, especially for improving exchange arrangements. Furthermore the impacts of orders for other commodities would probably be similar to the orders' impact on currently regulated commodities; that is, on the ownership and control dimension of farm structure, as influenced by exchange arrangements.

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Implications Of Increased Reliance On International Markets

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INTRODUCTION

Foreign markets for many agricultural commodities have become increasingly influential in determining the economic health of the farm sector. Today, 25 percent of farm income is derived from exports compared with 10 percent in 1950. The rate of growth in export markets for grains and oilseeds has exceeded the rate of growth in their production. The volume of agricultural exports increased by 77 percent from 1967 to 1977, compared with a 10-percent increase in domestic demand over that period. Cropland used to produce agricultural exports increased from an average of 22 percent during the sixties to slightly above 30 percent in 1977, even though total harvested acreage increased by 14 percent.

The national economy has also benefited from this expansion in exports. The net contribution of about $16 billion to the national balance of payments in 1979 is a major offset to large trade deficits generated by nonagricultural sectors of the economy. Since 1970, agriculture's gross contribution has increased nearly fivefold to a forecast of about $32 billion in 1979.

Increased reliance on export markets has some disadvantages. The expansion of export markets enlarges the impact of changes in world political, economic, and weather conditions on the domestic food and agricultural sector. During the seventies, food prices reached record-high levels as a result of a series of shortfalls in national and world food production. Long-term growth in the worldwide demand for food and feedstuffs resulted in the livestock sector's becoming a residual claimant to domestic feed grain and oilseed production. The commodity price boom and bust, largely resulting from inflexible world markets, left much of the farm sector in economically depressed conditions during the midseventies.

Domestic commodity programs and agricultural policies have been greatly restructured in response to the increased importance of foreign markets for the food and agricultural sector and the national economy.

In addressing the impact of the foreign market on the structure of the U.S. farm sector, three causal influences can be identified:

- Changes in the level of agricultural exports.
- Changes in the composition of agricultural exports.
- Export variability.

The first two influences have a direct impact on relative crop prices, resource allocation among commodities (cropping patterns and uses of inputs and factors), the level of income to the farm sector, and the distribution of income among commodity producers. The third factor affects the stability of agricultural prices and thus the level of risk and uncertainty faced by producers. The structure of the farm sector is not directly influenced by these underlying factors. Rather, by their impact on prices, incomes, risk, and market arrangements, these factors indirectly influence U.S. farm structure.

WORLD AGRICULTURAL TRADE AND THE UNITED STATES

In the past three decades, there have been significant changes in the level and composition of world agricultural trade. Trade flows have also changed drastically. These changes provide perspective for the expanded role of the domestic farm sector in world agricultural trade.

U.S. agricultural exports assumed a larger share of world agricultural trade between 1951-55 and 1971-75, despite a 33-percent decline in the U.S. share of total world trade (table 1). Over the period, world agricultural trade nearly quadrupled and U.S. agricultural exports

increased about fivefold, rising from 12 to 16 percent of world agricultural trade. The United States became an increasingly important force in world agricultural trade.

The composition of world agricultural trade also changed during that period. Food and feed products now account for nearly 70 percent of world agricultural trade, up from 45 percent in 1951-55. Major growth items were oilseeds, feed grains, and livestock products. Agricultural raw materials, natural fibers, tobacco, and rubber decreased in relative importance from about 29 percent in 1951-55 to about 11 percent. World wheat trade doubled between the late thirties and 1960. Since then, it doubled again despite recent record world levels of food grain production. World trade in coarse grains did not grow appreciably between the late thirties and sixties. Since then, it tripled because of increases in incomes and expanded livestock feeding in many countries, especially Western Europe, Eastern Europe, Japan, East Asia, and the USSR.

Trade flows have changed substantially; developed economies are contributing an increasing share of grain exports, and developing and centrally planned economies are absorbing an increasing share of imports. Prior to World War II, developed market economies accounted for 60 percent of wheat exports (primarily North America and Australia) and for two-thirds of wheat imports. Throughout the postwar period, the proportion of wheat exports provided by developed market economies has increased to over 90 percent. Developing countries now account for half or more of wheat imports and the centrally planned economies account for a quarter of wheat imports. Thirty years ago, developing market economies exported nearly 60 percent of coarse grains entering world markets. Centrally planned economies provided 20 percent. Major importers of the time were almost exclusively developed market economies which imported 85 percent of all coarse grains being traded. Only 2 percent of coarse grain imports went to developing economies. Developed market economies now account for more than 80 percent of coarse grain exports. Developing market economies have increased their imports and reduced their exports of coarse grains.

The changing patterns of trade in wheat and coarse grains, the expansion of developed market economies as the major source of exports, and the emergence of developing countries and centrally planned countries as grain importers have been accompanied by significant policy changes. These changes are addressed in the final sections of the article.

Table 1—Exports, total and agricultural, United States and world, 1950-76

Period	Total			Agricultural			Agriculture's share of total	
	World	U.S.	U.S. share	World	U.S.	U.S. share	World	U.S.
Average	*Billion dollars*		*Percent*	*Billion dollars*		*Percent*		
1951-55	84.82	15.20	17.9	26.80	3.30	12.3	31.6	21.7
1956-60	113.32	19.06	16.8	31.62	4.26	13.4	27.9	22.3
1961-65	157.52	23.76	15.1	38.67	5.64	14.6	24.5	23.7
1966-70	248.00	35.05	14.1	47.60	6.54	13.7	19.2	18.7
1971-75	610.75	73.22	12.0	96.74	15.73	16.3	15.8	21.5
1976	999.10	114.61	11.6	138.00 (est.)	22.99	16.7	13.9	20.3

Source: Arthur Mackie, "Foreign Economic Growth, Foreign Aid, and Demand for U.S. Farm Products," *World Economic Conditions in Relation to Agricultural Trade*, WEC-12, Economic Research Service, U.S. Dept. Agr., Aug. 1977.

THE LEVEL AND COMPOSITION OF U.S. EXPORTS

The value of U.S. agricultural exports increased fivefold since 1970, from $6.7 billion to a forecast of about $32 billion for 1979. By comparison, the value of agricultural exports doubled in the fifties and sixties. The volume of agricultural exports increased 77 percent between 1967 and 1977 (table 2). Exports of grains and feeds grew 82 percent, and oilseed products, 97 percent. Although exports of animals and animal products as a general category have fallen slightly below the growth rate of total agricultural exports, exports of meat and meat products have tripled since 1967. Cotton and tobacco exports have each grown by only 15 percent since 1967.

Through much of the sixties, U.S. grain exports averaged slightly over 20 percent of production. During the seventies, that share rose to about 35 percent. Wheat exports as a percentage of production rose from 50 percent in the sixties to 60 percent in the seventies. Corn exports as a percent of production also exhibited substantial gains. Corn exports averaged about 15 percent of production during the sixties, but are now about 30 percent of production.

While soybean production has nearly tripled since the early sixties, the percentage of soybeans that are exported (in bushel equivalents) has more than kept pace. Soybean exports in 1971-75 were about 60 percent of that produced, compared with an average of 51 percent in the sixties.

The 77-percent increase in export volume of farm commodities from 1967 to 1977 compares with a 10-percent increase in domestic use over that same period. The production of farm commodities has increased 22 percent. Similarly, cropland used to produce exports increased from an average of 22 percent of harvested acreage in the sixties to slightly above 30 percent in 1977 even though total harvested area increased 14 percent. In the early fifties about 10 percent of the cash receipts came from the export market compared to 25 percent now.

AGRICULTURAL EXPORTS AND THE FARM SECTOR

The increased reliance on export markets as an expanding source of demand for several major farm commodities has led to significant changes in the source of income for major farm commodity producers. Changes in agricultural export demand and in the composition of world agricultural trade have led to changes in the distribution of income within the farm sector.

The domestic agricultural sector has become increasingly vulnerable to changes in economic, political, and weather conditions affecting inter-

Table 2—Index of U.S. agricultural exports, selected years

Export	1951-55	1956-60	1961-65	1966-70	1971-75	1976	1977
				Index[1]			
Total agricultural exports	46.4	67.8	90.2	102.0	140.8	167.0	177.0
Animals and animal products	66.2	99.0	115.0	103.2	133.0	144.0	170.0
Animal fats	72.2	89.4	105.8	96.0	112.2	84.0	127.0
Meat and meat products	58.4	91.4	97.8	108.0	158.0	256.0	303.0
Dairy products	139.0	212.6	204.8	112.6	83.0	44.0	53.0
Poultry and poultry products	49.2	64.4	130.4	99.6	95.6	149.0	208.0
Cotton and linters	102.4	125.8	125.4	87.6	113.2	86.0	115.0
Tobacco (unmanufactured)	82.8	87.0	87.8	98.8	108.0	105.0	114.0
Grains and feeds	32.8	50.4	82.6	100.2	136.2	184.0	182.0
Vegetable oils and oilseeds	21.0	51.2	77.6	110.0	187.4	195.0	197.0
Fruits and vegetables	59.4	84.8	93.0	101.0	125.8	161.0	184.0

[1] 1967 = 100.

national commodity markets. While the expansion in the export demand for food and feedstuffs was due in part to permanent long-term changes (world population and income growth), the precipitous and largely transitory crop shortfalls of 1970-75 further expanded the export demand for U.S. farm products. The deteriorating condition of world commodity trading mechanisms coupled with crop shortfalls throughout the world amplified the impacts on U.S. consumers and producers, and also on developing food importing countries. When world grain production returned to normal after 1975, this same deterioration in markets led to a severe decline in commodity prices and to depressed economic conditions in the U.S. farm sector.

Farm Income

The demand for wheat, corn, and soybeans increased substantially as a result of export market growth. Together, these crops use 60 percent of all cropland and represent about 50 percent of income in the crop sector.

In 1951-55, 31 percent of the value of wheat production was obtained from the export market (fig. 1). This percentage averaged 60 during 1971-75 and reached a high of 73 in 1972. The value of wheat export earnings increased fivefold between 1951-55 and 1971-75. Recall that, before 1970, between 50 and 60 percent of wheat exports were marketed under concessional sales programs. Concessional sales now account for about 4 percent of wheat exports.

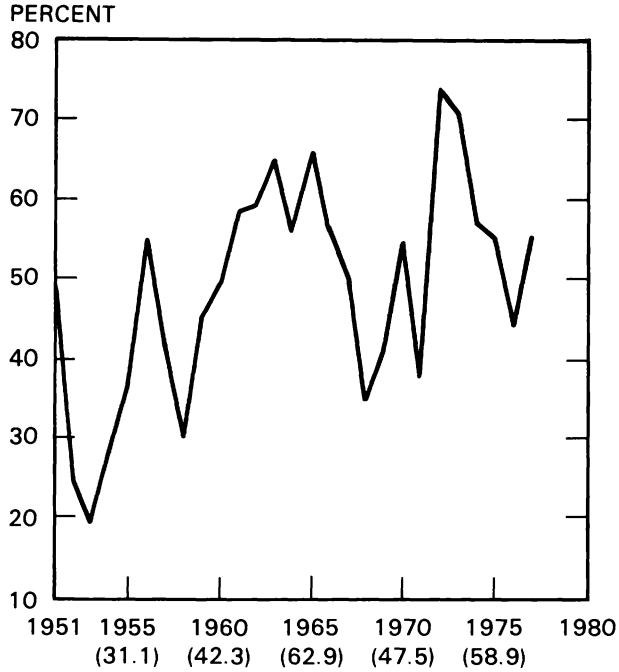
Earnings from corn exports in 1951-55 averaged about 4 percent of the value of production (fig. 2). The value of corn export revenues increased 17-fold over the two decades.

The share of the value of soybean production derived from the export market averaged about 20 percent in 1951-55. Export earnings for soybean products increased throughout much of the sixties and averaged 51 percent for the decade. (fig. 3). This trend reflected increases in the foreign demand for high protein feeds. The value of soybean export revenues in 1971-75 was 25 times that of two decades earlier.

Export demand for these crops, rising significantly faster than either domestic demand or production, has affected the level of income for the farm production sector and the distribution of income among commodity groups. The exact magnitude of the income and resource adjustments, however, is unknown. Major changes in production patterns during the seventies paralleled the rapid export expansion and the policy changes that responded to foreign market growth. Between 1973 and 1976, wheat-planted acreage rose 33 percent and corn-planted acreage increased 17 percent. Soybean-planted acreage increased 37 percent between 1970 and 1977. These increases largely accounted for the increases in acreage planted to principal crops.

FIGURE 1

WHEAT: EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION



NUMBERS IN PARENTHESES SHOW THE EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION FOR THE PRECEDING 5 YEARS.

Price and Income Instability

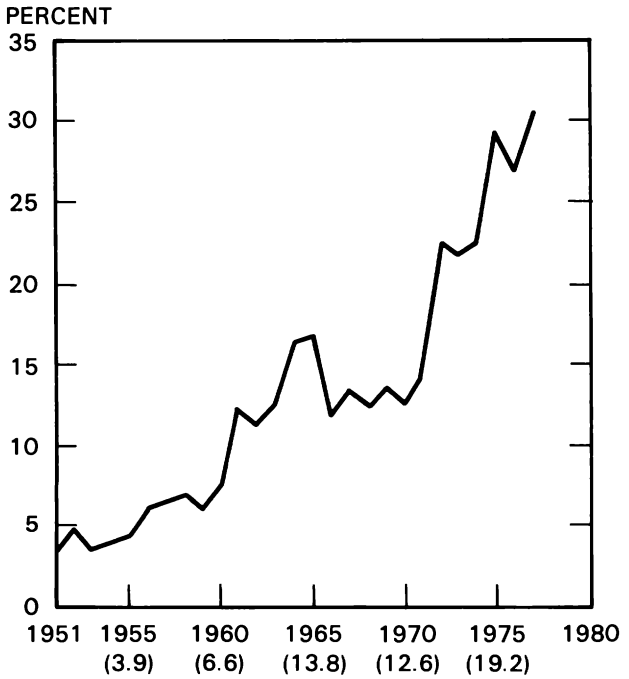
The variability of exports and the resultant need for policy intervention is illustrated by the instability of prices and incomes. The prices of major farm commodities were much more unstable during the seventies than in any other recent period. From 1968 to 1977, the coefficient of variation for wheat prices was 50 percent and for corn and soybean prices, 38 percent. Comparable figures for the fifties and sixties ranged from 7 to 18 percent.

The instability in the prices for these commodities is reflected in the variability of farm income—which was about four times greater in the seventies than in the sixties (table 3). In 1971, total net farm income was $12 billion. In a matter of 2 years, net farm income had risen to $25 billion (constant dollars). Net farm income fell to $11.5 billion in 1977, reflecting the decline in commodity prices and also the rapid increases in production costs. Income from farming was the most volatile of any of the major components of national income. Per capita income in the farm sector was also significantly more volatile than that for the total population, even when income from nonfarm sources is included.

THE ROLE OF POLICIES IN TRADING NATIONS

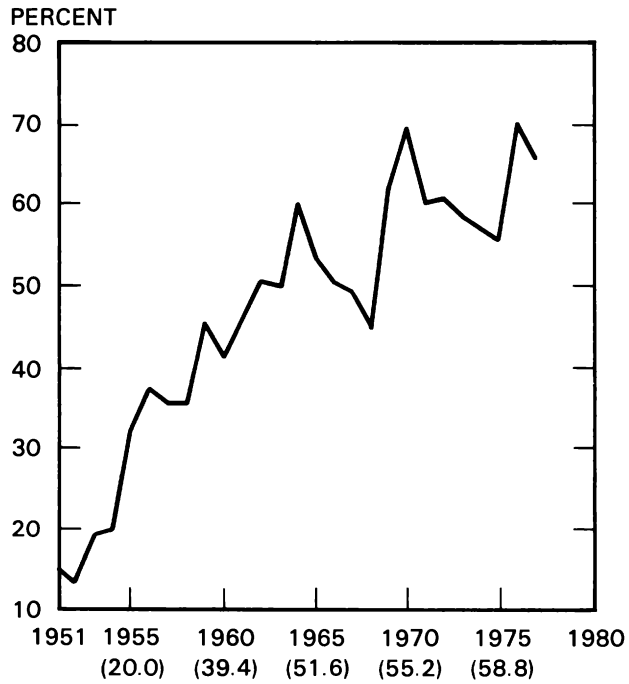
Developed market economies attempt to isolate their producers and consumers from world market prices. Consumption and production within countries may not reflect world market conditions, and, as a result, trade patterns become distorted and inflexible. Canada and Australia (major grain-exporting countries) have

FIGURE 2
CORN: EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION



NUMBERS IN PARENTHESES SHOW THE EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION FOR THE PRECEDING 5 YEARS.

FIGURE 3
SOYBEANS: EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION



NUMBERS IN PARENTHESES SHOW EXPORT REVENUE AS A PERCENTAGE OF THE VALUE OF PRODUCTION FOR THE PRECEDING 5 YEARS.

pursued a dual-price policy in conjunction with use of a central marketing agency to garner maximum returns for their producers. The European Community and Japan (major grain importers whose producers are relatively inefficient) have invoked tariff and nontariff barriers for the protection of their producers.

In developing countries, governmental regulation of trade and internal prices also influences trade adjustment. A reduction in consumption may not be economically or politically feasible, despite limited world supplies of grain, when large parts of the population are at or near subsistence levels. Expansion of consumption when supplies are ample is also risky because of the need to conserve foreign exchange for future periods of high import prices. In the aftermath of the world food crisis and OPEC oil price increase in 1972-74, many less developed countries have pursued costly and inefficient self-sufficiency programs in agricultural production—not only to meet food security objectives but also to conserve exchange earnings to purchase costly energy supplies. The measures imposed to achieve self-sufficiency further restricted normal adjustments in production and consumption.

Centrally planned economies, major importers of U.S. grain, have exhibited reluctance to adjust consumption in response to tight world supplies. The decision of the USSR in the early seventies to import large amounts of grain to maintain its livestock herd despite extremely low grain production illustrates further the impact of protectionist policies on price instability.

Without substantial changes in the policies of major grain and oilseed importers and exporters, price instability will probably not decrease. The trade patterns discussed earlier are also likely to continue. Increased income levels in developing and centrally planned countries will most likely be translated into increased demand for grains, high protein feedstuffs, and livestock products—commodities in which the United States has a substantial export interest. For several reasons, domestic production of many of these commodities in developing and centrally planned

Table 3—Variation in real national income, by income components, United States, 1961-77[1]

Component	1961-70		1971-77	
	Average annual change	Index of variability	Average annual change	Index of variability
	Percent			
National income	4.5	3.4	2.0	3.6
Compensation of employees	5.2	1.8	2.1	3.1
Nonfarm proprietors income	1.6	5.3	−1.7	5.6
Rental income of persons	.4	6.9	−4.1	4.5
Corporate profits	2.4	16.0	1.5	12.8
Net interest	10.3	2.8	8.0	3.2
Farm income:				
With Government payments	−.7	7.4	−4.4	29.4
Without Government payments	−2.9	8.5	−1.0	34.7
Per capita personal income:				
Total population	3.5	1.6	1.6	2.4
Farm population	6.1	3.3	1.8	13.6
From farm sources	3.4	4.5	−1.3	25.0

[1] These estimates were calculated from regressions of the natural logarithms of the components of national income on a linear time trend. The deflator was the consumer price index. The average annual change refers to the coefficients of time, and the index of variability refers to the standard errors of the regression. Data for 1977 are preliminary.

Source: *Economic Report of the President,* Council of Economic Advisers, 1978.

countries is not likely to expand sufficiently to meet internal needs.

The Multilateral Trade Negotiations failed to achieve significant reductions in trade barriers. Efforts to institute an international system of nationally held grain reserves also did not succeed. Export instability is not likely to diminish and will continue to be a destabilizing influence on U.S. food prices and farm income. The United States will continue to bear the brunt of this instability due to its increasing reliance on grains and oilseeds trade and on commercial firms for trading.

U.S. COMMODITY POLICIES

When the social costs of resource adjustments are excessive, public policies are generally instituted to ease the transition (dairy, sugar, and beef are examples). Prices and incomes vary widely in response to exogenous demand shocks; thus policy measures to moderate these shocks, and structural responses by the farm sector are ongoing concerns.

The U.S. response to the export and price instability of the early to mid-seventies is contained in the Food and Agriculture Act of 1977. The act's programs maintain the market orientation of U.S. agricultural policy. The act also established food and feed grain reserves to meet price stabilization objectives. The target price principle was extended with modifications that improve income protection to producers without interfering with market conditions. Another major provision of the act includes the current-plantings concept, which allows producers greater flexibility in responding to market conditions.

The grain reserve program, through the operation of release and accumulation rules, establishes a corridor for grain prices. When prices are low, producers are encouraged to store grain through the use of storage subsidies. Grain reserve release prices and the minimum release price for stocks held by the Commodity Credit Corporation provide protection for consumers against excessively high prices. Within the price corridor, market prices adjust in response to supply and demand. The grain reserve program, for the first time, allows price stabilization objectives to be pursued independently of farm income support objectives.

The programs that manage reserves have important implications for consumers and livestock producers. The grain reserve program moderates surges in demand for grain. This holds prices paid by livestock producers for grain below levels that lead to serious liquidation of the livestock herd and subsequent high meat prices for the consumer. The necessity of managed reserves is indicated by the dramatic adjustments that took place in the livestock sector during the mid-seventies in response to extremely high commodity prices.

Will the grain reserve programs established unilaterally by the United States be sufficient to offset future instability in international markets? If U.S. reserves substitute for those held by other grain producing and consuming countries, the adequacy of these reserve programs will be further jeopardized and the likelihood is increased of a repetition of the events of the seventies.

THE TRANSITION OF THE FARM SECTOR

Some analysts argue that the boom and bust period of the early and mid-seventies has radically and irreversibly transformed the role of U.S. agriculture in international economic and political affairs and in the domestic economy. Characteristics of the transformation often mentioned are: the contribution of U.S. agriculture to the ability of the world to feed itself, the importance of agricultural export earnings to the national balance of payments, and the implications of domestic food price inflation for the national economy.

Changes in the structure and responsiveness of the farm sector are likewise characteristic of this transformation. Acreage constraints and price support programs have either been eliminated or not put in effect. Burdensome stocks have been liquidated. Increased usage of large specialized

machinery, growing specialization in the production of single crops or commodities, increased reliance for purchased inputs from other sectors of the economy, and increased use of debt capital have all altered the debt and cost structure of agriculture and reduced the ability of large segments of agriculture to make internal adjustments to risk and low prices.

The extent of changes in the farm sector depends largely on producers' response to risk. With expanded reliance on export markets, world economic, policy, and weather conditions increase producers' market risk.

Public policies in the agricultural sector have shifted the burden of risk to all taxpayers. When market risk decreases, farm size usually increases. Decreased risk results in greater use of external sources of capital and new technology, less diversification in production, and greater output.

CONCLUDING REMARKS

The role of commodity policies in moderating the impacts of foreign markets on the farm sector has changed considerably. The grain price support policies of the fifties and sixties held the domestic price generally above the world price. Under this regime, the United States was the residual supplier of grain for the world. Export shocks were moderated substantially through the release of chronic surpluses. The inflexibility of these programs subsequently resulted in consumption and production adjustments being made elsewhere in the world grain market.

With the narrowing of world grain supply and demand, the United States, as the only major grain exporter with excess stocks and production capacity, realized a rapid and turbulent expansion in export demand. Trade had an expanded role in determining commodity prices and incomes in the farm sector. However, the amount of trade that is fully or partially isolated from traditional adjustment mechanisms increased. Producers and consumers in the United States and in developing countries absorbed the costs of resultant instability. The commodity policies in existence at that time were not sufficient to moderate the massive shocks to prices and incomes. Policy adjustments were subsequently made in the Food and Agriculture Act of 1977. Of major importance is the grain reserve program that more effectively allocates grain stocks when world and U.S. supplies are low.

Without substantive progress in reducing the inflexibility in foreign markets or in implementing international reserve measures to spread the burden of adjustment, serious questions continue:

- Do the new realities of international commodity markets indicate that new national and international institutions are required?
- What are the implications of expanded use of bilateral purchase and sales agreements?
- What would be the impacts of a central marketing agency for major U.S. commodities?
- Would the formation of an international grain cartel resolve the problem of export instability?

Farm Structure And A Changing Food Policy Environment

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INTRODUCTION

Structure can be defined as the organization of productive units; the number and size distribution of firms. Structure reflects society's technological capability and its entire set of individual and social desires. Both technology and consumer desires change over time.

Structures, including the farm structure, must be allowed to change. For in the final analysis, they are judged on whether the products actually produced match those made possible by technological advances and whether the products are consistent with those most desired by "the society," collectively and as individuals. Changes in structure, however, generally imply the need for economic adjustments. As a consequence, individuals and groups adversely affected resist change.

This article describes indicators of a change in the public thinking about food and agriculture and discusses their implications for the structure of the farm sector.

THE CHANGED SETTING FOR FOOD AND AGRICULTURE

Throughout most of history, the struggle for food was directed primarily at getting enough to eat. At the turn of the century, more than 40 percent of our population lived on farms, largely providing for their own food needs. The food supply was highly perishable and commercial food distribution was characterized by small family-owned "Mom and Pop" stores. Public programs were devised to encourage increased production, longer product "shelf life," and improvements in the national food distribution system. The regional specialization of production was also encouraged by such policies. The structure of the farm sector today has been influenced by those policies.

In recent times, however, a point has been reached where, for a relatively high proportion of our people, the basic requirements for food have been satisfied. Indeed, excess consumption is considered by many nutritionists to be a serious national health problem. The successes of the past, it appears, have resulted in new,and in many ways more difficult, national food and nutritional problems:

- The leveling off of our national population slowing the rate of increase in the domestic demand for agricultural products. At the same time, technological developments are increasing the amount of food actually sold from each unit of farm product, which further reduces demand.

- Use of the chemicals used to increase production, retard spoilage, and preserve foods is now being questioned because of their potential effects on human and animal health. Since 1966, pesticide use has more than doubled. The commercialized use of animal drugs at subtherapeutic levels did not occur until 1950. From 1960 to 1970, antibiotics used in animal feeds increased sevenfold.

- Food processing and distribution now account for nearly 75 percent of the retail price of food. Changes in the purchase price of food thus bear little direct relationship to the availability (supply) of agricultural commodities. Whatever the rate of inflation in the general economy, agricultural policies are not able to have a major role in reducing food price inflation.

Clearly, these are fundamentally different "food" problems than we faced in the past. Rather than being production-oriented problems faced by a new country with a rapidly expanding population, the problems are those of an industrialized food and agriculture system. Each of these problems involves a policy focus on improvements in safety and quality. Sometimes those improvements will only be possible at the expense of quantity.

The changed nature of the problems being faced has been accompanied by a broadened public sector interest in food issues. Food safety, food quality, food prices, nutritional balance, and food assistance issues have become more central to public food and agricultural policymaking. Secretary of Agriculture Bob Bergland, for example, said recently that a narrow, farm-interest food policy "is a luxury no single operator in the food system can afford" (*1*).[1]

The new emphasis on food and nutrition programs was evident in the goals he gave for the Department. He said that programs would be designed and implemented to:

- Assure consumers that there would continue to be adequate supplies at prices fair to both producers and consumers.
- Make certain the food supply was safe, wholesome, and appealing to eat.
- Assure that all Americans had access to nutritionally adequate diets.

That program emphasis is reflected in the policy development and implementation process within USDA. Public participation in decisionmaking is being encouraged and an institutional structure for obtaining such input has been established. A new Human Nutrition Center has added organizational importance to USDA's human nutrition research program. Food safety and quality programs have been combined in one organization to achieve administrative efficiencies and to form an integrated approach to program implementation.

Some of these changes result from explicit efforts to foster the implementation of a broader food policy. Others simply reflect the fact that food and agriculture issues have become too important nationally to be resolved in a context limited to food and fiber producers.

ARE REAL CHANGES LIKELY?

Some people have argued that these changed conditions and the changed public involvement in food and agriculture related issues are only passing phenomena. The evidence, however, suggests otherwise and if the present momentum is sustained, the structure of the farm sector could well be influenced. Let us consider a few examples.

Nutrition Guidelines

The U.S. Senate published its first version of the "Dietary Goals for the United States" in January 1977 (*8*). After a year of discussion and debate, a revised version of the initial report was released (*9*). Simultaneously, a joint committee of the U.S. Department of Agriculture and the U.S. Department of Health, Education and Welfare was at work developing dietary guidelines that would reflect contemporary concerns about nutrition. Then, in August 1979, the U.S. Surgeon General issued a report discussing the scientific evidence relating nutrition and health and offering dietary advice paralleling that of the Senate Select Committee.

The real message of the changed advice on nutrition is moderation in intake of certain foods (*2*). The argument is simple enough. Fifty percent of American men now die of coronary disease, 20 percent of cancer, and 20 to 25 percent have hypertension. One way to reduce the risk, the Surgeon General suggests, is to lower intake of fat, salt, sugar, and cholesterol and increase consumption of fruits, vegetables, and grain products.

Health and nutrition are not the only considerations. While the recommended changes do not imply an increased dietary risk they could alter relative economic positions. An overall decrease in the consumption of animal fat and cholesterol, for example, would adversely affect dairy farmers, egg producers, and producers of fed cattle. Producers of fruits and vegetables and food grains would, however, stand to make relative income gains.

Clearly, if actual food use is affected by the changed nutrition message, the structure of the farm sector will also be affected. But the extent of the implied structural change, and its ultimate

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

economic consequences for the farm sector have been overstated by groups and individuals on both sides of the debate. The Government's ability to influence those changes has also been overstated.

First, dietary guidelines are not new. In 1945, the National Research Council of the National Academy of Sciences first published its Recommended Dietary Allowances (RDA's). The RDA's were originally established as "goals we should strive to meet" (2). Nor are dietary guidelines static. The RDA's, for example, have been changed over time to reflect changes in lifestyle, nutritional philosophy, and the available information. Consistent with the direction of change embodied in the Dietary Goals, the protein requirement for adult men has been reduced about 15 percent over the years.

Second, while Government policies have influenced what is eaten, it is simply unreasonable to talk about Government policy dictating the national diet. Commodity programs have made the production of some agricultural products relatively more profitable and, sometimes, encouraged production beyond market needs. Commodity Credit Corporation purchases of dairy products and subsequent National School Lunch Program distributions, for example, result in increased consumption and higher prices for farmers. Import policies, too, have had an influence. In 1979, meat imports totalling 1.6 billion pounds were available to American consumers. Consumers can also purchase coffee, bananas, and tea, not produced domestically, and more sugar than is produced domestically. But the impact of these policies on the structure of the domestic farm sector is certainly small compared with those resulting from other policies discussed in this report.

However, if consumers do change their eating habits in response to the changed advice about food, relative prices as well as amounts of commodities produced will change to reflect the new set of preferences. The impact of Government policy in influencing such changes is slight. The Government will likely be pressured to minimize the adverse economic impact of the resulting adjustments but there will also be pressure for it to support the changes taking place.

The evidence appears to favor such an interpretation of the present food environment. During the past decade, there has been a significant increase in the public concern about nutrition. There is increased emphasis on nutrition research, surveillance, and education. There has been a significant decline in the per capita consumption of eggs and butter. More poultry, fish, and cheese are now being consumed. The shift from whole milk to low-fat milk has been dramatic. These types of market-based changes will determine the farm structure significance of the changing public nutrition message.

Food Safety

In the past decade, there has been considerably more public attention devoted to issues involving food safety. Part of the concern stems from not knowing the health consequences of the increased use of chemicals in food production, preservation, and processing.

Chemical substances have had a significant role in shaping agricultural production and, hence, the structure of the farm sector. Fertilizer has increased yields and, with other chemicals to control weeds and pests, has made it possible for each farmer to produce more food. Animal drugs and feed additives are generally regarded as making possible the confinement feeding of livestock and poultry.

Restricting the use of such chemical substances, without suitable substitutes, would have economic and structural implications. But, as with most food issues, the farm income (or farm structure) implications of a particular policy action represent only one of the many important considerations. A growing body of scientific evidence is linking the use of agricultural chemicals, food additives, and animal drugs to human health conditions. Many are being isolated as cancer causing compounds. Others are causing environmental damage. In many cases, it seems, we have been paying hidden costs for the dramatic increases in agricultural productivity.

Attempts to avoid these health and environmental costs by banning or severely restricting the use of agricultural chemicals, food additives, or animal drugs would influence changes in the number and size distribution of farms. Some producers would likely be affected more than others. A recent study of an immediate ban on the use of sodium nitrite as a bacon curing agent provides an example (*4*).

The study results indicate that hog prices would fall, about $2-$3 per cwt., because large quantities of diverted bellies would need to be rendered into lard instead of being used for bacon. Food prices, though, would be expected to increase because of the higher costs for processing pork. The demand for substitute meat products (beef and poultry) would increase. Some hog producers would probably go out of business. But cattle producers would probably benefit from such a ban. The increased demand for beef products could be expected to increase cattle producers' receipts 2 to 4 percent. If there were a *total ban* on the use of nitrite in meat curing, cattle producers potentially stand to gain more, as only about 10 percent of all beef is cured with nitrite, compared with over 55 percent of all pork (*5*).

Similar structural results would occur with a ban on the use of animal drugs like penicillin, the tetracyclines, sulfa, and the nitrofurans (*3*). While per unit production costs would increase, prices for meat would increase more than proportionally so that net farm income would actually increase.

Thus, consumers rather than farmers end up shouldering most of the impact. In either case, food prices would tend to rise, but aggregate farm income would increase or remain about unchanged. But do consumers really end up worse off? If these actions do improve people's health, the result may be higher food costs but lower costs for medical care.

Food Quality

A final example of the changed setting for food and agriculture with influences for farm structure is the recent concern about food quality. Public interest in this issue seems to be primarily one of better (more complete and more accurate) product information. In essence, consumers and producers are applying more pressure to obtain changes in product labeling. In recent years, USDA policymakers have dealt with information issues as diverse as meat grading, allowable uses of processing technology (for example, mechanically deboned meat), and standards of product identity (ice cream and "turkey ham," for example). In each case, the policy question centered on the consumers' "right to know" prior to purchase.

One of the more obvious examples of the distributional impacts implied by changes in product labeling rules is shown by the current debate over the weight labeling of meat and poultry products. Federal law allows use of a dry tare standard; product weight is equal to package weight minus the dry weight of the packaging materials. Following a petition by consumer groups and local and State weights and measures officials, USDA proposed a regulatory change that would require package weights to be net of both packaging materials and free liquid.

Suppose a package of chicken contains 14 ounces of meat and 2 ounces of free liquid and sells for 65 cents. The reported price per pound is 65 cents. Under the USDA proposal, the reported package weight would be lower (14 not 16 ounces) and the reported price per pound would be higher (74 cents). That is, if other things did not change, the total cost for the package would still be 65 cents. Fundamentally, nothing has changed except that consumers are protected from potential fraud and have a more accurate product weight for making comparisons (see (*7*) for more detail).

If consumers do want to know the reported price per pound and the rule is changed, beef producers could gain relative to poultry producers as poultry products generally have more free liquid than pork or beef products. But that implies that the present rule—allowing use of dry tare—has given a price advantage to poultry producers because relatively more free liquid is

counted in the reported package weight. A higher (more accurate?) reported price per pound for poultry would give a price advantage to beef and pork products, encourage consumers to substitute beef and pork for poultry, and strengthen the demand for these meats.

In some instances, formulated nonfood substances substitute for the farm-produced ingredients. If consumers prefer the "natural" ingredients, more detailed product labeling could increase the demand for output from the farm sector. More explicit nutrition labeling should have the same result.

In the product information area, as in the safety and nutrition area, the structural implications are, however, more likely to be reflections of underlying changes in consumer food preferences than result from changes in public policy *per se*. While public policy can increase consumers' knowledge about the foods they eat, it can do little else to change their choices of foods.

STRUCTURE AND FOOD PRODUCTION

Most of the discussion to this point has dealt with the structural implications of changed economic and social concerns regarding food and nutrition. But there is another side to the issue. Policy changes that would alter structure also have implications for food production and nutritional balance. Explicit policies to enhance the economic viability of smaller farms, direct marketing and localized production, for example, would appear to be consistent with heightened consumer interest in "fresh" and "natural" foods.

But the overall consequences of such a policy on actual food use and prices are unclear. Unit production costs would probably increase as less output is produced in those areas with a comparative economic advantage. Further, the smaller sized production units would be less able to make efficient use of the production technologies that, throughout the fifties and sixties, resulted in declines in real (deflated) food costs. However, some people have argued that such changes would make the food system less dependent on industrial inputs and would encourage the development of a less concentrated food system. If that is the case, there could be some downward pressure on food prices.

CONCLUSIONS

The emerging concern for a food policy that emphasizes adequate supplies, nutritional balance, safety, and a more complete description of quality attributes does carry structural implications for the farm sector. Based on the assumption that these concerns will grow in importance in the decade just ahead, the following changes would appear likely:

- Consumer demand for fresh products will increase. Such a shift would encourage the localized production of certain products now dependent on chemical substances to preserve shelf life. There will be less emphasis on processed meats, fruits, and vegetables. The changed energy situation will likely facilitate such a structural shift. Higher priced energy inputs will give some production areas less of a comparative advantage, regardless of consumer preferences.
- Consumer demand for lean beef and lowfat dairy products would increase more than for products relatively high in cholesterol and animal fat. This shift in demand, coupled with an increased concern about the extensive use of certain feed additives and animal drugs, could encourage a shift away from the very large confinement cattle and hog feeding operations. The change could also precipitate changes in the meat grading and milk pricing systems.
- Consumer demand for food grains and fruits and vegetables would increase more than the demand for animal products. Such a shift could result in fewer acres being planted to feed grains.
- There would be a significant decline in sugar consumption. The public support for a domestic sugar industry with public price support programs would diminish. U.S. sugar production would decline as domestic producers generally have higher production costs than those in other producing areas around the world.

The extent to which these changes occur depends on at least three factors: whether a real and fundamental attitudinal change is taking place among consumers, the political strength of groups affected by the changes, and the change in food prices.

The evidence suggests that the public sentiment regarding food, agriculture, and the food system is changing. Rather diverse groups are now taking an active role in shaping public food policies. But beyond that, the changed attitudes about food are beginning to be felt in the marketplace. There is more promotional emphasis on nutrition, "natural," and product labeling (open dating and unit pricing, for example). Even so, those groups adversely affected by the changes can be expected to exert political pressure to maintain and enhance the status quo. Their successes likely will slow the rate of change and, thus, the extent of the economic dislocation.

The question of food prices is somewhat more complex. Most of the changes discussed would be likely to result in higher food prices. As long as food takes a relatively small proportion of income for most consumers, food safety and quality concerns can be accommodated at little real cost. But, we are in a period when food price increases at about the rate of inflation appear to be the norm (*6*). However, changes in commodity prices can have only marginal impacts on food prices, when compared with changes in marketing costs, because the farm share of the food dollar is low (26 percent). It remains to be seen whether there will be widespread public support for changes which put upward pressure on food prices at a time when inflation is a serious economic problem.

On balance, these forces will influence rather than shape the emerging farm structure. Factors that would result in significant changes appear approximately balanced by those which would preserve and enhance the status quo. There is evidence though that the food and agricultural agenda will be broader than in the past, with due consideration to nutrition, safety, and quality. Food-related problems will continue to be discussed and resolved in a broader public interest context. And the evolving structure of the farm sector will reflect this changed economic and social setting.

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Rural America

Off-Farm Employment And the Farm Sector

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INTRODUCTION

The shift toward more off-farm work by farm families is one of the most dramatic changes taking place in U.S. agriculture. Farm operators and members of their households are increasingly combining farm work with full- or part-time off-farm employment. Off-farm work is more prevalent among operators of small farms, but some operators of all size units are working off farm. Those that hold off-farm jobs tend to have more specialized farming operations and use more labor-saving machinery than full-time farmers. Off-farm work is also more common among farm operators less than 45 years old. It may be a factor in helping younger farm operators get started or expand their farming operations by providing capital. For many, part-time farming is a way of life.

Prior to World War II, about 6 percent of all farm operators worked off the farm 200 or more days each year. Since then, the proportion has increased until, in 1974, about 30 percent of all farm operators reported 200 or more days of off-farm work (see table). An additional 10 percent worked at least 50 or more days off farm. Data for 1977 suggest that this trend in multiple job holding by farmers is continuing. Most multiple job holders have wage and salary jobs in the nonagricultural sector as either their primary or secondary job. This off-farm work appears to be in both blue-collar and white-collar occupations.

Between 1954 and 1974, the total number of U.S. farms decreased by 52 percent. The number of farms where the operator reported working 200 or more days off farm declined by 36 percent during the 20-year period, while the number of farms where the operator reported working off farm less than 200 days declined by 56 percent. Over 80 percent of the decrease in farm numbers over the period was in the group where the operator worked off farm less than 200 days.

Whether a farm operator's primary occupation is farming or some other occupation is highly related to the size (as measured by value of agricultural products sold) of farming operation. Of those operators with less than $2,500 in sales in 1974, nearly 70 percent reported a primary occupation other than farming. At the other extreme, nearly 90 percent of those operators producing $40,000 or more sales reported farming as their primary occupation.

Off-farm employment is more common in some regions than in others. Farming is least likely to be the principal occupation of farmers in the South; slightly over 50 percent of the operators report farming as their principal occupation, compared with 62.6 percent for all U.S. farmers. In the North Central region, particularly in Minnesota, Iowa, North Dakota, South Dakota, Nebraska, Kansas, Wisconsin, and Illinois, farming is the principal occupation for over 70 percent of farm operators. This probably reflects the scarcity of nonfarm job opportunities in some parts of the North Central region relative to other regions. It may also reflect the fact that more farms are generating full employment for farm operators in these States.

Black farm operators are less likely to have full-time off-farm employment than white farm operators. In 1974, 62 percent of black farm operators reported farming as their principal occupation, compared to 53 percent for farm operators in the South (where virtually all black farm operators reside). In addition, black farm operators who do work off farm are less likely to be employed at higher paying white-collar occupations.

Along with the rise in the percentage of farm operators working off the farm, the proportion of other farm family members doing off-farm work has also increased significantly. Most of these workers are female, probably wives of the farm operators. Most work a considerable

Employment of farm households by selected characteristics, 1974

Item	Farm operations	Principal occupation		Working off-farm		Household members other than operator working off-farm	
		Farming	Other	200+ days	100-199 days	200+ days	100-199 days
	Number	*Percent*[1]					
All farm operators by region							
Northeast	124,534	62.7	37.3	29.8	7.6	NA	NA
North Central	1,006,903	71.3	28.7	24.0	6.0	NA	NA
South	919,525	53.4	46.6	33.9	7.5	NA	NA
West	228,308	61.4	38.6	29.4	8.1	NA	NA
Total	2,279,270	62.6	37.4	28.9	6.7	NA	NA
Farm operators with farms having less than $2,500 in sales	616,728	31.1	68.9	50.4	8.8	NA	NA
Farm operators with farms having $2,500 or more in sales							
By value of agricultural products sold:							
$2,500-19,999	896,367	59.5	39.8	31.2	7.9	52.8	23.8
20,000-39,999	321,771	86.3	12.6	12.0	5.4	42.1	25.6
40,000-99,999	324,310	91.3	6.8	6.7	3.4	35.8	24.9
100,000 or more	152,599	84.3	5.0	4.8	2.1	34.8	22.5
Total	1,695,047	72.9	25.2	20.5	6.0	46.3	24.3
By standard industrial class of farm:							
Cash grain	580,254	76.4	22.6	19.4	6.0	44.0	25.2
Cotton	30,725	82.5	15.2	13.1	4.6	51.2	24.4
Tobacco	95,493	71.6	27.9	21.1	6.9	53.9	22.4
Field crops	82,415	69.8	27.7	21.6	6.8	48.4	24.0
Vegetable and melon	19,548	69.9	25.3	20.4	7.6	44.7	25.6
Fruit and tree nut	51,270	57.3	36.2	28.2	7.4	50.6	21.5
Horticultural specialties	19,678	51.1	31.1	19.0	5.2	54.3	22.0
General farm-primary crops	44,659	77.7	20.8	18.1	5.9	44.3	24.9
Livestock	493,816	64.8	33.3	26.0	6.7	48.8	23.9
Dairy	196,057	92.1	6.7	7.5	3.4	37.7	25.1
Poultry and egg	42,690	68.6	26.7	22.2	5.7	50.4	23.9
Animal specialty	11,167	42.6	52.1	37.0	8.1	57.2	20.3
General farm-primary livestock	14,995	86.7	12.4	11.1	4.5	35.1	24.0
Farms not classified	13,280	53.0	44.8	32.0	9.7	53.8	20.5
Total	1,695,047	72.9	25.2	20.5	6.0	46.3	24.3
By tenure of farm operator:							
Full owner	904,320	66.9	31.2	24.3	6.2	50.2	24.0
Part owner	565,620	81.1	16.9	15.2	5.6	41.6	24.9
Tenant	225,107	76.3	21.5	18.1	6.7	46.5	23.6
By race of farm operator:							
White	1,631,926	74.3	25.7	NA	NA	NA	NA
Black and other	30,616	75.4	24.6	NA	NA	NA	NA
By age of farm operator:							
Under 35	216,521	68.6	31.4	27.9	8.7	44.9	24.4
35-44	290,709	65.6	34.4	30.6	7.6	42.8	23.7
45-54	433,174	72.0	28.0	24.4	6.7	46.0	23.9
55-64	442,449	79.0	21.0	16.4	5.6	49.5	25.1
65 and over	279,689	84.1	15.9	7.0	2.8	48.9	24.7

NA = Not available from published sources.

[1] Percentages exclude those farm operators and household members who did not report primary occupation or days of off-farm work.

Source: U.S. Department of Commerce, Bureau of the Census, *1974 Census of Agriculture.*

time at an off-farm job in the nonfarm sector. In 1978, 43 percent of nonmetropolitan farm females 16 years of age and older were members of the labor force. Of those employed, nearly 72 percent held nonfarm jobs.

IMPACT OF OFF-FARM INCOME

An immediate outcome of increased off-farm employment by farm operators and family members has been an increase in dependence on off-farm income to maintain family well-being. Since World War II, off-farm income has increased steadily as a proportion of the total per capita income of the farm population (from 26 percent in 1945 to 50 percent in 1975). Over this period, increases in real off-farm income of farm people were greater than increases in their real farm income. In fact, during the fifties, while real farm income declined, real off-farm income increased moderately, helping to maintain the well-being of the farm population. In 1977, off-farm income comprised 57 percent of the per capita personal income of the farm population.

Only about 8 percent of all farm families have income from farming as their sole source of income. The remaining 92 percent have at least one other source of income. This off-farm income is derived from a variety of sources. The largest single source is wages and salaries earned, primarily from off-farm jobs (68 percent of total off-farm income in 1975). The remainder of off-farm income comes from such sources as nonfarm self-employment, interest and dividends, Social Security, and public assistance.

Off-farm income is reported by all sizes of farming operations, but families operating smaller farms depend more on off-farm income than families operating larger farms. In general, the lower the total family income, the more dependent farm families are on off-farm income. In 1970, almost three-fourths of all farm families would have been classified as low income (less than $5,000 family income) if only farm income were considered. When income from off-farm sources was taken into account, only one-third remained in the low-income group. This suggests that farm poverty would be much higher without off-farm income.

The incidence of poverty among farm families (17 percent in 1977) is higher than that among nonfarm families (11 percent in 1977). Most low-income farm families live in the South, with the Delta States having the highest incidence of farm poverty. Poverty is also particularly high among black farmers, of whom over 40 percent are poor. This reflects the fact that black farm families depend more on income from farming, predominantly from small farms, than do white farm families.

In any one year, about 40 percent of all farm operators report a loss from their farm. In general, operators with farm losses tend to have higher off-farm incomes than farmers with farm profits. Most farm losses are associated with smaller farming operations, and the average loss tends to be small. It appears that off-farm income enables many small-farm operators to continue farming even in years when the farm does not earn a profit.

Wealth is another important factor determining the well-being of farm families. The average net worth of farm families is nearly twice that of all families in the United States. When net worth is included with income in a measure of well-being for farm families, the average level of well-being increases, and the distribution appears to be more equal than in simple income comparisons. Also, the disparity in well-being between farm and nonfarm families is less pronounced. It may be especially important to consider the wealth position of older farm operators in measuring their well-being, as older farm operators may have low current incomes but relatively high net worth.

Farmers view combining farming with a nonfarm job as both a necessity and a way of life. In a study of dual employment of Illinois farmers, Hanson and Spitze found that, in general, the farmers (especially those on small farms) seemed satisfied with their dual employment as a means

of earning adequate income. Only 6 percent of the farmers surveyed expected to shift entirely to off-farm employment within the next 5 years. Combining part-time farming with off-farm jobs may provide the staying power for many farmers to remain in farming.

Some types of farms can be operated part time more readily than others. In 1974, operators of animal specialty farms (fur-bearing animals, horses, bees, pets, and others), livestock farms (specializing in beef cattle, hogs, or sheep and goats), and fruit and tree nut farms reported working off farm more often than farm operators of other types of farms. Yet operators of cotton, dairy, and general livestock farms (no specialty in any one animal) reported farming as their primary occupation more often than farm operators with other classes of farms. Also, a smaller-than-average percentage of these farm operators reported working off the farm 200 or more days per year.

Off-farm work by farm operators, while increasing family income, affects the day-to-day farming operation. The farm family must allocate its labor between farming and off-farm employment; often the nonfarm job tends to be of a fixed duration (such as 8 a.m. to 5 p.m., Monday through Friday). Thus, part-time farmers must adjust their farm enterprises to the off-farm labor requirements. In most instances, this means adopting less labor intensive farm enterprises and having a high machinery investment in relation to sales. Cropping systems do not differ greatly between full- and part-time farmers, except that meadow crops are grown more frequently on the part-time farms. Cropping systems show greater similarity than do livestock programs. The part-time farm operator is apt to specialize in one type of livestock operation, primarily beef, while the full-time operator tends to be more diversified.

IMPLICATIONS

Many farmers in all regions are successfully combining farming with an off-farm job. The U.S. farm structure has become dualistic, with a large number of farmers operating small production units part time while a few full-time farmers operate large farm businesses. These changes resemble trends in other countries in the Western World.

With increased off-farm employment of farm family members, farm family income and well-being have become linked more closely to economic conditions in the nonfarm sector. Because of this, national employment and income security policies have as much significance to the well-being of farm families as agricultural price and credit policies. And rural development policies that treat rural income problems through the encouragement of off-farm job growth may have allowed more people to continue to farm and to live in rural areas.

Off-farm income is not equally important for all farmers. For large farm operators and some farmers living in the Northern Plains, where off-farm opportunities are not available, traditional farm policies probably are more important in determining family well-being.

Many small farmers, especially black farmers in the South, do not have off-farm jobs even in areas where off-farm jobs appear to be available. In these cases, it is doubtful that traditional farm policies will greatly improve family well-being unless farm size is substantially increased. Policies that improve access to off-farm employment could provide greater opportunity to improve family well-being.

KNOWLEDGE GAPS

General trends in the amount of off-farm work by farm families can be discerned through existing data sources; however, data are not currently available on other aspects of farm family off-farm employment. Little is known about the occupations and industries in which farm people are working. The conditions of their employment such as seasonality, wage rates, and fringe benefits are also relatively unknown. Filling these data gaps would provide a clearer picture of the employment status of the farm population.

Small-Farm Component Of U.S. Farm Structure

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INTRODUCTION

There is a growing feeling in America that small farms ought to have a role in contemporary agriculture. The public interest in small farms derives from several perspectives and diverse groups. Some are concerned about issues such as increased concentration in agricultural production and marketing, dependence on capital intensive technology, use of harmful production practices, and land reform. Others are concerned about the plight of limited resource farmers and farm poverty. As William W. Wood recently pointed out: "Small becomes less a descriptive term than it is a philosophical one. Policy objectives and small-farm categories are interrelated, and they are identified on the basis of the concerns of interested parties or participants."

For more than 30 years, analysts and policymakers have considered small farms to be outside the mainstream of commercial agriculture. Small farms were regarded as subsistence operations, retirement residences, and part-time establishments. Such assumptions have encouraged a search for nonagricultural solutions to small-farm problems. The Federal Government's main small-farm emphasis since the early fifties has been on programs aimed at the entire rural community: provision of services, nonfarm job opportunities, and special problems of low-income citizens. The objective was to stem the post-World War II flow of farm families to urban areas by providing local nonfarm employment opportunities. The policy was partially successful; the reduction in farm population between 1950 and 1970 would have been greater without expanded opportunities for off-farm employment.

Framers of the Rural Development Act of 1972, reacting to a growing body of thought that the small family farm should remain an integral part of U.S. agriculture, included provisions for research and extension focused on agricultural production problems on small farms. The Food and Agriculture Act of 1977 extended this small-farm research and extension activity. Secretary Bergland recently emphasized USDA policy to encourage, preserve, and strengthen the small farm as a continuing component of U.S. agriculture. The Department will provide, on its own initiative when appropriate, assistance which will enable small farmers and their families to expand the necessary skills for both farm and nonfarm employment to improve the quality of life.

WHAT IS A SMALL FARMER?

There are various definitions of small farms. All farms selling less than $20,000 in farm products is one. This definition is required by statute only in connection with certain research and extension programs authorized by the Rural Development Act of 1972, as amended. USDA has recently established other criteria to be used to identify small-farm families. The families so designated should:

- Operate farms by providing most of the labor and management.
- Have total family incomes from farm and nonfarm sources below the median non-metropolitan family incomes in their States.
- Depend on farming for a significant portion, although not necessarily most, of their incomes.

The former definition (less than $20,000 in farm sales), which emphasizes the farm business as the primary policy concern, would include an estimated 1.7 million farm operators. But it is so broad that it does not reflect a commonly understood problem.

The USDA guidelines depict a group whose members share a problem that distinguishes them from other farm families—moderate to low income. This would include an estimated 1.3 million farm operators. The policy objective

Note: David Brewster, John Crecink, and James Lewis provided information for this paper.

flows naturally from the concept itself: undertake actions which improve family income and well-being.

A large number of farm operators (estimated at 1 million) would be identified as small using either of the above two definitions. However, the USDA definition would *exclude* families with relatively large off-farm incomes who sell less than $20,000 in agricultural products from the farms they operate (about 0.7 million farm operators). Included in the USDA definition would be families selling more than $20,000 in farm products from their farms but for various reasons having low net total family incomes (about 0.3 million farm operators).

Two elements of the USDA definition are admittedly subjective and cannot be easily measured. However, one element, median nonmetropolitan family income, is easily measured and can be used to identify families to be included in the USDA target population (definition A). There is limited information on the characteristics of farm families with incomes below the median nonmetropolitan family income ($13,800 in 1977 for the nonmetropolitan U.S.). This information will be contrasted with similar information about families selling less than $20,000 in agricultural products from their farms (definition B).

SMALL-FARM CHARACTERISTICS

Small farms are located throughout the Nation, with major concentrations in the North Central region and the South (table 1). Relatively more definition A farmers live in the North Central region, particularly the western part, than do definition B operators. This is due in part to the fact that southern farm operators are more likely to have an off-farm job which raises total family income above the median nonmetropolitan level.

Definition A farm operators are more likely to have farming as their principal occupation than are definition B operators (table 2). Definition A farmers work fewer days off farm, which results in lower off-farm incomes. Total family income for these operators is almost half that of definition B operators.

Small farmers, under either definition, control about 30 percent of total farm assets. Their assets are relatively unencumbered by debt compared with larger scale farmers. However, the median value of assets owned and controlled by definition A farmers is higher than that of definition B farmers.

Small-farm operators appear to be older than all farm operators; a fifth are 65 years old or over. And, under either definition, small farmers are involved in all types of farming operations.

About 16 percent of the farm population is in poverty in any one year. The incidence of poverty among definition B families may approach 20 percent. The incidence of poverty among the

Table 1—Geographic distribution of small-farm families under two definitions

Area	Farm families with incomes below median nonmetro income, 1975[1] (Definition A)	Families with farm business selling less than $20,000 in farm products, 1974[2] (Definition B)
	Percent	
Northeast:	6	5
New England	2	1
Middle Atlantic	4	4
North Central:	42	37
East North Central	17	18
West North Central	25	19
South:	43	49
South Atlantic	13	15
East South Central	15	18
West South Central	15	16
West:	9	9
Mountain	5	4
Pacific	4	5

[1] Estimates using data from U.S. Bureau of Census, "Money Income in 1975 of Families and Persons in the United States," *Curr. Pop. Rpt.*, Series P-60, No. 105, U.S. Govt. Print. Off., Washington, D.C., 1977.

[2] U.S. Department of Commerce, Bureau of Census, *1974 Census of Agriculture: United States Summary and State Data,* Vol. 1, Part 51, Dec. 1977.

definition A group is undoubtedly higher, perhaps 30 percent.

About 6 percent of the total farm population are minorities, predominately blacks located in the South. Minority operators are generally older compared with other farmers, work fewer days off the farm, have smaller farms, and tend to be primarily engaged in crop production. Most minority farm operators (90 percent) sell less than $20,000 in farm products from the farms they operate. Minority farm families depend more heavily on farm earnings as a component of their total family income. This accounts in part for their extremely low total family incomes. For example, about 92 percent of all black farm families have incomes below the 1977 median nonmetro family income.

The share of total farm sales provided by small-farm operators is substantially less than the proportion small-farm operators are of all farmers. Definition B farms account for 10 to 15 percent of total farm sales while definition A farms provide more of total farm sales, perhaps 30 percent.

SPECIAL SMALL-FARM PROJECTS

Public and private institutions have undertaken a number of projects to assist small-farm families. Usual objectives are to increase farm income with better farming practices. Examples include the Texas Intensified Farm Planning Program and the Missouri Small Farm Program, both carried out by the State cooperative extension services.

The basic approach of these projects has been to provide technical assistance to a selected group of low-income farmers. The technical

Table 2—Characteristics of all farm families, low-income families, and families with a small-farm business, 1975

Characteristics	Unit	All farm families	Farm families with incomes below income, income, 1975 (Definition A)	Families with farm business selling less than $20,000 in farm products, (Definition B)
Farming principal occupation[1]	Pct.	69	69	48
Working off farm 100+ days	do.	35	36	55
Average total family income	Dol.	11,700	5,600	10,400
Average net farm income	do.	3,800	1,500	1,100
Average off-farm income	do.	7,900	4,100	9,300
Average age	Years	52	53	53
Under 35	Pct.	12	12	12
35-64	do.	73	66	66
65 and over	do.	15	22	22
Average value of farm sales	Dol.	17,900	10,800	4,400
Median size farm	Acres	185	135	82
Median market value of farm assets	Thou. Dol.	232	142	91
Median net worth	do.	204	110	84
Type of farm:[2]				
Small grain	Pct.	10	9	7
Cotton/tobacco	do.	2	2	3
Corn/soybean	do.	27	24	20
Potato	do.	1	–	–
Other field crop	do.	1	1	–
Vegetable	do.	3	2	2
Horticultural	do.	7	21	27
Livestock, dairy, and general	do.	39	41	41

[1] That occupation in which operator spent 50 percent or more of his work time in 1975.
[2] Based on crop using the largest acreage in 1975.

-- = Less than 1 percent.

Source: Special tabulations from the 1975 Farm Production Expenditures Survey and the 1973 Farm Family Living Expenditures Survey Conducted by Econ. Stat. Coop. Serv., U.S. Department of Agriculture.

assistance has generally been provided on a one-on-one basis by a paraprofessional—a former farmer or other local community resident locally recognized and who has received special training for such work. Farmers are encouraged to adopt improved crop and livestock production practices, to better utilize existing government programs and services, and to better organize and manage their farms. The Missouri Small Farm Program has reportedly led to increased farm sales, a better net farm income, slightly more efficient resource utilization, and more use of professional agriculturalists. Expansion of small-farmer programs in other areas has followed the success of these pilot efforts.

IMPLICATIONS

Small farmers may not contribute greatly to the total U.S. output of food and fiber, but they represent a majority of all U.S. farm operators. Some, particularly minority operators, depend on income from farming for family living. Others have combined farming with a nonfarm job, but their off-farm earnings are low. The small-farm population is clearly a heterogeneous one.

Programs and policies to assist small farmers must be diverse to accommodate the heterogeneity of the population. Some small farmers can benefit most from programs to improve farm operations. Others can benefit most from increased off-farm employment opportunities. Still others, such as the elderly, may benefit most from improved access to public assistance and social services. The exact combination of programs depends almost entirely on individual family circumstances. Pilot programs which provide one-on-one guidance to small farmers appear promising. Whether such programs should be implemented nationally is still an open question.

The family, rather than the farm, is probably the most satisfactory point of reference for a small-farm policy. Whatever the specific family situation, the goal of such policy should be to capitalize on all the agricultural and non-agricultural resources available to the family.

KNOWLEDGE GAPS

There is some national information already available on small-farm families. Unfortunately, available national population and agricultural data do not provide information on attributes of small-farm families, characteristics of the farming operations, and other factors needed to identify small-farm families most in need of assistance. And, any efforts to assist small-farm families must consider the goals and aspirations of the family and the role that farming plays in family well-being, a particular area where little research insight is available.

Agriculture And the Changing Structure Of the Rural Economy

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INTRODUCTION

As America has shifted from an agrarian to an industrial-service society, the importance of agriculture as a source of income and employment in rural counties has diminished steadily. Total employment in agriculture has declined nationwide. There were 20 States in 1940 in which agricultural employment amounted to 30 percent or more of total employment. By 1970, only 10 States had even 7.5 percent of the workers employed in agriculture (figs. 1 and 2), and approximately 63 percent of the U.S. nonmetro population lived in counties where less than 10 percent of the employment was in agriculture (table 1). In 1975, only 9 percent of the personal income in nonmetropolitan areas was derived from farming.

Regional Differences in the Rural Economy

In 1975, agriculture, forestry, and fisheries accounted for nearly 19 percent of total earnings in nonmetro counties in the North Central region—the second most important source of earnings (table 2). Only manufacturing accounted for more. In the South, agriculture, forestry, and fisheries were important but secondary to manufacturing, government, and trade. Agriculture was of little economic importance in the Northeast.

Since 1968, earnings from agriculture, forestry, and fisheries have increased 121 percent in nonmetro countries of the North Central region (table 2). The South's 69-percent increase in earnings in this sector was outdistanced by all other sectors. In the Northeast, agriculture, forestry, and fisheries grew only 36 percent, which was even slower than manufacturing.

FIGURE 1

PERCENTAGE DECLINE IN PROPORTION OF EMPLOYMENT IN AGRICULTURE, 1940-70

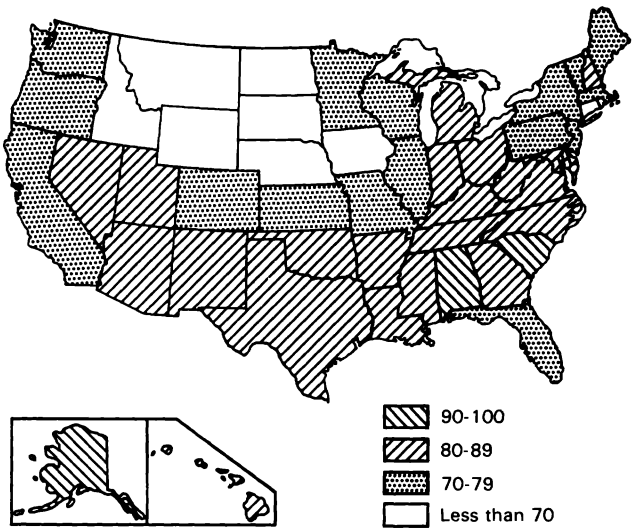

FIGURE 2

AGRICULTURAL EMPLOYMENT AS A PERCENTAGE OF TOTAL EMPLOYMENT, 1970

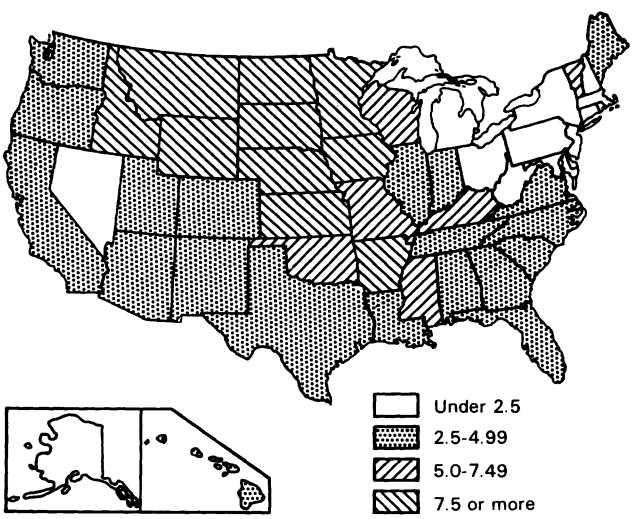

Table 1—Population of nonmetro counties by employment in agriculture, 1970

Workers employed in agriculture	Counties	Population	
	--- *Number* ---		*Percent*
Total nonmetro counties[1]	2,469	54,424,000	100.0
30 percent and over	331	2,059,000	3.8
20-29 percent	372	4,664,000	8.6
10-19 percent	724	13,295,000	24.4
Under 10 percent	1,042	34,407,000	63.2

[1] Nonmetro as of 1974.

Source: Calvin L. Beale, "Making a Living in Rural and Smalltown America," *Rural Development Perspectives,* ESCS, USDA, Nov. 1978.

Variations In Farm Size

Most of the Nation's farms—eight out of ten—are in the South and North Central States (table 3). Farms with low-volume sales are common throughout the United States, but especially important in the South. The South alone had nearly six of every ten farms selling less than $2,500 per year. More than two-thirds of its farms sold less than $10,000 worth of agricultural products, compared to slightly over a third of the farms in the North Central region.

Table 2—Earnings by industry and region, 1968-75

Industry	South			West		
	1975[1]		Growth rate 1968-75[1]	1975[1]		Growth rate 1968-75[1]
	Total	Total personal income		Total	Total personal income	
	Million dollars	--- *Percent* ---		*Million dollars*	--- *Percent* ---	
Manufacturing	20,843	26.3	73.4	4,231	13.4	89.4
Government	14,759	18.7	86.3	7,508	23.8	97.0
Trade	11,153	14.1	90.2	4,462	14.2	98.9
Services	8,685	11.0	86.5	3,714	11.8	97.6
Transportation, communications, and public utilities	4,261	5.4	94.9	2,107	6.7	105.4
Contract construction	4,261	5.5	94.0	2,762	8.8	186.6
Finance, insurance, and real estate	2,256	2.8	101.6	823	2.6	89.2
Agriculture, forestry, and fisheries	8,662	10.9	69.3	4,401	14.0	108.8
Mining	4,152	5.2	167.5	1,468	4.7	141.8
Total	79,132	100.0	85.4	31,476	100.0	105.6
	North Central			Northeast		
Manufacturing	16,704	24.9	65.5	6,781	29.1	45.6
Government	10,880	16.2	85.7	4,916	21.1	87.1
Trade	10,109	15.1	75.0	3,472	14.9	72.4
Services	6,899	10.3	81.1	3,449	14.8	81.8
Transportation, communications, and public utilities	3,762	5.6	83.3	1,400	6.0	77.9
Contract construction	3,232	4.8	58.1	1,146	4.9	36.9
Finance, insurance, and real estate	1,766	2.6	73.8	739	3.2	73.1
Agriculture, forestry, and fisheries	12,397	18.5	120.9	803	3.4	35.6
Mining	1,359	2.0	129.2	573	2.5	188.0
Total	67,108	100.0	82.1	23,279	100.0	65.8

[1] Detail may not add exactly to totals because of rounding.

Table 3—Farms by value of agricultural products sold, by regions, 1974

Value of sales	South		West		North Central		Northeast		United States	
	No.	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*
$100,000 and over	45,765	4.9	29,914	12.4	69,440	6.8	8,003	6.3	153,122	6.6
40,000 to 99,999	73,981	8.0	35,407	14.8	192,962	19.0	22,358	17.5	324,708	14.0
20,000 to 39,999	75,791	8.1	31,224	13.1	194,488	19.1	20,543	16.1	322,046	13.9
10,000 to 19,999	99,629	10.7	29,824	12.5	165,864	16.3	14,900	11.7	310,217	13.4
2,500 to 9,999	254,050	27.3	50,474	21.1	224,488	22.1	24,917	19.5	553,929	24.0
Under 2,500	380,883	41.0	62,173	26.0	170,125	16.7	36,810	28.9	649,991	28.1
Total	930,099	100.0	239,016	100.0	1,017,367	100.0	127,531	100.0	2,314,013	
Percentage of total		40.2		10.3		44.0		5.5		100.0

Source: 1974 Census of Agriculture.

REGIONAL VARIATIONS AND DEVELOPMENT

In the western portion of the North Central States and the northern part of the Great Plains, farming remains the major source of income and employment in many rural areas. Declining farm numbers and employment in agriculture have not been fully offset by an increase in nonfarm jobs, and total population has declined. Rural trade and services have had to enlarge their market areas because of their dwindling population base. Large farms are also more likely to buy directly from suppliers. But dwindling population and direct buying are not the only reasons for the decline of smalltown shopping. Highway and motor vehicle improvements have reduced transportation costs substantially and cut the time for people to drive to larger towns for shopping, medical services, jobs, education and a variety of other activities. [1] These many developments make it hard to say what impact farm policy changes to increase farm numbers would have had in these regions in the last 40 years.

Some of the changes in these regions undoubtedly can be attributed to farm consolidation and declining farm numbers. However, it is difficult to say how many of these changes in rural communities would have occurred regardless of changes in farm structure.

[1] David Brown's article "Farm Structure and the Rural Community" elaborates on these developments.

The Northeast and West have few small farms. Impacts of declines in farm numbers may be important in local areas (irrigation projects, for example) but are unlikely to have major regional effects. In the South, the picture is more complicated. Small farms are plentiful, but in most States less than 5 percent of the labor force is employed in agriculture. Since World War II, the South has adjusted to a much less labor intensive agriculture. During the late forties and early fifties, agricultural workers moved to the major urban centers within and outside the South. More recently, Southern rural areas are becoming industrialized, which is providing more opportunities for employment. Increased opportunities in industrial and services employment are enabling more people to combine farming with nonfarm jobs or to move off the farm into nonfarm jobs. Policy issues in these regions may center on whether Government programs should attempt to preserve the opportunity for a life-style which many people seem to prefer: combining part-time farming with a full-time non-agricultural job.

FARM FAMILY INCOME IN RURAL AREAS

Farmers historically have had lower incomes than the rest of the population. In 1975, the mean family income for nonfarm families was $15,640 compared with $13,251 for farm families. Almost 17 percent of the farm population had incomes below the poverty level in 1977, but only 11 percent of nonfarm people

lived in poverty. The poverty rate for the farm population ranged from 12 percent in the Northeast to 19 percent in the South. Farmers with large gross sales received a large share of total net income. The 6 percent of farms in 1976 with gross sales over $100,000 had almost 40 percent of all net farm income.

Thus, an area with much of its income derived from farming may have two related problems: a large number of low-income farmers and a large share of the local income concentrated in a few families.

THE FARM FAMILY AS A SOURCE OF NONFARM LABOR

Although farm employment had declined 70 percent from 1940 to 1970, total rural and small town population did not decline. Some of the drop in farm employment was offset by increases in farm-related rural jobs in businesses and activities providing farmers with goods and services. Many such businesses and activities previously did not exist or became more widespread and complex with the technological developments in agriculture. These include agricultural offices of the government, large-scale farm machinery firms, tax and computer accounting services, irrigation projects and processing equipment firms, and firms supplying commercially produced inputs of fertilizer, seeds, and pesticides. The amount of employment in such agribusinesses is difficult to measure, but it is not a major national source of nonfarm rural growth.

Other sources of employment, such as manufacturing of nonagricultural products, health and other professional services, mining, recreation and related businesses, service and trade, and other activities generated by resident commuters have been more important. One major impact of this broadening of rural employment has been the significant increase in job opportunities for rural women, farm women, particularly.

Off-farm work is important to farm households and rural communities. Multiple wage earners among farm residents and multiple-job holding among these workers are significant phenomena. Recent data indicate that approximately 900,000 people in 1977 held two or more jobs with at least one job in agriculture. The greatest proportion of these people have their principal work off the farm (75 percent). Farming, or farm labor, is the secondary job as measured by time spent in work. Although the number of people combining farming with other work has declined, it has not declined as rapidly as total agricultural employment. Today, the proportion of farm operators whose farms are secondary to nonagricultural work has increased to about 25 percent. Secondary farming is most common among factory operatives, laborers, truck drivers, and craftsmen.

Labor force participation of farm women increased from 29 to 40 percent in 1960-76. This increase went entirely into nonfarm, off-farm work, and the participation of farm women in agricultural jobs decreased from 44 to 29 percent. Thus, many more farm families are partially supported by off-farm income, even if the operator is fully employed on the farm.

The well publicized turnaround in population (movement of people into rural and smalltown communities in the seventies) has added to the increases in nonagricultural occupations. Some of the new residents are "back to the landers," but only 5 percent of the employed inmigrants to nonmetro areas between 1970 and 1975 were working in agriculture in 1975. Most of the newcomers were in professional services (23 percent), trade (21 percent), and manufacturing (18 percent).

IMPLICATIONS

The structure of agriculture and the rural community do not seem importantly related if one examines national data. Forty-two percent of nonmetro counties, containing 63 percent of the rural population, have less than 10 percent of their employment in agriculture. In these counties, trends in agriculture leave the majority of the population untouched. In the other 58 percent, declining farm numbers are likely to be of major economic significance to the local community only in the areas where not enough nonfarm jobs exist for those leaving agriculture.

It seems likely that a policy over the last 40 years which encouraged greater farm numbers would have led to less decline in small towns in the Northern Great Plains and surrounding regions. But several qualifications must be made. Much of the decline in small towns should probably be ascribed to other changes in U.S. society. Technological improvements and increased capital investment in transportation, together with the increasing complexity of our society as a whole and our increasing affluence, would likely have led to many of the changes observed.

The implications for future policy are more cloudy. If the farm population base continues to decline, leaving fewer people, policies directed at preserving farm numbers would have correspondingly less impact on rural communities. Research on the impacts of farm consolidation on rural communities tends to be on a case study basis and difficult to generalize. Little analysis has been done on the potential for influencing population through farm policy. Implications of farm policies for preserving alternative lifestyles, such as combining farm and off-farm work, are only beginning to be examined.

Relationships between farm size and impacts of business cycles on rural areas have barely been researched. Neither has research focused on the gains and losses in well-being of rural people, or the economy in general, due to declining small communities. People in these communities lose an existing social structure, but they may gain a more diverse set of social, shopping, and business opportunities. Generally, there is little evidence to determine whether encouraging smaller scale farming is a logical strategy for fostering renewed social and economic activity in rural areas.

It is easy to overestimate the importance of declining farm numbers in explaining the decline of small rural communities across the Nation. But, declining farm numbers and increasing farm size are likely to be important in the decline of some communities. Policies affecting farm structure need to be one part of a well-coordinated rural development program.

Farm Structure And the Rural Community

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INTRODUCTION

The small town's role in rural America has changed significantly since the beginning of this century. Prior to 1920, rural settlement was characterized by relatively isolated, autonomous, self-sufficient trade centers. Economic and social relations centered around nearby small towns and interaction with larger, more distant places was not routine. Most people in the open country lived most of their lives within the confines of their rural community.

Since the twenties, tremendous changes have taken place in the social and economic structure of rural America, although these changes have not been precisely the same in all parts of the country. The socioeconomic structure of rural America differs depending on regional economic base, type of agriculture, settlement history, topography, and other factors.

FACTORS RELATED TO CHANGES IN SMALL TOWNS

Two trends are of central importance: (1) changes in transportation and communication and (2) changes in the structure of agriculture. Their effect has been to alter the division of labor among cities and towns and, consequently the spatial distribution of population and activities. Two direct outcomes are noteworthy: (1) rural population decline and (2) increased economic competition between urban and rural areas. In turn, these changes have led to a loss of support for retail and service establishments in small towns and villages.

Changes in Transportation and Communication

Transportation and communications helped determine the location and function of cities and towns. Population centers are tied together through social and economic relationships which in turn are tied to transportation and communication. The availability and wide use of new transportation and communication facilities have ended isolation in many parts of rural America. The automobile, coming into general use after World War I, and complementary development of a far-flung system of all-weather roads made it possible for people in the country to expand their areas of contacts greatly.

The wider geographic circulation of city newspapers and magazines in rural areas, and the diffusion of radio and television, has brought the city world to the country resident's mailbox and living room. More and more of what people in the country know and believe comes to them from outside their own localities.

More efficient transportation and communication bring spatially separated groups together. Such changes have contributed to a redistribution of population and activities which has affected centers of all types and sizes. Metropolitan cities have expanded in size and dominance. Intermediate-sized places—those with 10,000 or more residents outside of large cities—have come under the control of the central city, but in turn, have become centers of shopping, services, and economic opportunity for surrounding rural areas and small towns. Small towns continue to be trade and service centers for a surrounding agricultural area, but the range of their market and the size and number of their functions have changed. Improved transportation allows rural people a wider choice of places to shop for goods and services. Moreover, the demand for goods and services has become more specialized so that their satisfaction is often beyond the scope of a single town.

Modernization of transportation and communication, along with a generally increased

living standard in rural America and changes in the structure of agriculture, have led to notable changes in the variety of economic activities in small trade centers and in the shopping habits of rural people.

With the wider range of movement afforded by the automobile, people in rural areas are no longer required to shop at neighborhood stores or at the nearest centers. Many travel to more remote but larger centers—particularly to obtain such items as dress clothing and furniture or specialized medical services. Thus, specialization of centers has developed, since every town cannot try to offer all kinds of services.

Some small trade centers have become like the neighborhood store in large cities. People use them to pick up small items to avoid traveling long distances, but they make major purchases elsewhere. Moreover, the functions of small towns have become increasingly residential, as evidenced from business and population trends. From 1950 to 1970, nonmetropolitan towns of less than 2,500 people had an average decline of nearly one-third in the number of consumer business establishments. Yet these same places increased in population by an average of one-ninth. Thus, residential functions of small towns have taken a contrary overall course from their business functions.

Changes in the Structure of Agriculture

Mechanization of farming and the resultant migration of farm people to the cities reduced the population of hundreds of counties in the United States. From 1940 to 1970, about 900 of the Nation's 3,100 counties dropped in population in each successive decade. The vast majority declined because the loss of farms was not offset by other forms of employment. In about 400 counties, the maximum population was reached as early as 1900 because they were oversettled to begin with, or deteriorating productivity induced loss of farm people even before the advent of the tractor.

In the Great Plains and Western Corn Belt regions, stretching over about 700,000 square miles from Iowa to Montana and from North Dakota to Texas, the total rural population (farm and nonfarm) fell 27 percent in 1940-70. In the old Cotton Belt of the coastal southern plain, from South Carolina to east Texas, rural population fell by 36 percent during the same period. These declines resulted almost entirely from the drop in labor requirements in counties heavily dependent on farming that lacked compensating increases in nonagricultural activity.

At the same time, rural population was increasing steadily in the Southern Piedmont textile belt, the industrialized and suburbanizing rural areas of the lower Great Lakes region and the Northeastern Coast, the Florida Peninsula recreation and retirement communities, and areas of the Far West and Southwest. As a result, the distribution of rural people shifted. The national level of rural population changed little, for the regional changes were compensating. But, in the agricultural regions, hundreds of towns declined in population, hundreds of thousands of former farm homes were demolished or abandoned, and many businesses closed. The volume of agricultural output grew, but the proportion of rural people engaged in agriculture fell.

As late as 1940, farm residents comprised more than half of all rural people. Today, after years of farm population loss and diversification of rural nonfarm life, farm people make up only 15 percent of the total rural population. Even in the open country, most families no longer reside on farms or work in agriculture. But one must remember that there are wide regional variations in this national average. There are still counties in the Great Plains where a majority of people are farm people. Yet other areas, such as the heart of the Southern Appalachian coalfields, are classically rural but have almost no agriculture.

How are small towns affected by changes in the structure of agriculture? The technological advances most basic to changes in rural life are those which increase the productivity of the land (substitution of capital for land) and mechanization (substitution of capital for labor).

Shrinking farm numbers and fewer people employed in farming result.

One effect of these two changes is less support for businesses offering goods and services in small towns—an outcome similar to that associated with changes in transportation. Small towns become less viable centers of farm inputs and marketing. Consolidated farms, for example, bypass local machinery dealers for whatever new machinery is needed if the dealers cannot repair heavy and complicated machinery and do not stock all kinds and sizes of hydraulic cyclinders, electrical parts, and roller chains. Consolidation and improved equipment means dealers will be called upon for a wider array of specialized services and technical information.

Not only machinery dealers are affected. Sales of fertilizer will climb since the large farmer can afford it and knows how to make it pay. A study in southwestern Iowa in 1956 found that the average farmer who left the farm had spent only $30 for fertilizer. Farmers who took over were spending $308 and planned to spend $401 when they got extra land. The consolidated farmer not only buys more fertilizer per acre than his predecessor, but purchases a more specific fertilizer mix with additives. Again, the technical information needed for such an operation may be beyond the competence of the local dealer. Consequently, consolidated farmers often purchase such inputs at larger towns some distance away where soils technicians and manufacturers' troubleshooters are available.

Similar changes have been reported in farm marketing. Many small towns in the Plains and Corn Belt have retained their own grain elevators, but farmers tend to market poultry, eggs, milk, hogs, and beef cattle in larger farm service centers. This transfer of agricultural economic activity from smaller rural towns to larger ones is consistent with the shifts that have taken place in business and commercial activity.

Declining population produces changes in the organizational structures and institutional patterns of daily life. Population increases are usually accompanied by institutional and organization adjustments. The local hardware and grocery store merge, churches merge, schools consolidate.

The larger region, of which the declining community is a part, typically is undergoing a simultaneous process of increased differentiation. The functions and services once provided in the small town or village (the declining community) are now available on a more specialized basis in a larger regional setting. Larger rural centers have emerged as the providers of specialized economic services for a surrounding rural population. They are an intermediate link in the economic chain between the metropolitan city and the countryside. Indeed, many services previously available in the metropolis alone are now present in larger rural places.

The type of farm organization in a region appears to have important implications for the vitality of the region's small trade centers. Goldschmidt's studies in the San Joaquin Valley in 1945, replicated by Peterson for the California Community Services Task Force in 1977, have demonstrated that the scale of farming is related to trade center growth and change.

The two communities studied, Arvin in Kern County and Dinuba in Tulare County, were selected because of their similarity in size and social and economic characteristics, and their differences in pattern of farm size. Arvin was surrounded by larger farms and Dinuba was surrounded by smaller farms. While the farm size pattern persists, the communities have changed significantly since 1945. Dinuba's population has consistently increased over 30 years at a rate ranging from 9 to 33 percent. Arvin has fluctuated from a rapid growth rate of 60 percent in 1945-50, to an absolute decline of 220 persons in 1960-70. Dinuba had a 16 percent greater population in 1945 (3,750 compared to 3,139) and by 1975 had increased 30 percent (8,590 compared to 6,013).

- In 1976, the small-farm community had 2.5 times the number of independent business outlets found in the large-farm community—about the same ratio as in 1945.
- Retail trade volume in 1945 was 61 percent greater in the small-farm community, and 70 percent greater in 1976.

- The number of physical facilities and public services remains greater in the small-farm community. As in 1945, there are more schools in the small-farm community than in the large-farm community—four elementary schools to two, one junior high school to none, and one high school in each. The small-farm community provided more park facilities for its citizens; five to two, and eight playgrounds to none.
- The small-farm community has more than four times the number of social and civic organizations found in the large-farm community.
- The community with small farms continues to have twice as many churches as the large-farm community.
- Local decisionmaking was and is more accountable and unified in the small-farm community. In contrast, decisions in the large-farm community are made in fragmented confusion because of the proliferation of special districts.
- The large-farm community has become more dependent on outside sources of funding, in part because of the eroded local tax base, while the small-farm community has remained relatively self-sufficient.

The findings of these two studies are generally supported by the few studies that have investigated similar issues, but there is no evidence that they can be generalized to other areas.

TRENDS SINCE 1970

Reliable figures on the population of towns are obtained only every 10 years in the census of population. Current data indicative of population change are not available for towns in the same manner as for counties. However, for larger nonmetro places, the U.S. Bureau of the Census prepares estimates that give a reasonable picture of post-1970 trends. Nonmetro places of 10,000 or more people in April 1970 grew by an average of 2.6 percent in 1970-73, based on current metro-nonmetro definitions. Yet the rest of the nonmetro population—in places of fewer than 10,000 people and in the open country—grew an average 4.9 percent. Thus, the decentralization and dispersal of the nonmetro population into smaller places and open country foreshadowed in the 1960-70 data have continued to the point that major nonmetro urban centers are no longer increasing in population faster than the rest of the nonmetro sector. This is contrary to the pattern of earlier decades.

There is a growing analogy between the patterns of change in nonmetro cities and metro areas. As with their metro counterparts, nonmetro cities of 10,000 or more people continue to serve as primary employment, trade, and service centers for their hinterlands. However, residential population increase within these areas has declined from its former rate, while smaller places and open-country areas as a class show renewed population increase whether they are satellites to the larger towns or are independent of them.

Changes in the structure of agriculture and in transportation and communications have no considerable effect on the renewed growth of small towns. The greatest changes in farm technology and organization and in transportation have already occurred, and small towns and villages have adapted accordingly. However, the current energy situation may interject new uncertainty into the prosperity of small towns and necessitate adaption to changes in the price and availability of passenger and commodity transport.

The reasons for renewed population growth in small towns and rural areas are complex, but three interrelated factors appear to be at the root: (1) decentralization of nonfarm wage and salary employment from metro to nonmetro counties, (2) a preference for rural living, and (3) modernization of rural life, which makes inappropriate the stereotype of rural areas as backward and isolated.

Small towns and villages are less affected by farm issues and policies than in the past, yet they are an integral part of the Department of Agriculture's clientele for rural programs in the fields of housing, conservation, community facilities, electric power, and business credit. The national and regional dominance of nonfarm people in the total rural and small town

population is expected to grow, although the major part of the demographic exodus from farms is finished.

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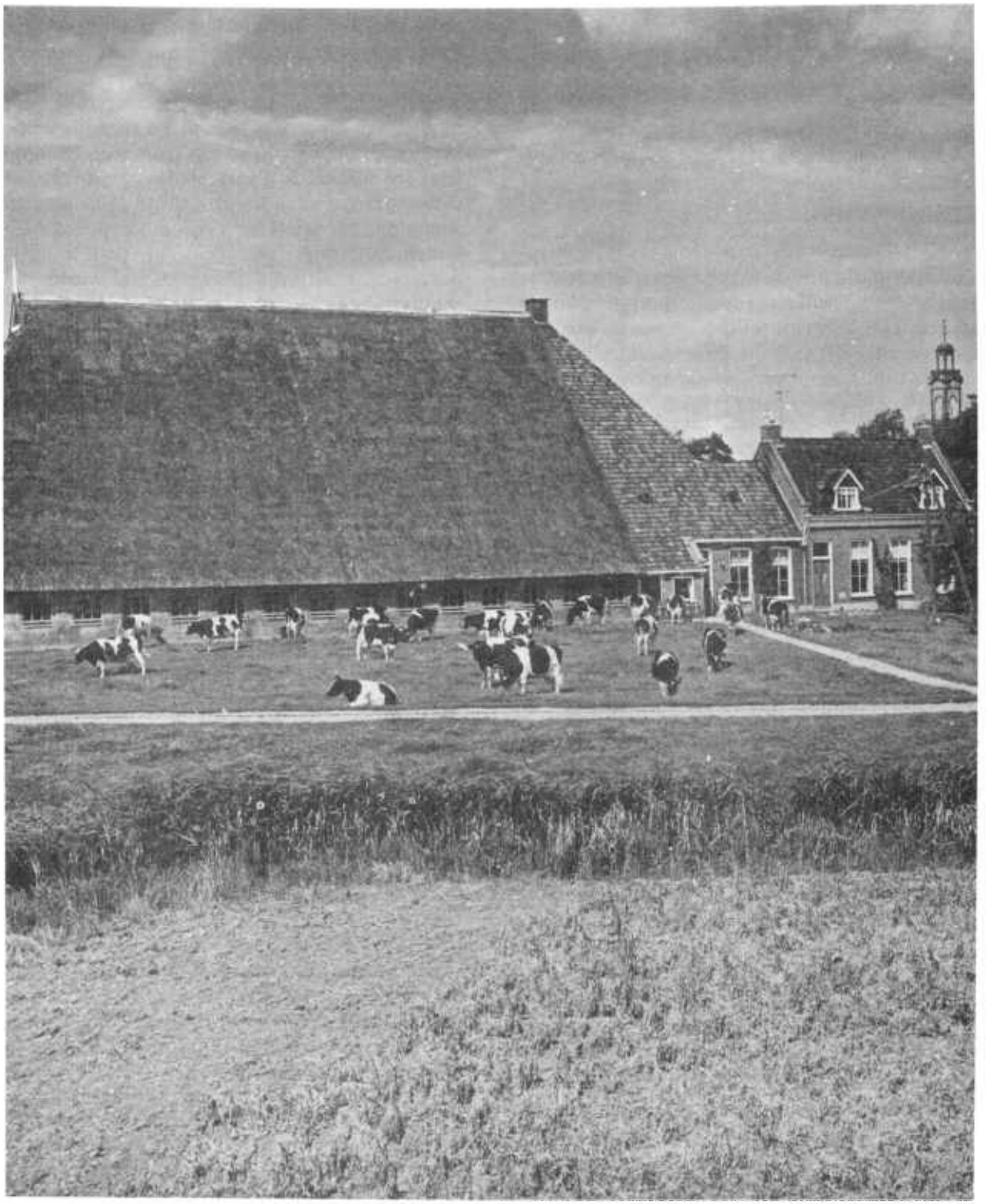
The Experience of Others



Farm Structure Policy In Other Countries

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INTRODUCTION

Studying the policy experience of other developed countries will not provide prescriptions for issues in U.S. farm structure. However, this analysis, which traces the direct and indirect impacts that policy instruments in other developed countries have had on farm structure, can be instructive. We may understand better the highly integrated nature of farm price, income, and structure policies and a range of structural policy tools that may be applicable to U.S. farm structure issues.

Each of the countries included in this survey has identified desired farm structure objectives and instituted programs to achieve these objectives. Changes in farm structure result not only from specific structural policies but also from the accommodation of the agricultural sector to prevailing economic, political, and cultural forces.

THE EUROPEAN COMMUNITY

Agricultural price policy in the nine-member countries of the European Community (EC),[1] embodied in the Common Agricultural Policy (CAP), has provided considerable support for farm incomes and protected EC farmers from price variability in international commodity markets. CAP is a complex system of market price supports, import protection measures, and export subsidies established in the early sixties. It now covers more than 90 percent of total EC agricultural output.

[1] France, Belgium, Luxembourg, Netherlands, Germany, Italy, United Kingdom, Ireland, and Denmark.

CAP has three key elements: a basic *target price* established in advance of the crop year, which serves as a guide for producers in planning future plantings; a guaranteed *intervention price*, which sets a floor on prices received for commodities covered by CAP; and a *threshold price* applied to imports. Imports from non-EC countries are subject to a variable levy that equals the difference between the threshold price and the world market price for a commodity. Subsidies, known as export restitutions, are paid to exporters when internal prices exceed world market prices.

CAP has contributed to the high degree of self-sufficiency in many EC commodity sectors and to embarrassing and costly surpluses in others, notably dairying. CAP provides protection from international competition and it has slowed the process of adjustment in such commodity sectors as grain and dairy. Implementation of CAP has proved costly. Expenditures on agriculture under the guidance and guarantee section of the CAP reached $9 billion in 1977. Expenditures under CAP have also fueled food price inflation throughout the European Community. There has been little empirical work on the relationship between the EC's price policy and the farm structure in the member countries. On balance, however, CAP has slowed agricultural adjustment, particularly in the six original member countries.

EC Farm Structure Policy

EC farm structure policy is designed to facilitate the adjustment process seemingly thwarted by CAP price policies. As with CAP, farm structure policy is set by the EC but implemented by member countries. Two related themes dominate EC structure policy: farmland consolidation and the welfare of older farmers. These two themes help integrate the agricultural sector into the general economy through the development of viable farming units. A viable farming unit is defined as one which after 6 years of modernization will provide farmers with incomes comparable to nonfarm incomes in the same region.

Farms that appear viable are granted selective aid, including consideration in the reallocation of land, interest rebates or investment credits, and loan guarantees. The fragmented landholdings which have resulted from European inheritance laws are the target of EC efforts to foster agricultural land consolidation and larger, more viable production units.

In the EC member countries, farm structure and social policies are linked closely. EC structure policy provides incentives for older farmers to leave agriculture and transfer their land either through sale or long-term lease to other farmers who are modernizing and enlarging their farms. Farmers between 55 and 65 are granted an annual allowance until they reach retirement age. Member countries may pay additional grants based on the agricultural area released by the retiring farmers.

Expenditures on structural programs (including the directive on hill farming) are well below those under CAP, yet at $104 million are substantial (table 1).

Directive on Hill Farming

The price support provisions of CAP and the EC farm structure programs accomplished little in economically lagging, resource-poor regions. As a result, the commission issued a directive in 1974 on hill farming. Under the directive, inefficient farms in poorer regions are preserved to maintain minimum population and income levels and the economic and social structure of the region.

Table 1—Country expenditures on agriculture and farm structure (U.S. dollars)

Country	Program	Year	Expenditure on programs	Total State budget	Agricultural share of budget	GDP	Contribution of agriculture to GDP	Agriculture as a proportion of GNP
			Million	*Billion*	*Million*	*— — — Billion — — —*		*Percent*
Japan	Agricultural Foundation	1978	4,250	182.93	16,410	982.00	1.10	0.1
Norway	Agricultural Development Fund	1976	32	8.90	340	32.94	1.27	4.0
Sweden	Land Fund, agricultural rationalization	1978	17	35.61	1,390	100.34	3.63	3.6
Australia	Rural Reconstruction	1978	50	30.82	220	103.85	4.66	4.5
	Foregone tax revenue	1978	6					
Austria	Structural measures	1978	50	16.56	100	59.13	2.70	4.5
France	FASASA	1976	3,600	50.26	7,300	386.65	18.45	4.7
	SAFER	1976	229					
Canada	Saskatchewan Land Bank	1976	[1]38	[3]45.61	1,020	194.60	7.19	3.6
	British Columbia farm income assurance program	1976	[2]89					
EC-9	Directive on modernization, retirement from farming, hill farming, and socio-economic guidance	1977	104,000	N.A.	[4]134,940	N.A.	N.A.	N.A.

N.A. = not available.

[1] Provincial program.
[2] Provincial expenditures between November 1963 and September 1977.
[3] 1977 figure for budget allocation to the Federal Department of Agriculture.
[4] Common guidance and guarantee measures of CAP.

Sources: Ministry of Agriculture, Forestry and Fisheries, Statistics and Information Department, *Statistical Yearbook of the Ministry of Agriculture;* Forestry and Fisheries, Japan, 1977-78, The Budget of the Ministry of Agriculture, Forestry and Fisheries, Japan 1978-79; Nordic Council and the Nordic Statistical Secretariat, *Yearbook of Nordic Statistics 1978,* Copenhagen, 1979; Central Bureau of Statistics, *Statistical Yearbook, 1977,* Oslo, Norway, 1978; Embassy of Sweden, Washington, D.C., private communication with the Agricultural Attache; OECD, *National Accounts, 1976;* Treasurer of the Commonwealth of Australia, *Budget Speech 1978-79 and Statements,* Canberra, 1978; Institut National de la Statistique et des Etudes Economiques, *Annuaire Statistique de la France,* 1977, Paris, France; Embassy of Canada, Washington, D.C., private communication; The European Community, *The Agricultural Situation in the Community,* 1978 Report, Brussels, Jan. 1979.

The hill farming directive, a program of regional development, pays income supplements to farmers in poor regions. The directive provides for member states to grant compensatory allowances to farmers with at least 3 hectares of utilized agricultural area who intend to farm the area for 5 years. The allowance is calculated by the member state based on livestock kept or area farmed.

The agricultural areas affected by the directive are mainly mountain areas, less-favored areas with rapid outmigration, and areas with natural handicaps, such as islands. These areas represent about 25 percent of the Community's agricultural area and account for about 10 percent of agricultural production.

Italy is the major beneficiary of the programs initiated under the hill farming directive; aid also goes to Ireland and parts of southern France. In 1977, EC expenditures under this directive amounted to $80 million, well over half of EC expenditure on structural measures.

FRANCE

Farm structure in France has evolved considerably since the establishment of CAP. Yet numerous small, fragmented farm units and many farmers over 50 years of age characterize farming in France. Farm size has been increasing. In 1960, 840,100 holdings or 47.4 percent of French farms were less than 10 hectares, and only 97,800 or 5.5 percent were over 50 hectares (table 2). By 1976, the number of farms under 10 hectares had dropped to 415,000 and accounted for 35.3 percent of all farms, while the number of farms over 50 hectares rose to 141,000—about 12 percent of the total. Average farm size increased from 17.0 to 25.1 hectares during 1960-76.

More younger farmers have been entering agriculture in France as older farmers leave. The number of farmers aged 15-29 grew 15,000 in 1962-75, 20 percent. In 1962, 542,119 farmers were over the age of 60, accounting for 33.5 percent of all farmers. By 1975, the number had dropped to 222,750, or 19.4 percent of all farmers (table 3). Part-time farming is not as widespread in France as in several other European countries. In 1976, 16.8 percent of all farmers had part-time, nonfarm employment.

Price and Income Policies

French agricultural price policies (target prices, intervention prices, subsidies, and levies) are determined by CAP. The French Govern-

Table 2—France: Indicators of farm structure, selected years

Year	Farms[1]	Average size of farms	Size distribution of farms[2]			Population		Full-time farmers	Part-time farmers		
			1-9 hectares	10-50 hectares	Over 50 hectares	Total population	Total farm population		Total	Part-time employment secondary	Part-time employment primary
	Thousands	*Hectares*	*Thousands*								
1960	1,773.5	17.0	840.1	835.6	97.8	45,684	10,096	N.A.	N.A.	N.A.	N.A.
1967	1,575.9	19.1	681.8	785.0	109.1	49,548	[3] 7,964	1,684.9	313.4	249.8	63.6
1970	1,420.9	21.0	576.1	724.4	120.4	50,770	6,961	1,586.9	352.3	262.6	89.7
1975	1,209.0	24.3	433.0	636.0	140.0	52,786	5,764	1,329.7	268.6	208.5	60.1
1976	1,174.0	25.1	415.0	618.0	141.0	52,915	5,530	N.A.	N.A.	N.A.	N.A.

N.A. = Not available.

[1] Holdings over 1 hectare.
[2] Agricultural area.
[3] Extrapolated from data for 1965.

Sources: Eurostat, *Agricultural Structure*, 1950-1976; Eurostat; *Agricultural Statistics*, 1977; FAO, *Production Yearbook*, selected years; Ministre de l'Agriculture, *Enquete Communautaire sur les Structures des Exploitations Agricoles en 1985*, Collections de Statistique Agricole, Etude No. 170, Jan. 1979.

ment also carries out national programs to support farm income. "Exceptional aids" for agriculture include premiums to dairy and hog producers, direct payments to small farmers, and drought payments as in 1976 and 1977. Government subsidies include incentives to encourage beef production and wine storage, allowances for low-interest loans to young farmers, and crop insurance programs. Government subsidies for agriculture in 1977 amounted to $924 million, around 7 percent of farmers' gross income.

Farm Structure Policy

French farm structure policy predates EC policy and emphasizes the consolidation of fragmented farm units through the redistribution of land made available by farmers participating in retirement incentive programs. These programs are guaranteed by the Social Fund for Improvement of Farm Structure (FASASA) which also supports a retraining program for young farmers who want to leave agriculture. In 1975, fund expenditures amounted to $3.5 billion, approximately 50 percent of national expenditures on agriculture (table 1).

SAFER Organizations

The redistribution of land is facilitated also by the Sociétés d'Amenagement Foncier et d'Etablissement Rural (SAFER) which are jointly operated by the French Government and farm organizations. SAFER's function is to consolidate landholdings for promising small farmers. The SAFER buy farmland, make necessary improvements (which are subsidized by the Government), and redistribute the land. The individual to whom the land is sold is selected based on criteria which include the size and capital resource base of his farm. Impending sales are reported to the SAFER, and they have the legal right to preempt sales to avoid transfer of land which may obstruct structural improvements. To prevent the Government from becoming a landowner, the SAFER may hold land for a maximum of 5 years.

Table 3—France: Farm operators by age, selected years

Year	15-29 years	30-59 years	60 years and over
		Number	
1962	68,384	1,006,156	542,119
1968	48,899	871,884	436,863
1975	[1] 82,005	842,055	222,750

[1] Age category for 1975, 17-29 years.

Source: Institut National de la Statistique et des Etudes Economiques, *Annuaire Statistique de la France*, 1977 and 1973.

NORWAY

In 1960, almost 90 percent of all Norweigan farms were less than 10 hectares, and over 30 percent were less than 2 hectares. By 1977, these percentages had dropped to 76.5 and 15.5 percent, respectively. During 1960-77, average farm size grew from 5 to 8 hectares. The current average farm size is around 10 hectares (table 4). Evidence suggests that Norwegian policies have encouraged the enlargement of farm size and discouraged excessive fragmentation. Larger farms and regional development are encouraged through a system of efficiency norms established for farm size and different levels of technology. Special income programs are used to assist the rural poor.

Farm Income Support Policy

Norwegian farm policy relies on deficiency payments to support farmers' incomes. Payments are distributed based on a graduated point system according to criteria which include farm location and size, with the smallest, more remote farms receiving the largest payments. Farmers who receive 50 percent or more of their income from farming receive the full payment. No payments are made to farmers who earn less than 20 percent of their income from farming.

Farm Structure Policies

Norway has an explicit set of policies for ownership, transfer, and management of farmland to keep it in agricultural production. These policies are incorporated in three significant pieces of land legislation.

The Land Act, the legal basis for the protection of farmland, requires arable land to be used in agricultural production in accordance with normal farm management practices. In cases of mismanagement, farmers may be compelled to lease their land to others. In exceptional cases, the State can expropriate property it deems seriously mismanaged.

The Concession Act requires that a buyer of farmland have the professional qualifications for operating a farm to be eligible to buy farmland. The buyer must take up residence on the farm and operate it for at least 5 years. The farm must also have the potential for providing sufficient income to support the farm family, either as the sole source or in combination with other income.

Under the Concession Act, the State can preempt sales of farm real estate. Preemption is usually applied to establish larger farms, but may be used to establish smaller farms. When preemption is applied, the State assumes the obligation of the buyer. When the price exceeds the value of the property in normal agricultural use, however, expropriation may be applied. In such cases, the price is determined by an impartial appraisal in accordance with the value of the property in agricultural use.

The Allodial Act gives priority to the eldest child to assume ownership of the undivided farm. Furthermore, relatives are given the right of preemption of farm property, provided it has been in the possession of the owner or his de-

Table 4—Norway: Indicators of farm structure, selected years

Year	Farms	Average size[1]	Size of farms (hectares)[1]					Total population	Agricultural population
			0.5-2.0	2-5	5-10	10-20	Over 20		
	Number	*Hectares*	*Number*					*Thousands*	
1959	198,315	5.10	60,303	75,527	42,126	15,074	5,285	[2]3,581	[2]674
1969	154,977	6.16	33,314	55,167	42,240	17,938	6,318	3,784	[3]476
1975	117,616	7.37	19,351	38,433	34,050	18,806	6,976	4,007	384
1976	114,044	7.59	17,754	36,553	33,456	18,949	7,332	4,027	370
1977	113,120	7.68	17,522	35,720	33,350	19,100	7,428	4,044	357

Year	Tenure			Age of farmers[4]			Full-time farmers[5]	Part-time farmers[5]		
	Owner	Tenant	Other, rented	Under 40 years	40-59 years	60 years and over		Total	Part-time employment secondary	Part-time employment primary
				Number						
1959	181,611	15,510	1,194	32,937	101,192	50,729	70,131	127,401	48,787	78,614
1969	140,799	13,761	417	21,023	74,912	48,599	51,186	103,307	31,884	71,423
1972	N.A.	N.A.	N.A.	17,327	61,574	41,490	43,852	83,770	27,481	56,289
1976	N.A.	N.A.	N.A.	19,637	52,385	35,372	37,727	75,896	22,695	53,201

N.A. = Not available.

[1] Agricultural area.
[2] 1960 figure.
[3] Extrapolated from data for 1965.
[4] Number of male holders only.
[5] Holdings with 0.5 hectare of agricultural area or over.

Sources: Central Bureau of Statistics of Norway, *Agricultural Statistics*, 1977, Oslo, Norway; Central Bureau of Statistics of Norway, *Historical Statistics*, 1978, Oslo, Norway; Central Bureau of Statistics of Norway, *Statistical Yearbook*, 1978 and 1977, Oslo, Norway; FAO *Production Yearbook*, selected years.

scendants for at least 20 years. In case of inheritance or other forms of transfer within the family, the act gives the person who holds first priority the right to take over the undivided farm. As about 90 percent of all transfers take place between close relatives, the act has limited the fragmentation of Norwegian farms.

An important element of Norwegian farm policy is an investment support program which complements national objectives concerning landownership and farm enlargement. The Government extends grants for purchasing land, building farm facilities, and developing new lands. Interest rates on loans extended through the State Bank are kept below commercial rates for certain investments such as land transfers.

Food and Nutrition Policy

The Norwegian Parliament has recently established a comprehensive food and nutrition policy, scheduled to be implemented fully by 1990, which promises to have a profound influence on Norwegian farm structure. The policy establishes standards for a nutritious diet and, consequently, the kind of agricultural products to be produced. The chief policy instrument for encouraging consumption of domestically produced food is the consumer subsidy on retail food prices, which has proven effective in altering food-buying habits. Accordingly, subsidies will be used to increase the consumption of skimmed milk, poultry, beef, and mutton.

An innovative aspect of the new policy is the "efficiency norm." An income target is set based on a uniform labor input of 1.6 man-years for a model dairy farm with a specific number of animals. The norms are more lenient in less developed regions. The efficiency norm scheme allows farm prices to be adjusted, enabling small farms in disadvantaged regions to receive income based on a comparable labor input for fewer animals.

The proposed food and nutrition policies do not replace but complement the more traditional Norwegian farm structure programs. Large farms and regional development will be encouraged and special income programs will continue to assist the rural poor.

SWEDEN

The contribution of the agricultural sector to the Swedish Gross Domestic Product in 1978 was 3.6 percent. The share of Government expenditures allocated for farm programs was 3.9 percent. Also in 1978, $136 million was allocated to the Swedish Land Fund, established exclusively for agricultural development. Sweden had 44,600 farmers, or 31.8 percent, over the age of 60 in 1975 (table 5). The percentage of farmers working part time increased from 47 percent of all farmers in 1961 to 89 percent in 1971. In 1961, 61 percent of all farms were under 10 hectares; by 1977, they accounted for only 41 percent of the total.

Farm Price and Income Policy

Sweden provides an historical example of how shifts in agricultural policy can affect farm structure. The farm income policies of the early sixties sought to improve income parity between farm and urban workers. The government relied on intricate producer price indexes and income adjustment plans.

By 1967, however, several economic developments resulted in a fundamental shift in Swedish farm programs. Low world food prices, the high cost of supporting marginal farms, the growing surplus of milk, and an expanding industrial sector competing with the heavily subsidized farm sector for the same resources, persuaded policymakers to reverse the farm program of the sixties.

The 1967 legislation's guidelines for decreasing production encouraged a reduction in marginally productive farms in remote areas. Acreage subsidies for small (8-10 hectares) farms and certain milk subsidy schemes were replaced by a system of transition support. Under this program, temporary financing was provided to encourage farmers either to retire completely from farming or to change to nonfarm employment.

In practice, the transition support scheme had little impact on structure. The policy did succeed in reducing agricultural production of some surplus commodities, especially in the dairy sector. Milk production, which amounted to 3.2 million kilograms in 1967, dropped to 2.8 million by 1970.

Swedish income and price policies were reversed in 1974 as a result of an emerging sensitivity toward agriculture, national food self-sufficiency, and the rural environment. The new farm program was designed to increase farm output, particularly in the dairy sector, with special supplementary payments to small farmers holding 12 cows or fewer.

Farm Structure Policies

Explicit structural reform measures are important in Sweden's farm policy. Farm structure policies are designed to promote "farm rationalization," the development of profitable farm enterprises that use modern techniques efficiently. Agricultural policy no longer addresses the issue of maintaining the family farm specifically. Swedish structural policy emphasizes instead enterprise specialization and farm enlargement, independent of type of enterprise. The Government supports its rationalization program by advisory services, economic aid, and purchasing and selling farm real estate.

The National Board of Agriculture of the Ministry of Agriculture is responsible for the administration and implementation of farm structure policies. The Board supervises and coordinates the work of the 24 County Agricultural Boards (CAB) which implement farm rationalization and advisory services locally.

The most important aspect of Swedish structural policy concerns government involvement in the market for farmland. The Land Acquisition

Table 5—Sweden: Indicators of farm structure, selected years

Year	Farms	Size of farms (hectares)			Total population	Farm population	Tenure		
		2-10	10-50	Over 50			Fully owned	Fully held on lease	Partly owned
	Number	*Number*			*Thousands*		*Number*		
1961	232,920	141,652	83,672	7,596	[1] 7,480	[1] 1,051	160,471	30,727	41,722
1966	186,267	102,326	75,418	8,523	7,808	[2] 906	121,938	22,122	42,207
1968	171,902	87,595	74,774	9,533	7,918	[2] 815	106,061	21,921	43,920
1970	155,364	73,539	71,354	10,471	8,043	746	90,000	19,880	45,484
1975	131,949	55,241	64,553	12,155	8,196	595	69,342	18,776	43,831
1976	130,955	55,125	63,436	12,393	8,219	569	68,683	18,652	43,620
1977	126,918	51,785	62,487	12,640	8,255	545	N.A.	N.A.	N.A.

Year	Age of farmers			Off-farm work			
	Under 30 years	30-59 years	60 years and over	0 workdays	1-50 workdays	51-150 workdays	Over 150 workdays
				Number			
1961	N.A.	N.A.	N.A.	152,400	15,700	26,900	29,100
1966	N.A.	N.A.	N.A.	117,800	10,700	23,200	26,800
1968	6,947	117,401	54,984	N.A.	N.A.	N.A.	N.A.
1970	6,381	104,935	51,612	N.A.	N.A.	N.A.	N.A.
1971	N.A.	N.A.	N.A.	77,800	21,600	15,300	33,000
1975	7,680	87,880	44,600	N.A.	N.A.	N.A.	N.A.

N.A. = Not available.

[1] 1960 figure.
[2] Extrapolated from data for 1965.

Source: Statistiska Centralbyran, *Jordbruksstatistik Arsbok,* Stockholm, selected issues.

Act of 1965 established the legal basis for Government real estate dealings. The principal purpose of the act was to create efficient holdings and prevent land acquisitions which would obstruct rationalization. Under the act, the purchaser must apply to the CAB for permission to buy unless the seller is a relative. As a rule, a farmer promising to farm the land will be granted permission to buy an existing farm or additional crop or forest land. The act prevents speculative purchases and provides for the preemption of land needed for urban development. The CAB can refuse permission to acquire farm real estate if it is found that the property is better suited to another farm. If it refuses to allow the acquisition, the CAB is normally obliged to take over the property at the price agreed upon by the buyer and seller.

An important tool for the implementation of farm structure policies, the Land Fund, finances the CAB's participation in the farm real estate market. Funds used arise from sales of property held by the Boards and from Government transfers. The Board does not hold acquired land for periods longer than is required for structural reallocation. On average, cropland has remained in possession of the Board for about 2 years and forest land for about 3 years.

Readjustment Allowances

As part of its general labor market policy, Sweden provides readjustment allowances to farmers between 60 and 66 years old on the condition that they give up their employment in agriculture. The support is intended as a protection until they find a new job. These readjustment allowances also contribute to the reallocation of land to larger units and make land available to younger farmers. The allowances amount to a maximum of about $167 (1974) a month. To qualify for support, an applicant must have farmed as a main occupation at least 24 of the 36 months preceding the time of application.

Regional Development

Several programs have been established to slow the depopulation of certain regions. Farmers in northern Sweden, for example, receive the country's largest farm price subsidies. State guarantees are given for regional investment in land, buildings, and animals. Grants amounting to 40 percent of investment costs are also provided by the State for land improvement.

JAPAN

Japan, a heavily populated country, has little arable land. Except for some fruits and vegetables, the country has little comparative advantage in producing agricultural products. Domestic agriculture is protected from foreign competition and heavily supported by producer subsidies and support payments.

Japan is characterized by many small owner-operated farms, a large proportion of which are run by part-time farmers (table 6). The number of young farmers has declined sharply in recent years (table 7). In 1975, there were 3.5 million farms under 1 hectare in size, 70 percent of all farms. Only 160,200, or 3.2 percent, had a land area greater than 3 hectares. While the number of farm households decreased from 6.1 million in 1960 to 5 million in 1975, average farm size increased from 1 hectare to 1.12 hectares during those years. About 84 percent of farms in 1975 were owner-operated while only 55,584, or 1.1 percent, were tenant-operated. In 1975, 4.3 million farmers, or 87 percent of all farmers, worked part time off the farm, up considerably from the 66 percent who worked part time in 1960.

The number of farm operators 16 to 29 years old declined sharply from 1.5 million in 1965 to 395,500 in 1977. Thus, while farmers under 29 years of age comprised 14.7 percent of all farmers in 1965, their numbers had declined to 8.4 percent by 1977.

In 1978, about one-tenth of 1 percent of the Japanese Gross Domestic Product was derived from its agricultural sector. The total budget for the Ministry of Agriculture, Forestry, and Fisheries was $16.41 billion, or 9 percent of the total national budget (table 1).

Table 6—Japan: Indicators of farm structure, selected years

Year	Farms[1]	Size of farms (hectares)					Total population	Total farm population
		Less than 1	1-2	2-3	Over 3	Other[2]		
	Number	*Thousands*						
1960	6,056.6	4,224.8	1,430.5	232.6	151.2	17.6	93,419.0	34,411.0
1965	5,664.8	3,893.4	1,371.0	238.2	150.1	12.2	98,275.0	30,083.0
1970	5,341.8	3,626.0	1,285.6	255.7	161.4	13.3	103,720.0	26,282.0
1975	4,953.1	3,447.1	1,087.5	246.9	160.2	11.5	111,937.0	23,197.0

Year	Full-time farm	Part-time farms			Tenure of farms[3]				
		Total	Part-time employment secondary	Part-time employment primary	Owner	Owner tenant	Tenant owner	Tenant	Other[2]
	Thousands								
1960	2,078.1	3,978.5	2,036.3	1,942.3	4,552.4	1,089.6	219.0	178.0	17.6
1965	1,218.7	4,446.0	2,080.7	2,365.4	4,538.5	857.2	157.0	100.0	12.1
1970	831.4	4,510.5	1,801.8	2,708.7	4,241.4	851.8	150.1	85.2	13.3
1975	616.4	4,336.6	1,258.7	3,077.9	4,160.3	605.6	120.1	55.6	11.5

[1] Refers to households with cultivated land of 2 or more hectares in some districts and 4 or more in others.

[2] "Other" refers to farms of less than minimal size which have total sales of farm products greater than a specified level (20,000 yen in 1960; 30,000 in 1965; 50,000 in 1970).

[3] Tenure of farm households is based on the ratio of cultivated land owned to total operating cultivated land as follows: "Owner," 90 percent or more of cultivated land owned; "owner-tenant," 50-89 percent owned; "tenant-owner," 10-49 percent owned; and "tenant," less than 10 percent owned.

Source: Office of the Prime Minister, *Japan Statistical Yearbook,* 1977.

Farm Income and Price Policies

The use of the rice price subsidy as the Japanese Government's principal agricultural policy instrument illustrates the impact of nonstructural policies on farm structure. A rice price subsidy scheme was introduced in the early sixties to increase farm income and reduce the gap between farm and nonfarm income. While the rice price subsidy increased farmers' incomes, it also encouraged some undesirable structural developments. The subsidies have enabled farmers on extremely small holdings to earn incomes comparable to those of urban wage earners through intensifying production and improving yields. While farm plots have remained small, rice production has increased and enormous rice surpluses have been generated. The subsidy program has become a burdensome expense for the Government.

Since 1967, the Government has experimented with policies to correct the imbalances caused by the rice price subsidies. Although it has not been feasible to withdraw subsidies from politically powerful rice producers, the Government is attempting to improve the wheat-rice price ratio to make wheat production an attractive alternative. In addition, payments are made for land area diverted from rice production.

Farm Structure Policy

Japan's farm structure policy objectives include (1) enlargement of farm size, (2) retraining of farmers for employment in other industries, and (3) improvement of farmers' living conditions and welfare. Farm price policy has slowed structural change, however, and farm enlargement has been slow. Part-time farming on the other hand, has been increasing.

A 10-year program was implemented in 1969 which emphasized larger farms through land consolidation and transfer of land. This program was a followup to a similar one in 1962. In 1972, the Regional Agricultural Production Integration Program was implemented to facilitate cooperative use of large farm equipment. This program may further slow land consolidation by encouraging small farmers to stay on their farms.

The Farmers' Pension Fund, established in 1970, is authorized to purchase agricultural land from retiring farmers (contributors to the pension) and sell it to farmers who wish to enlarge their farms. The fund can also finance applicants for purchase of agricultural land from retiring farmers.

Table 7—Japan: Number of farm operators by age

Year	16-29 years	30-59 years	60 years and over
		Thousands	
1965	1,496.0	6,665.0	1,974.0
1971	757.1	4,898.2	1,406.2
1974	495.9	4,108.0	1,309.1
1976	429.1	3,490.7	1,114.4
1977	395.5	3,261.8	1,075.3

Source: Ministry of Agriculture and Forestry, Statistics and Information Department, *Statistical Yearbook of the Ministry of Agriculture and Forestry*, Japan, 1976-77, Vol. 53 and 1971-72, Vol. 48.

CANADA

Average farm size in Canada increased from 145.3 hectares in 1961 to 201.9 hectares in 1976 (table 8). During the same period, the number of farms dropped from 480,903 to 338,578. The number of owner-operated farms declined from 350,428 to 189,063. Thus in 1961,owner-operated holdings comprised 73 percent of all farms while in 1976 they made up only 56 percent. The number of partly owned and fully rented farms increased from 26 to 31 percent of all farms. Similarly, farm population dropped significantly, from 2.1 million to 1.1 million. In 1961, farmers were 11.7 percent of total population and in 1976 only 4.6 percent. During 1961-71, the number of young farmers dropped, but in 1971-76, the number of operators under 25 increased from 8,649 to 11,335. The number of farmers over 70 years of age continued to drop in 1971-76.

Canada's current farm structure has been shaped largely by historical, social, and economic factors associated with Canada's western development. While the seignorial system existed in Quebec from 1626 to 1854, immigrants left Europe for Canada to get away from the system's restrictive feudal land tenure. A land system that allowed maximum individual control evolved in Canada as a result. Canadian settlement policies established the owner-operated family farm as the predominant form of agricultural production unit. Technological changes in agriculture have resulted in an increase in the scale of farming, and a shift from single proprietorship to partnerships and the family corporation.

Price and Income Policies

Price and income policies in Canada, together with the operation of the Canadian Wheat Board and national market management programs for dairy, eggs, broilers, and turkeys have also reinforced the evolution toward large farms.

Farm Structure Policy

The major structural issues in Canadian agriculture are the maintenance of the owner-operated family farm, increased farm size, rising farmland prices, the loss of agricultural land to nonagricultural uses, the intergenerational transfer of farmland, and the decline in rural population.[2]

Canadian farm structure policy consists of separate policies developed at the Provincial level. Under the British North America Act (BNA Act),[3] as intepreted currently, Federal and Provincial governments share responsibility for agriculture and have a wide range of commodity programs that affect farm structure. While several Provinces have land use, land tenure, and ownership programs, two of the most innovative and relevant are the Saskatchewan Land Bank and the British Columbia Land Commission Act.

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[2] For additional information, see C. E. Bray, *Canadian Land Use*, U.S. Dept. Agr., FAER-155, Aug. 1979.

[3] The BNA Act is a component of the Canadian Constitution. It created the Canadian Federal union and delineates the distribution of power between the Federal and Provincial Governments. The Parliament of Canada was granted legislative jurisdiction over subjects of common interest, while Provincial legislatures were given jurisdiction over matters of local interest.

Table 8—Canada: Indicators of farm structure, selected years

Year	Farms[1]	Average size of farms[1]	Total farm population	Farm population as percentage of total population	Tenure				Age of operators			
					Owner	Tenant	Part owner, part tenant	Manager	Under 25 years	25-34 years	35-69 years	70 years and over
	Number	*Hectares*	*Thousands*	*Percent*	*Number*							
1961	480,903	145.3	2,128.4	11.7	350,428	27,696	100,383	2,396	12,354	68,026	372,612	27,911
1966	430,522	163.5	1,960.4	9.8	310,684	19,769	97,597	2,472	9,409	56,201	340,753	24,159
1971	366,128	187.4	1,489.6	6.9	251,066	19,200	95,862	[2]	8,649	46,886	292,517	18,076
1976	338,578	201.9	1,056.6	4.6	189,063	17,298	93,757	[2]	11,335	46,120	229,604	13,059

[1] Figures not necessarily comparable between census years due to changes in the definition of a "census farm."
[2] In 1971 and 1976 census, land operated by a hired manager was classified as either owner or tenant.

Source: *Selected Agricultural Statistics for Canada,* Agriculture Canada, Economics Branch, June 1977.

Saskatchewan Land Bank

The Provincial Government of Saskatchewan developed the Saskatchewan Land Bank Program to alleviate some of the problems associated with intergenerational transfer of land. The Land Commission, a Saskatchewan government agency, purchases farmland, thereby absorbing the capital costs of the land transfer. The Commission rents the land to applicant farmers who have the desire and ability to begin farming but lack capital. The leases are long term and tenants are reimbursed for any capital improvements they make. After 5 years, the tenant has the option to purchase. Applicant tenants are chosen based on a competitive point system. The criteria used to allocate points (size of holding, number of work units, and age and education of the operator) specify the structural characteristics of a viable farm unit as conceived by the Saskatchewan government.

Landownership Programs

The Saskatchewan Farm Ownership Act of 1974 was developed to ensure that resident full-time farmers of the Province will control agricultural resources. The Farm Ownership Board may prohibit nonresidents and nonagricultural corporations from owning more than 65 hectares or a quarter-section. Nonresidents need not dispose of landholdings acquired between March 31, 1974, and September 15, 1977, if the assessed value of the holdings for taxation is not greater than $15,000. No nonresident holding land prior to 1974 is required to dispose of it. If a nonagricultural corporation has holdings in excess of 65 hectares, it must dispose of the excess land by January 1, 1994, and submit a landholding disclosure statement to the Farm Ownership Board once a year.

British Columbia Land Commission Act

The British Columbia agricultural land use program implemented by the Land Commission Act in 1973 was one of the first comprehensive attempts by a Province to redirect agricultural land allocation. In December 1972, the Provincial government placed a moratorium on all future use of certain agricultural land for purposes other than farming. Agricultural Land Reserves (ALR) were established to preserve agricultural land for agricultural use.

The Farm Income Assurance Program (FIAP) is a corollary to the Land Commission Act. Under the land use program, agricultural land may be used only for agricultural purposes. The program's premise is that if land with agricultural production potential is restricted to agriculture, production on it should provide farmers with returns to their labor, management, and assets comparable to the nonfarm sector. Under FIAP, producers and the Provincial Government contribute premiums to an assurance fund. Indemnities are paid out of the fund when market returns fall to a specified percentage of the basic cost of production. Basic costs include the calculated costs of labor, management, depreciation, interest on investment, and cash operating costs. The Income Assurance Program operates for a wide variety of commodities. Between November 1973 and September 1977, $89 million had been paid out, an average of $17,800 per participating producer.

The British Columbia ALR did bring about a major shift in the location of new residential and commercial development in 1972-74. In addition, the ALR prevented much change in land use within its boundaries. The rate of subdivision within the ALR was considerably lower than in undesignated areas. Designation of land as agricultural within an ALR plan, however, did not insure that the land was actually used for agricultural production. Much ALR land was left idle because returns from farming were insignificant compared with the costs of capital investment on land which had been purchased at prices reflecting demand for the land for urban subdivisions. The brief experience with the ALR demonstrates that if economic conditions in the farm sector are not conducive to allocating land to agricultural production, opportunity costs are incurred by keeping land in agriculture and greater costs are incurred by leaving it idle.

AUSTRALIA

The total number of farms in Australia declined about 5 percent from 252,243 in 1970 to 240,570 in 1974. Between 1965 and 1977, people in agriculture accounted for 10 percent of the total population; by 1977, their number had dropped to 6 percent. The majority of farm operators are engaged in full-time farming and are over the age of 40. The number of part-time farmers has declined faster than that of full-time farmers.

The Australian agricultural sector accounted for 4.5 percent of the Gross Domestic Product in 1978. Government assistance allocated to agriculture was $225 million, or 0.7 percent of the country's total outlays. Funds disbursed to programs other than commodity-specific programs included $49 million for the Rural Reconstruction Program (table 1).

Price and Income Policies

Australian agriculture is supported by commodity-specific farm price programs for wool, wheat, dairy, poultry, fruit, and livestock production.

Wheat is an important export crop in Australian agriculture. The Sixth Wheat Industry Stabilization Scheme began with the marketing of the 1974/75 crop and covered the seasons 1974/75 to 1978/79. The stabilization arrangements provide for producers' contributions to the Stabilization Fund when export returns are relatively high. Payments are made to growers from the fund when export returns are relatively low. If grower contributions held in the fund are insufficient to make required stabilization payments, the Commonwealth will, under certain circumstances, contribute to make up the shortfall. Stabilization contributions by the Commonwealth are not anticipated in the 1978/79 crop year.

Under new marketing arrangements for dairy products, an equalization levy (equal to the difference between the domestic price and the assessed average export price) was imposed on the production of certain dairy products, and the proceeds redistributed among manufacturers to protect the domestic price structure. New limits have been imposed, however, on the volume of production which will qualify for equilibrium payments.

Farm Structure Policy

Explicit farm structure policies in Australia take the form of adjustment assistance to farmers who do not benefit significantly from commodity price support programs. The main objectives of such policies are to increase farm production and efficiency and facilitate the transition to nonfarm employment. In January 1977, almost all rural adjustment measures were consolidated under the Rural Adjustment Scheme (RAS). RAS provides financial assistance—loans and grants—to farmers with long-term viability who, without such assistance, would face difficulty in continuing their operations. An applicant, however, is expected to have exhausted all other available financial sources before seeking such assistance. RAS also assists farmers who do not have prospects of successful operation and who wish to leave the farm.

Under RAS, farm debts are consolidated and the terms of the loans are lengthened. In some cases, the interest rates are lowered. Small, nonviable farmers are provided assistance to increase their farm size or sell the property if the farmer wishes to leave farming. Loans, which may be converted to grants, are also provided to alleviate personal hardship suffered by those obliged to leave their farms.

Financial assistance is available to farmers who can show that their operation could be restored to long-term economic viability. Financial assistance may allow farmers to diversify or change their mix of enterprises. Loans are also made to farmers to keep them operating through short-term economic distress.

RAS also provides household support when a farmer is considering leaving the farm. But, acceptance of such support does not require a

farmer to leave the farm. A farmer is deemed eligible if assessed as operating a nonviable farm and suffering personal and financial hardship. Assistance is designed to bring a farmer's net household income to the level he would receive were he eligible for unemployment benefits, and is provided in the form of loans, which may be converted to grants. If a farmer has not left the farm 3 years after first receiving assistance, all loans not converted to grants must be repaid.

CONCLUSIONS

The policy objectives of farm structure programs in other countries may differ from those that would be applicable in the United States. However, this brief survey of structural and nonstructural policies reveals several policy instruments that could be used to bring about changes in U.S. farm structure.

Explicit Structural Policies

All countries surveyed have developed explicit farm structure policies and identified policy instruments. Farm price and income policies have been major influences in shaping the structure of agriculture as have historical, cultural, economic, and other factors. Certainly EC and Japanese price policies have had a tremendous impact although their intended effects were not structural. Over the long run, settlement patterns (Canada) and inheritance laws (European countries) have also caused farm structure to evolve in unique ways.

Explicit criteria, such as farm size and farmer age and income level, have been developed to allocate assistance under several of the programs covered—SAFER in France, the Saskatchewan Land Bank in Canada, and the Food and Nutrition program in Norway. Comparable sets of criteria to be applied nationally or regionally in a comprehensive U.S. farm structure program would aid in determining the kind of farm structure the United States intends to foster and the appropriate policy instruments.

Government Control of Farmland Use

In Canada, Japan, France, Norway, and Sweden, government assumes an active role in controlling land allocation. In these countries, the government purchases farmland and redistributes it to farms to increase farm size or production efficiency. This approach can provide considerable flexibility in controlling farmland prices, land use patterns, and foreign ownership of land, but means government involvement in landownership to a much greater degree than in the United States.

Regional Development and Social Welfare

In several countries, the goal of developing larger, more efficient farms has been subordinated to social welfare objectives for disadvantaged regions. The European Community's directive on hill farming exemplifies the policy aimed at resolving social issues, such as regional depopulation or loss of rural social infrastructure that override farm structure issues. Structural adjustment may also result in the temporary or even permanent dislocation of resources, particularly farm labor. In France, Norway, Sweden, and Japan, welfare programs such as old age pensions and farmworker retraining ease the social effects of such policy-induced dislocations. Such farmer retirement programs are common. In the European context, they serve to redress the imbalance between land and labor which has perpetuated the fragmentation of farms, and they encourage older farmers to leave agriculture so that their land can be consolidated. The effects of such welfare programs in facilitating structural change should be investigated to determine their relevance for the United States.

Relationship Between Price and Income Policies And Structure Policies

Specific programs designed to shape farm structure according to specific criteria operate in an environment of price and income programs which may have ends contradictory to those of

the structure program. Farm income stabilization programs which reduce fluctuations in income may also reduce fluctuations which signal the need for or precipitate changes in structure. This situation is illustrated clearly by Japan's rice subsidy program.

Several structural programs, however, operate as complements to income stabilization and price support programs. The European Community's CAP, with its price supports and producer subsidies, has maintained farmer returns at relatively high levels. While EC price supports tend to maintain the existing farm structure, policies are also in effect to encourage consolidation of farms. EC's price support policy tends to increase the price threshold necessary to obtain the desired changes in structure. Conversely, price support programs under which support is based on the quantity produced (such as the quota-based wheat price support program in Canada) can result in the greatest returns going to those who produce the greatest quantity; such price support programs may encourage larger production units. A more detailed examination of how the two sets of policies interact to change farm structure would help assess the applicability of different policy instruments to U.S. conditions.

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