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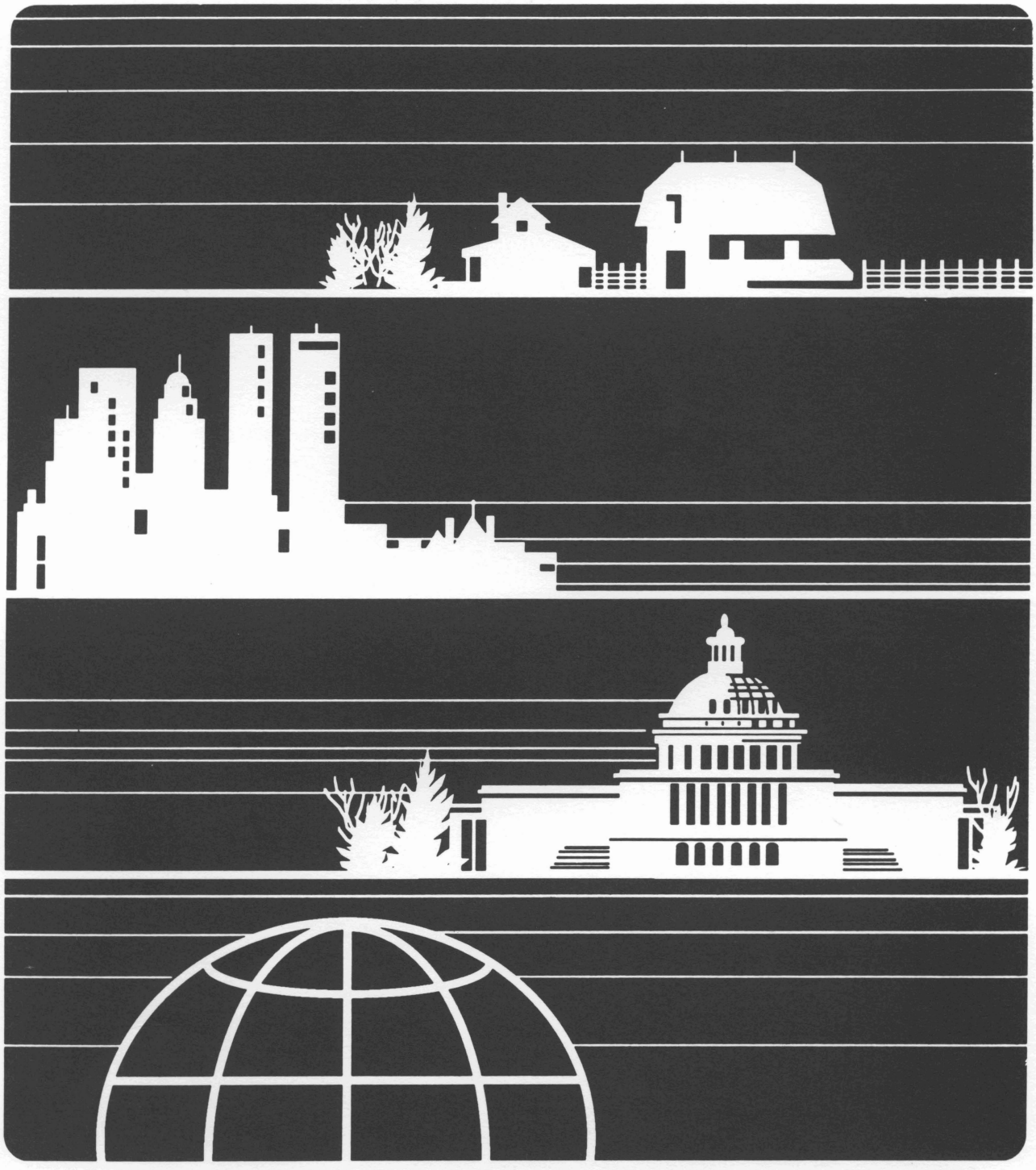
Texas Agricultural Extension Service

POLICY CHOICES FOR A CHANGING AGRICULTURE



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POLICY CHOICES FOR A CHANGING AGRICULTURE...

A Project of the National Public Policy Education Committee

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PREFACE

Policy Choices for a Changing Agriculture is a project of the National Public Policy Education Committee. Its purpose is to generate informed discussion about ongoing changes that are occurring in agriculture and alternatives for public policies which can influence these changes. The objectives are improved understanding and reasoned response — knowledgeable and perspective input into the public policy process by those most directly affected by and concerned about the implications of a changing agriculture.

The project's steering committee selected nine factors of change, each of which is a major force shaping American agriculture at the present time and will continue to be in the future. The accompanying leaflets discuss each of these factors. Each basic force is first defined or described. Subsequently, each basic force is related to changes in the organization and structure of agriculture and its impacts on farmers, agribusinesses, rural communities and indeed on society as a whole are assessed. Relevant public policy issues and options are identified and expected consequences are examined.

The issues sections are particularly important. Their purpose is to stimulate discussion. What difference does it make, and to whom, that each of the identified forces is generating change in the agricultural sector? Even more important is "what to do about it", particularly as a matter of public policy. The authors offer some ideas and alternatives. These are put forth not as solutions but as options — options designed to stimulate discussion among the knowledgeable and concerned — discussion that will ultimately help reconcile individual and regional differences and lead to a consensus for constructive public policy.

These leaflets need to be read, studied, critiqued and discussed. New and clearer insights need to be lifted out of such discussions, and considered feedback provided. The steering committee will reappraise the forces of change in American agriculture as a result of this discussion, analysis and feedback. Policy choices will be clarified and refined, consistent with responses from you the readers, as informed citizens and community leaders.

The rate of change in agriculture clearly is accelerating. The need for intelligent discussion and well-reasoned input into the public policy process has never been greater.

A.L. (Roy) Frederick
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POLICY CHOICES FOR A CHANGING AGRICULTURE...

IS BIGGER BETTER: ECONOMIES OF SIZE IN AGRICULTURE

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There are now about 2.2 million farms and ranches in the United States. About 300,000 of the largest farms produce 70% of total output and account for over 95% of the total net farm income. At the other extreme, the smallest 60% of all farms produce only about 6% of all output and, on balance, have negative net farm incomes. These numbers increasingly reveal a two-tier structure of large and small farms. A small number of large farms produce a large proportion of total output while many small farms account for a small share of total output. An important force determining the number and size of farms has been economies of size.

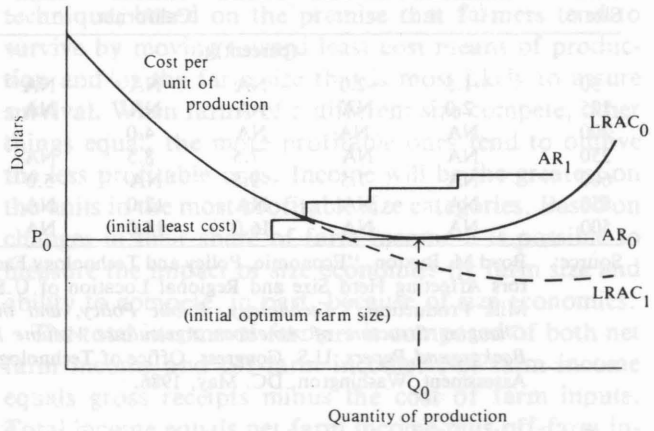
Sources of Economies of Size at the Farm Level

Economies of size refer to the production cost and market return advantages or disadvantages enjoyed by different size farms. If economies of sizes exist, larger farms are able to purchase inputs at lower prices, exploit old technologies more fully, adapt new technologies more rapidly, and/or obtain higher prices for products marketed. These sources of size economies are grouped into technical and pecuniary (price) categories.

Technical Economies

Technical economies of size refer to cost savings that result from increased production specialization and the spreading of fixed costs as output increases. Production specialization results in lower per unit costs as farm size increases. The result is a movement along the downward sloping portion of a farm's long-run average cost curve ($LRAC_0$) (Figure 1). Technical diseconomies can result from problems associated with managing and coordinating complex production processes. Diseconomies mean that the costs per unit of output increase, leading to the upward sloping portion of long-run average cost curves.

Figure 1. Long-run average cost and revenue curves adjusted for pecuniary economies.



Pecuniary Economies

Pecuniary economies of size mean that larger farms are able to buy their inputs at lower prices and/or sell their output at higher prices. Input price discounts associated with large volume purchases augment the unit cost reduction associated with technical economies as indicated by $LRAC_1$ in Figure 1. Similarly, output price premiums experienced by large volume sales increase market returns as represented by the average revenue curve AR_1. Pecuniary diseconomies of size exist when, on a resource such as water or electricity, a higher price is charged when more is used.

Examples of Farm Level Economies of Size

Various combinations of technical and pecuniary economies and diseconomies may exist within the same

farm. The question is whether economies or diseconomies dominate a particular agricultural commodity.

Economists have not always agreed on the extent of economies of size in agriculture. Considerable research on this issue has been undertaken in the past 15 years. Specific examples of economies of size from recent research follow for dairy, cotton, corn, and rice.

Dairy: Technical Economies. A recent study of size economies in milk production reveals substantial technical economies of size (Table 1). The return on capital investment was determined for various herd sizes in major U.S. milk-producing states. Because milk prices vary little from producer to producer in a given area, differences in earnings were attributed to differences in production costs. These results suggest economies of size extend to much larger dairy farms in the West and Southwest than those found in traditional milk producing regions of the Upper Midwest and Northeast.

Table 1. A comparison of expected rates of return to investment for alternative size dairy farms.

Herd Size	Minnesota	New York	Florida	Arizona-California	Idaho
			(percent)		
50	-1.5	-2.0	NA	NA	NA
125	2.0	NA	NA	NA	NA
200	NA	NA	NA	4.0	
350	NA	NA	7.5	8.5	NA
600	NA	7.5	9.5	NA	5.0
850	NA	NA	NA	12.0	NA
500	NA	NA	16.0	14.0	NA

Source: Boyd M. Buxton, "Economic, Policy and Technology Factors Affecting Herd Size and Regional Location of U.S. Milk Production," *Technology, Public Policy, and the Changing Structure of American Agriculture Volume II Background Papers,* U.S. Congress, Office of Technology Assessment. Washington, DC. May, 1986.

Economies of size for dairies result from increases in labor, management, and capital specialization coupled with lower investment costs per cow as the size of the operation increases. For example, California feedlot dairies are more specialized in milk production because they buy their feed inputs. Minnesota and New York farms typically grow most of their own feed. Future additional advantages for large dairies may come from the use of such size-dependent technologies as computerized management and feeding systems, embryo transfer, and hormones.

Cotton: Pecuniary Economies. A Texas study of pecuniary economies suggests that large cotton farms are able to buy particular inputs with savings of 5 to 20% on individual items, resulting in about 5% lower overall unit costs (Smith, *et al*). Higher per unit revenues from marketings appear to be of similar magnitude. Large farms are able to realize about a 5% higher price per bale of cotton. Marketing advantages are considerably more variable because of the importance of the management factor in achieving them, including the use of futures and options, timing of sale, and choosing the place of sale.

Corn: Technical Economies and Pecuniary Diseconomies. A study of corn produced in the United States indicates that technical economies are greater than pecuniary diseconomies of size (Cooke). Some technical economies of size in each corn producing area result from higher yields combined with more productive machinery requiring less fuel, lubrication, repairs, and labor per bushel of corn produced. Some pecuniary diseconomies of size relate to the higher investment cost per service hour for machinery. Overall, moderate-size corn farms pay less per service hour for their machinery complement. However, the gains to large farms in terms of higher yields, lower variable costs, and more efficient use of labor more than offset the higher machinery investment cost.

Rice: Technical and Pecuniary Diseconomies. In rice production, laser leveling for flood irrigation permits a reduction in the total volume of water required and in the fuel required for pumping water, both of which lower production costs. However, rice farmers with very large flood-irrigated acreage may be less timely in the application of water. The lack of timeliness results in lower yields and higher per-unit costs. A study of rice production has indicated size diseconomies due to such water management and coordination difficulties. (Cooke).

Sources of Integration Economies

Farmers may benefit from technical and pecuniary size economies beyond the farm gate through vertical integration with related agribusiness functions. Vertical integration refers to the direct linking of two or more stages of the input-production-marketing channel for a farm product. An advantage of integration for the farmer, whether through ownership, contracting, or cooperative membership, is the ability to realize advantages of size in input supply or output marketing. Broiler production is an example of a vertically integrated industry in U.S. agriculture. Contract integration is used in fed beef production, fruits and vegetables for processing, and rice. Milk marketing is a good example of cooperative integration.

Relatively little information is available on the magnitude of economies of size involved in integration. However, the following five economic factors play a role in influencing integration trends.

- Size economies are different at each stage of the input-production-marketing chain. As integration into a size-sensitive stage occurs, size economies are spread to adjoining stages.
- Contract and cooperative integration gains economies by pooling the risk associated with high levels of capital and labor investment and by reducing risks associated with lost markets or insufficient supplies.

• Technological innovations such as confinement housing of livestock have lead to technical and pecuniary economies through integration by allowing production units to expand sufficiently to meet the supply needs of the processing and merchandising stages.

• Integrated systems can be designed to serve specific markets with products of uniform quality at competitive prices, but require quality and quantity controls that can be exercised best within a single, large-scale operation.

• Integration may result in economies of information management that can be used for risk-reducing strategies such as contracting, hedging, forward purchases, and/or sales.

Current trends are likely to result in a mixture of cooperative and contract integration. Contracts covering both production and marketing aspects of the business are becoming increasingly binding. Such contracts provide a mechanism to distribute the benefits of technical and pecuniary economies to participants in all stages of the integrated system, including producers.

Impacts of Economies of Size

Key concerns from the above findings include impacts of size economies on technological progressiveness, farm survival, rural agribusiness and communities, and the consumer and the environment. These impacts underscore the importance of size economies in agriculture.

Technological Progressiveness

Size economies increase the amount of investment capital a farmer must either borrow or retain from earnings. As farmers increase their dependence on borrowed capital, they become more vulnerable to unforeseen economic shocks such as a sudden decrease in foreign demand. Therefore, farmers trying to expand may trade off the benefits of exploiting size-dependent, capital-intensive technology against increased financial risk.

If a farmer does not want to be forced out of agriculture, it is important that the benefits and costs of size-increasing technologies be carefully considered. Farmers who cannot or will not adopt cost-reducing, size dependent technologies face the risk of eroding capital asset values as their farm assets become outdated or they become unable to fully use the most productive technologies available. On the other hand, farmers also face the risk from economic shocks as they become highly leveraged in an effort to be more competitive by fully exploiting capital intensive technologies required to realize size economies. Good management regarding size economies is knowing when to adopt new technologies for expansion.

Survival

One way to measure the impact (or determine the existence) of size economies is by the size of farm that survives. Economists refer to this as the survivorship technique, based on the premise that farmers tend to survive by moving toward least cost means of production and/or the farm size that is most likely to assure survival. When farms of a different size compete, other things equal, the more profitable ones tend to outlive the less profitable ones. Income will be the greatest on the units in the most profitable size categories. Based on changes in their share of farm income it is possible to measure the impact of size economies by farm size and ability to compete, in part, because of size economies.

The total income of farmers is composed of both net farm income and off-farm income. Net farm income equals gross receipts minus the cost of farm inputs. Total income equals net farm income plus off-farm income. Table 2 below indicates that the proportion of net

Table 2. Net farm income and total income of farmers by gross sales categories, 1974 and 1982.

	1974			1982			Change in net farm income concentration[a]	Change in gross farm income concentration[a]
Sales class	Farms	Net farm income	Total income	Farms	Net farm income	Total income		
$(1000)	#	%	%	#	%	%	%	%
A. 1-20	1,926,875	3.7	43.9	1,355,344	-3.8	43.8	-100	42
B. 20-99	559,076	23.2	16.1	581,576	5.4	14.4	-95	-23
C. 100-199	146,089	20.3	11.9	180,689	14.6	8.6	-58	-58
D. 200-499	67.091	21.2	11.6	93,891	20.4	9.3	-34	-54
E. More than 500	19,200	32.2	16.5	27,800	63.5	23.9	169	44
Total	2,718,331	100.1	100.0	2,239,300	100.1	100.0	134	27

[a]Changes in income concentration is based on Herfindahl measure in 1974 and 1982. The Herfindahl index is defined as the square of the percentage of income divided by the number of farms.

Source: U.S. Congress, Office of Technology Assessment. *Technology, Public Policy and the Changing Structure of American Agriculture* Washington, DC, March 1986.

farm income earned by the largest farms is increasing. Bigger, if not better, is at least more profitable. Yet, there are a large number of small farms that have survived. About 60% of all U.S. farms had gross sales of less than $20,000 annually in 1982. These operations lost money in farming. The continuation of these farms can only be explained by adding their off-farm income to their income from farming.

These data suggest that farmers are faced with a choice of being small or large. Medium size farms (sales between $20,000 and $499,000 per year in Table 2) generally are not able to fully exploit either opportunities for off-farm employment or technological and pecuniary size economies. This group is sometimes referred to as "the disappearing middle". If there were no size economies, moderate size farms would not have experienced such a dramatic loss in income relative to small and large farms.

Agribusiness and Rural Communities

Input and marketing businesses likely will direct their services in the future to meet the particular needs of the evolving small and large farm segments. Direct input sales from regional distributors, wholesale warehouses, and factories to large farms will become increasingly prominent. Information needs by operators of large farms will be met by consultants and Extension specialists. Small farmers who, though many in number, comprise a small proportion of total agricultural output will increasingly be serviced as consumer sales. Production inputs, credit, information, and marketing needs will be met at the local level. Small farms may survive largely in areas where there is substantial off-farm employment.

The structure of rural communities will depend heavily on the proximity to urban industrial centers and off-farm jobs. For farming areas located within commuting distance from urban-industrial centers, the structure of rural communities will change only in the sense of being increasingly populated by part-time farmers. For rural farming areas with few nonfarm employment opportunities, the impact on rural communities will be much more pervasive, reflecting the trends toward large-scale farms and agribusiness firms. Business centers will form to serve the needs of a large-scale agriculture with regional distribution facilities and terminal and subterminal marketing firms. Smaller communities located between these centers will have increasing difficulty competing for the business of large farms. Rural public services will decrease as a downward spiral of fewer farms and rural businesses shrink the tax base.

Consumers and the Environment

Economies of size lower per unit costs of production. In a competitive enviroment, farm commodity prices eventually fall in response to these economies of size. As long as lower prices are passed on through the market system, consumers are better off in terms of proportion of their disposable income spent on food and fiber. As a result they have more money "left over" to buy other goods and services.

Economies of size also concentrate resources in the hands of fewer producers. If concentration becomes extreme, a small number of producers could obtain sufficient market power to preclude the passing on of cost savings to consumers. At the farm level of the food system, the concentration of resources in all major agricultural commodities is much lower than in other sectors of the U.S. economy. Even in broilers where the 20 largest integrated agribusiness firms control over two-thirds of the production, concentration is much below the level that normally indicates the existence of monopoly pricing powers.

All the effects of economies of size may not be seen in the price alone. Technologies that make size economies possible may have negative effects on food quality, soil erosion, water conservation, and water purity. For example, antibiotic drugs have been one of the factors making large-scale confinement feeding of livestock possible. However, the extensive use of antibiotic drugs in agriculture could make them less effective against human pathogens.

Consumers and environmentalists, as voters, must decide whether potential food price decreases are more important than unquestioned food quality or natural resource protection and conservation.

Policy Issues and Trade-offs

Size economies generally exist in U.S. agriculture, and thus some painful policy decisions must be made.

Is Small Beautiful?

Small farms are unable to adopt size-dependent technology. These farmers substitute labor for capital and materials. Therefore, they are not technologically progressive. In turn, their costs of production are higher.

Small farms have an admirable ability to withstand adverse economic conditions with little or no governmental help. This is the main area of strength for small farms even though it means that they must subsidize their farm income with off-farm jobs.

Small farmers may provide urban consumers with an alternative source of fresh fruits and vegetables. As such, they help support an active chain of farmers' markets for fresh fruits and vegetables in urban areas. Often, however, this service is seasonal and the quality of the produce may vary. Small farms help maintain a consumer-like agriculture service sector, as well. Environmentally, small farms may use fewer chemicals than commercial producers, but may not use them in as safe a manner.

Should the Medium Size Farm Be Saved?

The medium size farm generally is more technically progressive than the small farm but less so than large farms in producing commodities for which size economies exist. Medium size farms are not able to fully exploit the technical economies of size.

Medium size farms often have low family income. These farmers are unable to fully exploit either size economies or off-farm employment opportunities. These farmers are trapped in production by the need to prevent further devaluation of capital assets.

The medium size farm is the mainstay of small town rural communities. This may be the best attribute of medium size farms. These farms and their associated agribusiness firms represent the ideal of independent entrepreneurs. These small communities symbolize to many the American way of life. There may be some commodities that medium size farms produce as inexpensively as large farms, but medium size farms still provide producers with low net farm incomes.

Is Bigger Better?

Large farms are technologically more progressive in that they are able to more fully realize economies of size. Large farms tend to substitute capital and materials for labor.

Large farms have the highest net farm income. This is a result of low cost production practices, higher prices received, and/or a higher volume of output. On the other hand these farms may be highly leveraged and therefore subject to economic shocks. Government programs that allocate benefits on the basis of volume of production enhance the competitive position of large farms.

Large farm agriculture is resulting in a restructuring of agribusiness and rural communities to a regional rather than a local basis. This restructuring is painfully disruptive to small communities that depend on agriculture, directly and indirectly, for a large portion of their tax base. Communities beyond commuting distance from urban-industrial centers are hardest hit.

Large farms potentially provide consumers with the lowest cost food. This food is generally available year-round and is of consistent quality. However large farms may "over exploit" chemical technologies in the process of realizing size economies. This production of an abundance of low cost food is the strong point of the large farm structure.

Adjusting to Change

Every year there is a marginal change in the average farm size. Thus, the policy issue is not whether to change farm size but rather how should the rate of change be influenced with public policy initiatives. Ideally, a structure policy for U.S. agriculture may be desired which has the progressiveness and low cost of large farms; the survivability and independence of small farms; and the contribution to rural communities and agribusiness of medium size farms. Such an ideal is not possible. For those commodities for which size economies exist, some hard choices must be made.

- Saving the medium size farm will be the most difficult. Research, education, and farm program benefits will need to be specifically targeted to meet their needs. In any event, a higher cost may be paid for food.
- Markets for the output of small farms which obtain most of their income from off-farm will need to be protected.
- A large farm agriculture will require programs that facilitate the transition of resources out of agriculture. Food costs will be lower, but perhaps with a greater environmental risk.

These are difficult decisions. Each choice comes at a cost. But not to decide is to decide. Unless specific policy decisions are made to alter forces already in place, agriculture will continue to progress toward a structure composed primarily of large and small farms, with a continuing decline in medium size farms and many rural communities.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

A NEW TECHNOLOGICAL REVOLUTION: HOW WILL AGRICULTURE ADJUST?

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The development and management of new technology has made American farmers and ranchers among the most productive in the world. The first of what have subsequently been referred to as "technological eras" began in the 1920s with the introduction of mechanical power and the initial concentrated effort to improve the genetic stock of plants and animals. The mechanical era of 1920-1950 made the transition from horsepower to mechanical power. It significantly increased the productive capacity of agriculture while dramatically decreasing farm labor requirements.

The chemical era of 1950-1980 further increased agricultural productivity by increasing the use of chemical fertilizers and feed additives and improving the farmer's ability to control pests and diseases.

Now, in the 1980s, American agriculture is entering the biotechnology and information technology era. New agricultural inputs, new crop varieties, and even new farm products may be genetically engineered (reconstituted) in this era. Concurrently, information systems will be developed that hold the potential for materially improving the ability of managers to make more effective production, marketing, and financial decisions. These newly emerging technologies will have a profound impact on American agriculture well into the next century.

Future Technological Change

The biotechnology and information technology era is expected to be faster paced than previous technological eras. Possibilities for transforming agriculture also are more far-ranging than ever before.

Biotechnology

Biotechnology uses living organisms to make or modify products, to improve plants and animals, or to develop microorganisms for specific uses. It focuses on the use of recombinant deoxyribonucleic acid (DNA) and cell fusion, two powerful techniques that allow for a large amount of control over biological systems. In agriculture, there are many applications. For example, the bovine growth hormone is formed by genetically engineering *Escherichia coli* bacteria to produce the hormone generated by the pituitary gland. This hormone causes the secretion of milk by mammary glands. Trial results from this hormone indicate increases in milk output per cow average about 25%.

Embryo transfer, which involves artificially inseminating a superovulated donor animal and removing the resulting embryos for implantation in surrogate mothers for carrying them to term, currently is being used commercially in both dairy and beef production. Its impact will accelerate in the next few years as techniques for embryo splitting, freezing, and sexing make it possible to duplicate superior animals. Research is currently in progress to identify traits associated with each gene in cattle. Such research will make it possible to develop cattle with desired traits.

Biotechnology likely will bring equally important changes to end products. One possibility is to tailor agricultural commodities to remove cholesterol from red meats, milk, and eggs. Another is to develop a broiler with all white meat.

Information Technology

Information technology for agriculture involves the use of computer- and electronic-based technologies for the automated collection, manipulation, and processing of information for control and management of agricultural production and marketing. Such technology has the potential to be used to create "expert" farming systems, and electronic market exchange systems. For example, in dairy, expert systems are in developmental and experimental stages which would detect and diagnose abnormal milk, specify the type and source of abnormality (such as mastitis), prescribe treatment, divert abnormal milk to other uses (feeding), keep animal health records, measure output per cow, shut off the milker when completed, determine and disperse the optimal concentrate feeding level, and recommend optimum breeding strategies.

Similarly, systems are being developed for crop production to diagnose the type of diseases or pests and

recommend control procedures, as well as make recommendations on optimum levels of fertilization and irrigation. In addition, some experimental models also have the capability of evaluating alternative marketing strategies, farm management practices, farm program options, income tax strategies, and crop rotations. Computerized trading in spot and contract markets for cotton is but one example. Electronic links from computerized markets to farm managers' offices appear to be only a matter of time.

Forces Driving Technological Change

The adoption of new technology as described will be improved by the recent granting of property rights for new plant varieties, new life forms and computer software. Patent rights were extended to new plant varieties by enactment of the Plant Variety Protection Act of 1970. This was followed in 1980 by the U.S. Supreme Court ruling in *Diamond vs. Chakrabarty* that investors of new microorganisms, whose inventions otherwise met the legal requirements for obtaining a patent, could not be denied a patent solely because the innovation was alive. This decision opened the door for potential patenting of a broad range of new products from the biotechnology era. Capping this series of policy changes was the enactment of a 1980 law which also made computer software patentable.

The importance of these institutional changes is that they have made it possible for newly discovered inputs, products, and information systems to be protected by patents and/or copyrights. Such rights create the potential for large monetary rewards for the inventor or developer. The private sector response to this potential has been impressive. The Office of Technology Assessment (OTA) found that by 1983, 61 companies were conducting research in animal biotechnology and 51 companies were involved in plant biotechnology. Several of these firms were formed using new venture capital. Private investment in agricultural research increased from $460 million in 1965 to $2.1 billion in 1983.

Institutional changes were likewise occurring in the university and USDA research sector. The opening of competitive grants to all universities brought about a larger pool of universities conducting biotechnology research. The importance of biotechnology research in USDA increased from less than 1.0% of the research budget in 1977 to 6.3% in 1984. By the latter date, about $100 million was being spent by USDA and land-grant universities on biotechnology research.

Potential Impacts of New Technology

The biotechnology and information technology era for agriculture will have significant impacts on production levels, the structure of agriculture, finance and credit, environmental quality, labor use, and research and extension education.

Production Levels

In the 1970s, there were concerns that yields of major crops were leveling off and that the world would not be able to continue to produce enough food to meet the demands of a growing population. However, a recent study reaches a somewhat different conclusion (Office of Technology Assessment, 1986). The analysis indicates that emerging technologies, if fully adopted, will significantly increase animal and plant production potential. A general conclusion, however, from the study was that biotechnology would not likely have a major impact on crop production until the late 1990s or early in the 21st century. As a result, yield increases for most crops that are at or below recent trends appear to be the most likely expectation to the year 2000 (Table 1).

Table 1. Past and projected output yield trend[a] for the specified crops and milk using bio and information technologies, 1982-2000.

Crop	Past yield trend 1960-82	OTA projections: 1982-2000		
		No new technology	Most likely technology	More new technology
	Annual percent change in yield			
Corn	2.6	0.5	1.2	1.6
Cotton	0.1	0.3	0.7	1.0
Rice	1.2	0.2	0.9	1.4
Soybeans	1.2	0.8	1.2	1.2
Wheat	1.6	0.7	1.3	1.4
Milk	2.6	1.4	3.9	4.2

[a]Note that this table refers to changes in yields, not to total production which is also a function of the number of acres farmed or cows milked.

Source: Office of Technology Assessment, 1986.

Biotechnology and information technology are likely to affect animal agriculture much sooner than the crop sector. The dairy industry provides the most dramatic example of the potentially profound impact these technologies might be expected to have on particular commodities. This is because of the rapid development of the bovine growth hormone, the expanding use of embryo transfer technology, and the development of increasingly sophisticated computerized milk production systems. From 1960-82, milk output per cow increased 2.6% annually. However, with these new technologies, output per cow is projected to increase by as much as 4.2% annually through the year 2000.

Structure of Agriculture

The emerging technologies could have an even more profound impact on the structure of agriculture than on production levels.

Technological change frequently has had the effect of increasing supply more rapidly than demand has increased, thus lowering real prices for farm products. Continuous infusion of new technology also puts farmers on a treadmill where the early adopters of new technology are the primary beneficiaries from lower costs or

expanded output. However, as more farmers adopt, supplies increase and prices fall. The adoption laggards realize lower profits or greater losses and often are forced out of business. Technology thus becomes an important contributor to expanded farm size and reduced farm numbers.

Future technological developments also are expected to benefit early adopters. Less aggressive producers will give in to the competitive pressures from the early adopters and the trend toward consolidation probably will continue.

New technologies will enable agricultural production to become more controlled. Examples are less fat per unit of lean in meat animals or higher protein content in corn. Less sorting and grading will be required to provide the market with products that closely match the desires of consumers. An anticipated economic consequence of increased control over production will be more vertical integration or contracting.

Finance and Credit

The severe financial crisis among some producers and their lenders and regulatory and competitive changes in financial markets have combined to change significantly the financial fabric of farming. Increasingly, farms are being treated financially much like any other business - they must demonstrate profitability before lenders will finance their operations. Managing a farm efficiently and profitably, which will necessitate keeping up-to-date technologically, is fast becoming the key to credit.

The financing consequences of new technologies in agricultural production will probably depend on the relationships between three important factors: (1) the financial requirements of the new technologies, (2) the credit worthiness of individual borrowers, and (3) the changing forces in financial markets that affect the cost and availability of financial capital.

Most new technologies are likely to be financed with short- and intermediate-term loans that are part of the normal financing procedures for agricultural businesses. However, the complex characteristics of the technologies, together with the factors constituting the credit worthiness of individual borrowers, suggest that increased emphasis in credit evaluations will be placed on farmers' management capacity, on their abilities to demonstrate competence in using the new technologies, and on building human capital via specialized training, where appropriate. In some cases significant lender-specified education may accompany new technology adoption. This is consistent with the more conservative responses by agricultural lenders to financial stress in the 1980s.

Environmental Quality

Most of the emerging technologies are expected to reduce land and water requirements for meeting future agricultural needs. Consequently, these technologies have the potential to reduce certain environmental problems associated with the use of these resources. The technologies should have beneficial effects in terms of reduced soil erosion, improved wildlife habitat, and reduced dangers associated with the use of agricultural chemicals.

Perhaps the most revolutionary of the new technologies are those associated with DNA. While the specific applications of such technologies appear likely to reduce resource requirements and threats to the environment that arise from agricultural activities, dangers may accompany the release of genetically altered microorganisms. The revolutionary nature of the new biotechnologies prevent specific evaluation of resource/environmental impacts associated with the deliberate release of new forms of life at this time. The resulting uncertainty is seen by some as a strong rationale for limiting, if not halting, biotechnology research and development. At least some future research should be focused on assessing the potential benefits and risks of the new products of genetic engineering.

Labor

As has been true for most past technologies, the emerging biological and information technologies are expected to result in a continuing shift of labor out of farming. But some new employment opportunities will be provided in the agribusiness sector supplying these new technologies. This represents a continuation of past trends which have already resulted in about 55% of the nonmetro jobs in the food and fiber system being located off-of-the-farm in input, marketing, and other service sectors.

Compared to the mechanical era, the newly emerging technologies probably will displace less farm labor. However, the skill requirements of the farm labor force will be increased substantially. This will be particularly true for workers in animal agriculture. Demand for unskilled agricultural workers will be increasingly limited to only some of the hired field workers employed on specialty crop (mainly fruit and vegetable) farms.

One message seems clear: new technologies will require those who work on farms to upgrade technical skills. This requirement will be coupled with increased management skills in order to operate successfully within a system of increased technical and economic complexity. Programs to support skill upgrading of the farm labor force may need to be given very high priority.

Research and Extension Education

Agriculture's entrance into the biotechnology and information technology era raises several questions about the impact of technological advances on the performance of the research and extension education system and about how that will affect the future of agriculture.

Public research in the past was a driving force for agricultural production. Now, with the private sector

becoming more involved in certain areas of process and product related research, the public sector is placing more emphasis on increased basic research. This situation leaves open the question of who will do applied research for users of technology.

As the rate of technological change accelerates, access to information will play a more important role in increasing agricultural productivity and the probability of farm survival. In the evolving biotechnology and information technology era the trend will be to substitute information for time, capital, labor, land, and energy throughout agriculture.

In the agricultural research system researchers have traditionally been the producers of new technology, whereas extension educators have been the agents of technology transfer. The newly emerging technologies place even greater demands on performance by extension educators; demands which may not be met using present organizational and operating procedures.

The role of extension is even more wide-ranging than it has been in the past. New, more complex products require evaluation and explanation. Extension educators will need to be more heavily involved in both new product testing and in helping people learn how to best use these innovations. The 1985 farm bill gives authority for the Cooperative Extension Service to engage in applied research functions such as product testing and evaluation.

Issues and Trade-offs

A number of specific policy issues surround the development, licensing, and regulation of new technology. These include issues relating to the protection of property rights via trade secrets and patents, environmental quality, human health and safety, product testing requirements, selectivity of product use, and others. These are important issues which need constructive attention by policymakers and the public. In addition, a number of more general issues, including the fundamental question of whether additional research and development is desirable, are already on the policy discussion agenda.

What Would Happen if a Moratorium was Placed on the Flow of New Technology or its Implementation?

The process of economic development involves a maturation process in which fewer workers are required in primary industries such as farming and mining and more workers are employed in the knowledge and service industries. American agriculture has achieved its preeminence in the world by substituting knowledge for resources. This knowledge, embodied in more productive biological, chemical, and mechanical technologies and in the managerial and production skills of farm operators, has given the United States a world-class agricultural industry at a time when many other sectors of our economy are losing ground. A necessary condition for U.S. agriculture to retain its international competitiveness is enhancement of both public and private sector capacity for scientific research and technology development. The costs, to both consumers and producers, of failure to maintain and increase our efficiency in production would greatly exceed the adjustment costs resulting from overabundance. Instead of just some people being left behind, the whole American agricultural system would be left behind. Thus, policies which appropriately encourage and regulate new agricultural technologies are preferable to those which attempt to stop them. However, these policies need to be augmented by others which make the adjustment process a less painful one for some participants in the industry. The major trade-off or consequence of a moratorium on new technology is an agricultural economy which is smaller in dollar volume and employment along with a less competitive and reduced export sector and eventually higher costs to domestic consumers.

What is the Structural Impact of New Technologies?

The post World War II era of farm mechanization made it virtually impossible for small unmechanized production units to compete and survive with farming as the sole source of family income. In contrast, many past chemical and biological technological advancements, such as in insecticides and hybrid seed, have been rather scale neutral, except for price discounts afforded producers who were able to purchase these inputs in large volume. The emerging biotech and information industries appear to have the potential for being relatively scale neutral in their application on those farms already large enough to support mechanization technology. But two qualifying considerations are important. First, the implementation of these emerging technologies will generally require increased management skills and computer literacy. Second, at least some of these systems in animal agriculture will probably involve environmentally controlled housing and scientifically based feeding and management procedures. Thus, increased managerial skills, and, in some cases, additional capital in the form of specialized buildings and equipment will be important components of successful farming. The trade-off to increased skill training is increased concentration of farm production among larger units with more sophisticated technology and management capabilities.

What Adjustments are Required as Agriculture Moves From a Labor Intensive to a More Knowledge Intensive Agriculture?

Adjustments fueled by technological change have been underway in American agriculture since the early 1940s. They include the relocation into retirement or alternative employment of people who were either underemployed in farming or had inadequate skills to succeed in farming in an age of high technology. At

least some were enticed into off-farm employment by wages which exceeded earnings in farming. Others left farming because they did not have an adequate base of land or operating capital to succeed in a changing farming environment.

Future adjustments in farming will be dictated less by large capital requirements than by the educational and managerial skill requirements for farmers. This is not to suggest that the future capital requirements in farming will not be high. They will. But recent major deflation in agricultural capital assets, particularly farm real estate, together with creative procedures by farmers for acquiring access to land and capital may result in educational and managerial skill levels becoming a more limited resource than capital. One clear-cut conclusion emerges. Persons who want to compete successfully in farming will need to invest in upgrading their managerial and technical skills. The major trade-off for not upgrading skills in agricultural management is that of finding off-farm employment.

What is to Become of Farm Operators and Workers Displaced by Continued Technological Change?

First, the absolute number of people displaced in the future will not be as great as it has been in the past. More workers have left farming since 1940 than now remain on U.S. farms. But for those individuals displaced by technology, the issue is a vital one with no simple answer.

Adjustment to alternative employment is most easily accomplished by young people who are just graduating from high schools, vocational schools, and colleges or universities. Thus, strong educational programs and vocational counseling for youth in farming communities are of vital importance. Selected public policies might be directed toward such educational support services. Other displaced farm workers will find the best alternative to be that of seeking nonfarm employment either with or without additional education. A number of special education programs are already in place for displaced farm operators and family and hired workers. These programs, however, need to be geographically and financially accessible and have appropriate entrance requirements for those displaced from farming. Moreover, they need to target employment skills to those areas for which jobs are available.

A number of older farm operators and other family members without new education may have to adjust to whatever full- or part-time employment opportunities exist in the local community. The availability of such employment opportunities, and the general quality of life in many rural communities, will depend heavily on the local farm economy. In some cases businesses based on newly emerging technologies, particularly those supplying farm inputs, will provide new local employment opportunities. A major tradeoff for not providing strong educational programs in rural communities is more unemployment locally and increased costs of social services for the unemployed and their families.

Adjusting to Change

Existing farm policy provides little direct help for producers to adjust either to technological change on the farm or to off-farm employment. The Food Security Act of 1985 and related farm policies are aimed largely at reducing the use of farm inputs (mainly land) to curtail farm output, providing a price and/or income floor for producers of selected commodities, and enhancing the position of U.S. farm commodities in world trade. A unique exception is the dairy herd buyout program which has provided some dairy farmers with an opportunity to "cash out" their dairy herds at more attractive prices than those afforded by the existing market. New or expanded public policies are needed for upgrading the managerial skills of some farmers to cope with technical change and for providing educational opportunities for others to enable them to exit from farming. Strong educational programs are also needed for all rural young people whether or not they have future opportunities in "high tech" farming. Expanded federal and state help will be required for effective educational programming in those rural areas with an eroding local tax base.

Public institutions need to target policies and programs on two somewhat different streams of participants - those who will adjust by staying in farming, and those who will seek alternative employment. Both groups need to be served by effective public technology transfer and training programs and supporting financial services. A reorganized and revitalized Cooperative Extension Service could play a major role in technology transfer while public credit agencies need to focus program delivery on the special needs of the two target groups. At the producer level, it is crucial that individuals realistically assess their opportunities in and out of agriculture. Most should make deliberate career choices and follow up with the acquisition of the managerial skills to succeed in high tech farming or the skills required for employment off-the-farm. Future farm commodity programs are not likely to provide an umbrella of income protection for any but those farm managers who can adjust effectively and quickly to technological change.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

CAPITAL FOR AGRICULTURE: TOO MUCH, ENOUGH, OR TOO LITTLE?

by
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Experiences of farmers and lenders in the 1980s have reemphasized the importance of financial capital in production agriculture. On some farms, debt has accumulated at a rapid pace. Cash flow has not been adequate to cover operating and family living expenses plus debt-servicing requirements. Many input suppliers and marketing firms also have felt the effects of the financial squeeze on producers, causing their own financial condition to deteriorate.

Decisions by individual farmers and lenders have contributed to financial stress in agriculture. But perhaps more importantly, public policies have helped to create a somewhat confused environment for the use of financial capital. If an environment for the wise use of capital is not created, stress often is compounded.

Forces Leading to Cash Flow and Credit Problems

A number of diverse forces have led to financial stress for farmers, their lenders and suppliers in recent years.

Expectations of a Continued Agricultural Boom

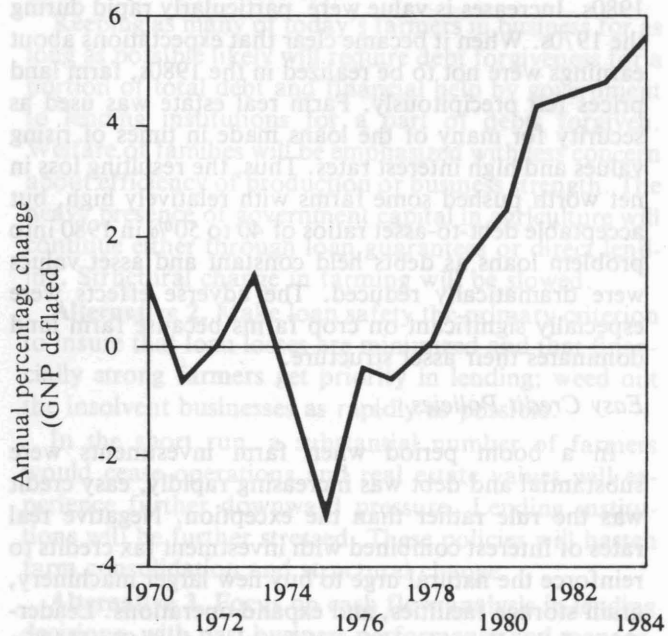
Between 1973 and 1975, Americans became convinced that the agricultural surpluses of the preceding decades were history. American farmers were asked to provide for a shortfall in world food production. Exports rose, pushing up commodity prices. Land prices rose faster than the inflation rate. Farmers who expanded their operations were rewarded by rapidly increasing cash flows and large increases in net worth.

Inflation and High Interest Rates

With boom conditions in agriculture and rapid rises in oil and commodity prices, inflation increased significantly in the 1970s. Interest rates rose along with inflation but at a somewhat slower pace. However, by 1980, interest rates on farm nonreal estate loans exceeded 15%, and rates for real estate loans began to rise rapidly.

Real interest rates, the difference between the rate of inflation and the rate charged customers for borrowed funds, actually fell below zero for four or five years in the mid-1970s (Figure 1). This encouraged many farm borrowers to take on additional debt when the rate of inflation more than covered interest costs and asset values were increasing more rapidly than debt. The other side of the problem appeared in the 1980s when inflation fell, farm product prices fell even more rapidly, and interest rates remained high.

Figure 1. Annual percentage change in real interest rates, 1970-84.

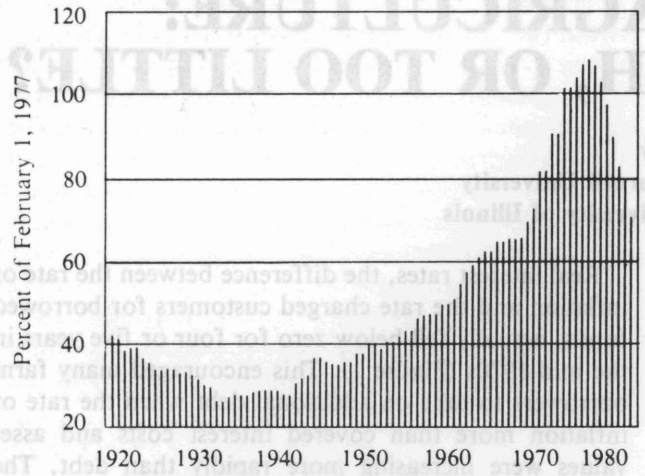


Source: Texas Agricultural Extension Service, No. B-1532, p. 11.

Big Changes in Farm Real Estate Prices

Farm real estate markets have been particularly volatile in the last 15 years. Changes in the real value of farmland are presented in historical perspective in Figure 2.

Figure 2. Index of real value per acre of U.S. farmland, 1920-85.



Source: United States Department of Agriculture, Economic Research Service, USDA, CD-90, August 1985, p. 5.

Investing in farm land was profitable during nearly all of the years following World War II up to the early 1980s. Increases is value were particularly rapid during the 1970s. When it became clear that expectations about earnings were not to be realized in the 1980s, farm land prices fell precipitously. Farm real estate was used as security for many of the loans made in times of rising values and high interest rates. Thus, the resulting loss in net worth pushed some farms with relatively high, but acceptable debt-to-asset ratios of 40 to 50% in 1980 into problem loans as debts held constant and asset values were dramatically reduced. The adverse effects were especially significant on crop farms because farm land dominates their asset structure.

Easy Credit Policies

In a boom period when farm investments were substantial and debt was increasing rapidly, easy credit was the rule rather than the exception. Negative real rates of interest combined with investment tax credits to reinforce the natural urge to buy new larger machinery, grain storage facilities, and expand operations. Leadership of the Farmers Home Administration (FmHA) in the late 1970s encouraged additional capital to flow into agriculture in a variety of ways. Direct lending to those who could not qualify for loans anywhere else continued under the auspices of various emergency loan programs and questionable loans of other agricultural lenders were frequently assumed by the FmHA. In short, it may have been "too easy" to take on more debt for many producers in the 1977-80 period.

Tax Policy

Tax legislation providing investment credit and rapid depreciation schedules gave strong incentives for farmers to buy new machinery and equipment and reduce their annual tax burden in the 1970s and early 1980s. Tax loss farming gained notoriety as wealthy individuals wrote off paper or real losses from livestock and other depreciable items against their other income. Tax management became an important component of farm management.

This review of forces which led to the cash flow and credit problems in agriculture is suggestive rather than complete. Another approach would discuss broader forces such as the fiscal and monetary policies which underlay the rapid rise in inflation and the subsequent efforts to curtail inflation; or the changing value of the U.S. dollar that has affected the competitive position of U.S. agricultural products in world trade. One can only conclude that federal policy has contributed significantly to the boom to bust conditions in production agriculture in recent years.

Policy Issues, Alternative Solutions, and Probable Consequences

The following policy issues are among the most important relating to the future availability of financial capital for agriculture.

Who Will Provide Equity Capital and Under What Terms?

Equity capital in agriculture reached an all time peak of $926 billion in 1980 after growing at a 12% compound annual rate in the 1970s (Barkley). By December 31, 1985, equity had fallen to $662 billion, largely because of declining farm real estate values.

These aggregate trends are somewhat misleading since all farm land rented by a farm operator from someone else is treated in the national balance sheet of agriculture as part of the sector's equity capital. Thus, an important component of total equity capital in the farm sector is provided by real estate owners who are not farmers. Farmers operating as part owners have become increasingly important. In 1982, part owners operated 29% of all farms and 56% of all farm land. This compared to 10 and 25%, respectively, in 1935 (Miller).

Equity capital can be provided for production agriculture in a number of ways (Harl, Hughes):

Alternative 1. Owner operators or relatives could provide the bulk of the equity for initial real estate investments and operating capital. Subsequent capital would come primarily out of earnings.

In general, the greater the equity capital provided by the farmer and his family, the safer is the debt capital invested in the business. This safety may come at the expense of investment in new technology. Yet, prudent investment still may be made and cash flow positions will be less vulnerable if prices and costs change rapidly. This type of organization will provide structural stability with a smaller risk of insolvency; part time farming is encouraged; farm expansion will come more slowly.

Alternative 2. Part of the real estate operated is owned by the farmer or his family; a majority of the cropland is rented from nonfarm owners who typically live in surrounding rural communities; the farm operator's equity is partly committed to land and partly to nonreal estate capital such as livestock and equipment.

Under this alternative, debt capital will have less security in terms of assets owned by the farm operator, but farm operators will have greater flexibility to invest in new technology. Cash flow analysis will be central to lending decisions. Relationships between farm operators and owners of rented land will receive increased attention. Individual farm operators will lose some of the security associated with ownership control over a major production resource - land. Ownership of farm land will continue to be widely distributed.

Alternative 3. The majority of farm real estate is owned by nonfarmers; holdings are widely dispersed among former farmers and their families, local businessmen and investors, and groups of individuals who have formed land holding corporations, partnerships, or trusts. Farm operators use most of their equity capital to provide machinery and equipment, livestock, and operating capital.

As farm operators own less and less of the land they operate, their capacity to adjust to changing economic conditions is improved. At the same time, management of the farm becomes more vulnerable to decisions of others since more of the resources farmers use belong to others. Farmers may take less risk under this alternative. More operating decisions will be made by suppliers or marketing firms. The resulting profits and losses likely will be smaller.

Which Farms Will Get Financing And Under What Terms?

A higher proportion of farmers are insolvent or heavily leveraged than at any time since World War II. Much attention has been given to the debt to asset ratios of farmers. However, this is only one financial indicator for farmers and lenders. The ability of a farm operator to have enough cash flow to meet interest and principal payments is much more important but also more difficult to assess (Economic Research Service, Miller).

Debt owed by farm operators at the beginning of 1986 was widely distributed among lending institutions, individuals, and others (Table 1). This distribution is somewhat different from one that would come from the balance sheet of agriculture which also includes real estate debt on land owned by nonfarmers and then rented to farm operators. The major holders of debt are the Farm Credit System, commercial banks, the federal government through the CCC and FmHA, and individuals. Much of the loan portfolio of each lending institution was concentrated on farms with substantial debt.

Table 1. Distribution of debt owed by farm operators, United States, January 1, 1986.

Lender	Percentage of operator loans	Percentage of their loan portfolio owed by operators with over 40% debt to asset ratios
Commercial banks	27	61
Federal Land Banks	22	68
FmHA	15	84
Production Credit Assn's	8	58
Commodity Credit Corp.	7	68
Other individuals	11	60
Others	6	60
Merchants and dealers	2	59
Other farmers	1	72

Source: Financial Characteristics of U.S. Farms, January 1, 1986, Econ. Research Service, U.S. Dept. of Agriculture, Agr. Info. Bull. 500, August 1986, Table 10.

A combination of federal and state policies can significantly affect the number and type of farms in production agriculture.

Alternative 1. Maintain as many farmers in business as possible, extending credit on easy terms with management help where necessary.

Keeping as many of today's farmers in business for as long as possible likely will require debt forgiveness for a portion of total debt and financial help by government to lending institutions for a part of debts forgiven. Welfare of families will be emphasized with less concern about efficiency of production or business strength. The heavy presence of government capital in agriculture will continue either through loan guarantees or direct lending. Structural change in farming will be slowed.

Alternative 2. Make loan safety the primary criterion to insure that loan losses are minimized and that financially strong farmers get priority in lending; weed out the insolvent businesses as rapidly as possible.

In the short run, a substantial number of farmers would cease operations and real estate values will experience further downward pressure. Lending institutions will be further stressed. These policies will hasten farm consolidation and structural change.

Alternative 3. Focus on cash flow analysis in lending decisions, with past business performance and management ability as major factors. Owner equity and accumulation of net worth will receive some, but not overriding, attention. The goal would be to keep the best managers and businessmen in farming.

With this alternative, greater emphasis is placed on production efficiency and management ability than on loan safety. In the long run, this strategy will likely have the greatest effect on structural change because it favors those with demonstrated ability to use capital wisely. Renting of cropland and part owner operations will continue to grow in importance.

What Role Should Federal and State Governments Have in Financing Agriculture?

Federal and state governments have had a significant role in the development of U.S. agriculture. Land was distributed to soldiers after the Revolutionary War and to homesteaders throughout our history, not only by the Homestead Act but by many other land settlement mechanisms. In the twentieth century, when new lands were no longer available, help to beginning farmers who could not get financing from commercial sources gained public support. While individual states have provided financial assistance including direct loans to beginning farmers and limits on taxes assessed on farm real estate, the federal government has become increasingly involved in farm finance.

The Farmers Home Administration (initially the Farm Resettlement Administration in 1935) and the Commodity Credit Corporation have become major suppliers of capital. The growth in FmHA funding is particularly evident since 1975. FmHA's original mission was to extend supervised credit to farmers unable to obtain credit elsewhere at competitive rates. Over time, Congress extended its mandate to nonfarm rural residents and rural communities for such projects as water and sewerage distribution systems. In addition, FmHA extended low interest disaster relief loans to qualifying farmers. More recently the emphasis in FmHA has shifted toward guaranteeing loans of commercial lenders that otherwise would not be made (Barry, 1985).

The Cooperative Farm Credit System, (FCS), which includes Federal Land Banks and Production Credit Associations, is the single, largest lender to farmers. The initial capital for the system was provided by the federal government beginning in 1916. Now, its bonds are sold along with other government agency bonds in the same capital market. In the current financial crisis, the system may need further financial help from the U.S. Treasury to meet its obligations to bondholders. If the federal government provides rescue capital to the FCS, other commercial lenders to farmers can argue they deserve equal treatment. Many small agricultural banks have experienced deteriorating financial performance due to farm loan problems. Anticipated changes in the geographic and legal structure of banking may pose further threats to the future of these banks.

Both short and long run alternatives are involved in considering appropriate roles for state and federal governments in financing agriculture.

Alternative 1. Maintain a strong federal presence in agricultural lending with FmHA accepting or guaranteeing loans to borrowers that cannot meet regular principal and interest payments. Legislation of some form would be enacted to provide capital to commercial lenders to help them reestablish their loan portfolios in a form where a high proportion of borrowers will repay their debts. An easy credit policy to agricultural producers will be continued.

A large number of farmers with difficult debt and cash flow positions will be maintained in business; emphasis in finance will be given to disadvantaged families; less stress will be placed on business performance and long term viability of operations; more public funds will flow into agriculture and the costs to taxpayers will increase considerably. The rate of structural change will be slowed; existing lending institutions will be strengthened.

Alternative 2. Curtail direct government loans to farmers; transfer loans with some chance of being repaid to commercial lenders; make the role of FmHA to be a guarantor of agricultural loans or a mechanism through which disaster loans or any other federal agricultural programs can move capital to existing lenders. A tighter credit policy to agriculture will be established.

A major upheaval in agricultural lending would be required, including a planned withdrawal from direct lending by FmHA over a span of years.

Relationships with commercial lenders and provision of loan guarantees would require maintenance of some field staff by FmHA, but such a substantial change would require much discussion and debate.

Alternative 3. Reduce the presence of FmHA as a major direct lender to farmers and rural communities; discontinue the practice of accepting nonperforming loans from other lenders; return to the mission of supervised credit to beginning farmers. Develop a separate arm of FmHA or create a new agency to provide loan guarantees or capital where necessary to sustain major lending institutions serving agriculture. Consider the creation of a federal agency or a branch of FmHA to acquire farm real estate from lenders when bankruptcy or asset liquidation is required.

The ease of obtaining credit by farmers would be reduced as compared with the situation from 1983-85. Cash flow positions and the ability to repay loans would determine credit decisions. Direct lending by FmHA to farmers would be sharply reduced from 1986 levels. The need for federal capital in some form to sustain agricultural lending institutions would be widely recognized. Debate would center on terms of repayment, controls exerted, and handling of farm assets acquired. Structural change would continue based on farm productivity and effective financial management.

How Much and in What Form Will Government Capital be Provided to Agricultural Banks and the Farm Credit System?

The major farm lenders have been hard hit by financial stress in agriculture. Especially vulnerable are those institutions that specialize in agricultural lending. The capital base in these institutuions has been rapidly depleted, in some cases leading to bank failures, as well as putting severe pressure on the Farm Credit System.

Some form of additional capital will be required if agricultural lenders are to continue to service production agriculture in areas where financial stress has become most difficult.

Alternative 1. Provide minimal government assistance with a loan of capital to the Farm Credit System requiring payment at modestly subsidized interest rates. Encourage larger, stronger banks to take over rural banks when they approach the potential of failure.

Minimal government involvement may lead to increased interest rates to agricultural borrowers relative to other businesses. Farm Credit System customers may have to pay a premium over rates charged by other lenders. The number of active agricultural banks may shrink and branch banking will be encouraged. FmHA lending will grow in importance as a source of credit to agriculture and rural communities.

Alternative 2. Transfer necessary capital from the federal government to the Farm Credit System and create an Agricultural Capital Fund upon which agricultural banks can draw. Control mechanisms exerted over lenders will be held to the minimum possible.

A major input of capital into agricultural lending institutions will not by itself solve their problems. Mechanisms to insure that government capital is used wisely will be demanded by the banking community. Relationships with FmHA and its responsibilities will require substantial attention. More federal control will likely evolve over time.

Alternative 3. Federal funding of the Farm Credit System and agricultural banks will proceed in a careful, regulated manner after substantial study. Mechanisms for repayment will be specified; lending policies will be held under continuous scrutiny; risk-bearing responsibility and centralization of management will be monitored regularly.

A carefully organized infusion of federal capital into agricultural financial institutions will come slowly and painfully for all involved. Controls will seem onerous and will take substantial time to be developed in an effective manner. A number of advisory boards in addition to those already existing will be created to monitor the system. The needs for new or added capital will be seen as greater than the costs and difficulties of required controls and administration.

Adjusting to Change

This discussion has focused on the question of how much capital should be supplied to agriculture. Has public policy in various ways encouraged too much capital investment in production agriculture? The answer depends on your perspective. It is easy to argue that the nation's current capacity to produce surpluses of many agricultural commodities is in part the result of easy credit policies. The current question is what kind of future policy is in the best interest of agriculture and the general public. Many adjustments have been made; many more lie ahead. It is possible to encourage too much capital to be invested in agriculture too rapidly. It is also possible to discourage capital investment when the social benefits from such investment would be large and bring good returns to individual farmers as well. Choices by well-informed individuals weighing the alternatives and consequences should lead to improved public policy and wise investment decisions.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

A RISKY BUSINESS: WHAT'S TO BE DONE?

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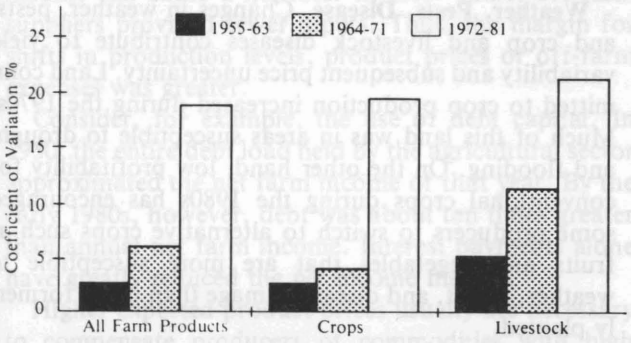
Farming is subject to considerable variability in input costs, quantity of farm product(s) produced, and product prices. Ultimately this variability affects farm profitability, whether measured from the perspective of the entire farming sector, individual commodities, or single farms.

Variability creates both risk and uncertainty. Risk is associated with variability which can be expected based on past experience. Uncertainty is more troublesome, however, because it is associated with variability that cannot be predicted on the basis of past experience.

Economic efficiency is often improved if risk and (especially) uncertainty can be reduced. Reduced risk and uncertainty allow producers to set aside fewer resources to accommodate the unknown. Producers also may be willing to accept lower average farm product prices if variability is reduced. Likewise, consumers benefit from lower average food prices.

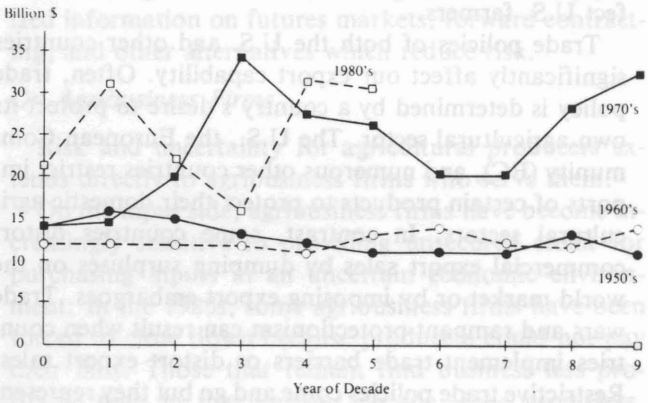
Unfortunately, variability in agriculture appears to be increasing. Both farm product prices and net farm income have been considerably more unstable in the 1970s and 80s than in the 1950s and 60s (Figures 1 and 2).

Figure 1. Variability of U.S. farm product prices, 1955-81.



Source: U.S. Department of Agriculture, Economic Research Service, "Economic Indicators of the Farm Sector," various issues.

Figure 2. Net U.S. farm income, 1950-85.



Source: U.S. Department of Agriculture Economic Research Service. 'Economic Indicators of the Farm Sector,' November, 1986.

What factors have contributed to greater price and income variability? What are the impacts of this variability? As a matter of public policy, should government do more or less to reduce variability? Answers to these questions, especially the last one, will have much to say about who farms in the future.

Forces Causing Variability in Farm Product Prices and Net Farm Income

The Nature of Product Demand and Supply

Price fluctuations in agriculture are in part triggered by the nature of demand for and supply of agricultural products. In the short-run, consumers, especially in the domestic market, maintain consumption of many agricultural products with relatively little reaction to its price. The quantity demanded of the product is said to be "inelastic" with respect to its price. If a product is scarce, consumers bid up its price to assure that they maintain consumption. But if there is a surplus of the product, its price tends to fall drastically.

In the 1970s, demand for a number of U.S. farm products jumped because of vigorous buying from foreign customers. Supplies were relatively short and producers could not immediately respond to increased demand. In the 1980s, however, foreign demand has been lackluster and supplies ample. Thus, prices have fluctuated over a wide range.

An Export Oriented Agriculture

Some of the most important causes of price and income fluctuations in recent years relate to our increasing dependence on agricultural exports. Exports increased more than four-fold during the 1970s, but subsequently fell by 40% from 1981 to 1986. For commodities such as wheat and soybeans, exports in the recent past have accounted for over 50% of annual production. Thus, changes in world supply and demand conditions, and expectations about them, directly and significantly affect U.S. farmers.

Trade policies of both the U.S. and other countries significantly affect our export capability. Often, trade policy is determined by a country's desire to protect its own agricultural sector. The U.S., the European Community (EC), and numerous other countries restrict imports of certain products to protect their domestic agricultural sectors. In contrast, some countries distort commercial export sales by dumping surpluses on the world market or by imposing export embargoes. Trade wars and rampant protectionism can result when countries implement trade barriers or distort export sales. Restrictive trade policies come and go but they represent a major source of uncertainty for U.S. prices and incomes.

Another contributor to variability in export markets is the exchange rate between U.S. dollars and foreign currencies. Since the early 1970s, the exchange rate between U.S. dollars and other currencies has been determined by market forces. As the value of the dollar rises in comparison to other currencies, the cost of U.S. products increases for foreign buyers, other tings being equal. The reverse situation prevails when the dollar falls relative to foreign currencies. Because exhange rates fluctuate in response to many variables, they add to the level of price uncertainty.

Domestic Macroeconomic Policy

Federal spending and tax policy (fiscal policy) and monetary policy as instituted by the Federal Reserve Board have brought added instability to agriculture in the past 15 years.

During much of the 1970s, fiscal and monetary policy accommodated high inflation and relatively low real interest rates. In that environment investments in farm production assets, especially farm real estate, were encouraged. In addition, low interest rates were associated with a low exhange value for the dollar and improving agricultural exports.

Beginning in late 1979, however, monetary policy began to be less accommodative. Interest rates increased as did the exchange value of the dollar. Owning farm production assets became much less attractive in that environment, as manifested by the subsequent drop in farm real estate prices in the 1980s. Producers who made plans for the 1980s on the basis of conditions in the previous decade were especially hurt.

Domestic macroeonomic policies are constantly evolving. The Balanced Budget Act of 1985 (Gramm/Rudman/Hollings balanced budget legislation) is a case in point. Questions remain about how effective this legislation will be in reducing the federal budget deficit. Potentially the legislation could significantly affect such key variables as economic growth, inflation, and interest rates. It also could alter program outlays. Since payments from the U.S. Treasury frequently comprise a significant share of net farm income, any potential reduction creates uncertainty for producers and lending institutions considering long term capital investments.

Domestic Agricultural Policy

Agricultural policy is subject to the imperfections and instability of the political-administrative system, and may introduce more uncertainty into agriculture than existed before government intervention (Just and Rausser). Even though an omnibus farm bill such as the Food Security Act of 1985 is intended to set major policy parameters for several years (in this case, through 1990), Congress increasingly has shown a tendency to make legislative changes in years outside those in which omnibus legislation is to be considered. Moreover, when the 1985 Act expires, there is no assurance that similar legislation will be approved for the 1990s.

The considerable amount of discretionary authority given the Secretary of Agriculture in recent farm bills also causes uncertainty. Price support levels and production adjustment levels are two of the more notable examples of how producers' incomes can be affected by the Secretary's decisions.

Other Forces

Weather, Pests, Disease. Changes in weather, pests, and crop and livestock diseases contribute to yield variability and subsequent price uncertainty. Land committed to crop production increased during the 1970s. Much of this land was in areas susceptible to drought and flooding. On the other hand, low profitability for conventional crops during the 1980s has encouraged some producers to switch to alternative crops such as fruits and vegetables that are more susceptible to weather, insect, and disease damage than crops formerly planted.

Changing Markets for Inputs. In contrast to earlier decades, most inputs for agricultural production are purchased from off-farm suppiers. Sudden changes in input prices can therefore have a dramatic effect on

farm profitability. Petroleum prices, for example, increased substantially in the 1973-80 period, before stabilizing in the early 1980s and subsequently falling in late 1985 and 1986.

Another example is interest rates which are subject not only to basic monetary forces, but the deregulation of credit markets that has occurred in the 1980s. The mobility of capital within domestic markets and into the international marketplace has exposed producers to a new level of financial uncertainty.

Technology Change. The ability of farmers to produce food and fiber depends on the available resources and technology. Recent technological advances that have affected production include energy conservation practices, integrated pest management, new crop varieties, improved water management, and growth hormones. Although many technologies reduce risk (irrigation reduces weather risks), other effects of technological developments are uncertain. A current example of the uncertainty caused by new technology is the potential impact of the bovine growth hormone on milk production and prices.

Impacts of Increased Variability

As farm product prices and net farm income have become more variable, good management has become increasingly important at the production level. Agribusinesses and consumers also are affected by higher production risk and uncertainty.

On Producers

Producers have become increasingly vulnerable to shifts in production levels and prices because a higher proportion of farm expenses (including interest and rental costs) are now cash expenses and must be paid to off-farm suppliers. Net income can disappear quickly if production levels or product prices turn out to be less than expected. For example, if off-farm expenses represent 90% of gross farm income, a relatively small increase in off-farm expenses or reduction in gross farm income can cause a net loss. In prior years, off-farm suppliers provided fewer inputs. Thus, the margin for shifts in production levels, product prices or off-farm expenses was greater.

Consider, for example, the use of debt capital. In 1950, the entire debt load held by the agricultural sector approximated the net farm income of that year. By the early 1980s, however, debt was about ten times greater than annual net farm income. Interest payments alone have greatly reduced the net income margin.

Higher expected product prices usually are necessary to compensate producers of commodities with high yield or price variability. In general, the higher the level of risk and uncertainty, the greater the pay-off needs to be to compensate for it. Producers may also be cautious about intesting in cost-reducing technology unless that technology reduces risk and uncertainty at the same time.

On Farm Structure

The effect of price and income variability on farm size and other structural variables is not conclusive. Some evidence suggests that middle-size family farms, which tend to own a large portion of their land and provide family labor, capital, and management, are better able to withstand price flutuations (Raup). In times of low commodity prices, they tend not to be committed to pay as much in cash expenses and can absorb losses within the farming operation, at least for a time. Other studies suggest that production, price, and income variability increase the incentive for investment and increased farm size (Lin and Ingerson, Robinson, and Johnson and Quiance). Larger farms also may have the sophisticated management and marketing skills to use specialized information on futures markets, forward contracting, and other alternatives which reduce risk.

On Agribusiness Firms

Risk and uncertainty for agricultural producers extends directly to agribusiness firms who serve them.

On the input side, agribusiness firms have become increasingly sensitive to providing unsecured credit for purchasing inputs in an uncertain economic environment. In the 1980s, some agribusiness firms have been forced to close down because producers could not pay their bills. Those that remain find business less profitable than in the previous decade. Like producers, many of these agribusinesses had expanded the scope of their business activities in the prosperous 1970s. Now, excess capacity exists.

Risk and uncertainty provide incentives for vertical coordination in agriculture (Reimund, *et al.*). Forward contracting can diminish price risk to producers, but also may move production decisions away from producers to those responsible for processing and marketing. Vertical integration and contract production have been especially important in the broiler, fed cattle, and vegetable industries. In general, as risk and uncertainty increase with specialized production processes, businesses tend to become linked vertically through a contractual or ownership arrangement. New institutions likely will continue to develop to facilitate risk management through vertical coordination.

On Consumers

Consumers prefer a steady supply of food and fiber products at relatively steady prices. As variability increases at the production level, it tends to be carried through to consumers, especially for products where processing and packaging costs are minimal. However, vertical coordination, market orders, and price stabilization efforts by the federal government have helped reduce food supply and price variability.

Policy Issues and Trade-Offs

Producers, consumers, and agribusinesses may benefit from reduced risk and uncertainty. However, price and income variability have increased in recent years, and there is no indication this variability will be reduced in the immediate future. The possibilities for reducing risk and uncertainty fall in one of two categories: greater direct risk-management responsibilities for government, or new institutions in the private sector.

Should Government Manage Risk, and if so, How? From society's viewpoint, government should help reduce risk and uncertainty in production agriculture if the social benefits of government intervention outweigh the costs and if the benefits of government involvement are distributed as society wishes.

Can Price and Income Supports Help? For many years, the federal government's price and income support programs have helped insulate some farm product prices and farm income from world market price fluctuations. Prices and incomes of food grains, feed grains, cotton, milk, and peanuts are among the products whose prices have been kept from falling as low as they otherwise would have. Government-controlled stocks also may be placed on the market during periods of shortage, thereby reducing sharp upward price movements. Target prices and accompanying deficiency payments have reduced income fluctuations.

While price and income supports have helped reduce uncertainty for producers, agribusinesses, and consumers, not all aspects of these programs may be desirable. Reduced risk of loss has encouraged some resources to remain in agriculture, even when world market conditions indicated an overabundance of agricultural output. Supports also have encouraged some producers to borrow more heavily to purchase land and other assets, putting these individuals at greater financial risk. From government's standpoint, supports have caused the federal government to acquire costly surpluses and to make large payments directly to producers.

What About Subsidized Insurance? All-risk crop insurance, issued through the Federal Crop Insurance Corporation (FCIC) and subsidized by the federal government has removed some of the burden of yield fluctuations for producers. Farmers may elect to insure at 50, 60, or 75% of the farmer's established yield, and choose from different prices on which to base compensation. Premiums vary, depending on the level of production selected and the historic loss experience in the specific farming area.

Participation in all-risk crop insurance has been less than hoped for, in part because some farms with low yield variability have been asked to pay the same premiums as those with high yield variability. A recently developed Individual Yield Coverage (IYC) Plan should reduce this concern over time. However, other government programs, such as price and income supports, compete with crop insurance. In the case of income supports, deficiency payments are based on a farm's historical yield, thereby providing insurance against crop losses.

Price or revenue insurance also could be offered through federal programs (Trechter). Presumably, a portion of the premium would be subsidized. Since such insurance has not been offered in the past, it is difficult to assess all of the potential ramifications.

In the case of price insurance, it could offer producers protection for a variable over which they have little control. Moreover, the premium cost could conceivably be linked to past management decisions. On the negative side, adjusting premiums for changing risk situations would be an imperfect process, resulting in either low producer participation or unexpectedly high costs for government.

Revenue insurance could be offered for a single crop or a whole farm. The primary advantage of revenue insurance is that it would potentially stabilize a variable (revenue) which is more closely related to producers' main interest (income) than other insurance programs. However, if revenue is insured on a single crop, there is a likelihood of a moral hazard. That is, a producer may be inclined to tend an uninsured crop more closely than the insured crop. In addition, actuarial tables for revenue insurance do not exist and would be difficult to specify, in part because losses associated with unexpectedly low prices are not independent events among producers. Thus, even though a more risky crop should pay a higher premium than the same coverage on a less risky crop, such premium differences would be difficult to establish.

Whole-farm revenue insurance would avoid some of the single-crop problems, but it too has drawbacks. Again, it would be difficult to establish actuarial tables. Revenue insurance which provides the same level of total income for agriculture as current farm programs cannot exist without major government expenditures.

Are Disaster Subsidies a Good Alternative? From 1974 to 1981, the federal government provided an extensive direct subsidy program for producers who could not plant their crops or experienced low yields because of natural disasters. However, as a result of legislative changes in all-risk crop insurance in 1980, the direct disaster payment program is being phased out. In addition to its cost, critics of direct disaster payments charge that such payments substantially remove producers from risk management responsibilities.

Other disaster programs have been operated on the basis of the federal government providing subsidized loans. In the past, the Economic Emergency Loan Program has offered loans at subsidized interest rates to certain farmers financially harmed by economic events out of their control, such as the U.S. wheat export

embargo to the Soviet Union. The Emergency Disaster program of the Farmers Home Administration has made subsidized loans available to producers within designated disaster areas. A problem with both programs has been their history of high rates of loan repayment delinquency (Trechter). In effect, they frequently have become outright government grants rather than loans.

Can Trade Liberalization Help? One study has shown that much of the price variability in internationally traded products is due to trade barriers among nations, and if these barriers were reduced, private traders and marketing firms would hold supply and price stabilizing reserves (Johnson). Price instability would remain, but it would be significantly reduced. This analysis underscores the importance of the new round of General Agreements on Tariffs and Trade (GATT) negotiations which begin in 1987.

Without trade liberalization, the study indicates that only through the joint effort of the largest grain exporters can international price stability be achieved. Price stability, within a range, might be obtained by establishing commodity reserves, taking commodities off the market during times of low prices and releasing them when prices increase. However, if price changes were held within fairly narrow limits, say 25%, the cost of the reserve program could be greater than the benefits derived from more stable prices.

Might Government Purchases Tied to Farm Prices Work? New government purchase, storage and sales policies have been proposed as ways to reduce price variability. One such proposal calls for government purchase of a specified amount of a commodity for each one cent per unit drop in the market price below a certain level (Just and Rausser). Conversely, the government would sell stocks for every one cent per unit increase above a certain level. Buying and selling could be in physical units such as bushels. Alternatively, buying and selling futures contracts might accomplish the same price stabilizing objective with far less storage, administrative and other costs.

This alternative is more responsive to price fluctuations than current fixed loan rates. However, such intervention would need to be designed carefully to avoid distorting futures markets' price discovery function. Its success would depend on specifying the appropriate levels that trigger government sales or purchase of commodities and the rate of sale or purchase.

Should New Risk-Reducing Institutions Be Developed in the Private Sector?

Given the imperfect manner in which government programs and policies have reduced risk and uncertainty in the past, an alternative is to provide additional opportunities to reduce risk and uncertainty in the private sector. Producers, acting as individual managers, already can do a number of things to reduce variability:

- Diversify into several enterprises that tend to have off-setting patterns of production and price variability.
- Choose production practices that reduce the likelihood of a crop being hurt by unexpected weather conditions.
- Lease a higher proportion of land and equipment, thereby reducing the possibility of asset devaluation.
- Increase the use of cash forward contracts, futures contracts, and futures options contracts.
- Participate in cooperatives and other mutual self-help organizations that reduce risk and uncertainty for individual members.
- Find off-farm employment for one or more members of the family.

The following price stabilization proposals would require changes in current institutions:

Extend Marketing Orders. Marketing orders regulate the quantity or quality of specified products that may be marketed. Jointly sponsored by industry and government, market orders stabilize supplies, prices, and producer incomes. Marketing orders currently are available only for commodities designated in the Agricultural Marketing Agreement Act of 1937. These include specific fruits, vegetables, nuts, and milk.

It is conceivable that marketing orders could be extended to additional commodities if producers of those commodities made a strong case to do so. However, current market orders have been attacked by some government officials and consumer groups because it is alleged that order significantly disrupt market flow and unnecessarily raise prices. Market orders also would be more difficult to operate for crops grown widely such as wheat and corn.

Extend Futures and Options Markets. Current futures and options markets do not extend to all agricultural commodities. Nor do these markets provide opportunities to protect prices much beyond one year into the future. Thus, the suggestion has been made to extend the scope of futures and options trading.

The trading exchanges (for example, the Chicago Board of Trade) generally favor expanded trading as a matter of principle. However, in order for trading to occur, a market must have both buyers and sellers. If there is relatively little trading interest from a speculative standpoint, a futures or options contract is almost impossible to establish. Realistically, the opportunities for increased price stabilization from futures and options markets probably are not large.

Establish Forward Contract Markets. An increasing number of farm products are produced under contract. However, there are no competitive markets for these contracts except for cotton. Where contracts are available, they are for the most part private treaty agreements. In short, contracts reduce uncertainty for participants, but not the system as a whole.

An institution that would encourage contracting might be created. Such an institution could be a national electronic market in forward contracts between producers and buyers. A national electronic market could provide price and terms of trade information to all. It would provide information not available in the futures market because only contracts intended for delivery would be negotiated.

The major difficulties associated with a national electronic contract market are to account for unexpected production shortages or quality variation in such a manner that both buyers and sellers have confidence in the system. However, with patience and persistence on both sides, this problem probably could be overcome.

Adjusting to Change

Fluctuations in agricultural prices and incomes significantly affect agricultural producers. In recent years, these fluctuations have tended to increase, and there is little hope that price and income variability will disappear in the future. The increased integration of agriculture into the national and international economies implies that agriculture is more vulnerable to forces affecting those economies than in the past. Technological change in agriculture is proceeding at an unprecedented rate, and although some technological advances can reduce yield variability, other uncertainties are created because we don't know what the impact will be on production and price. Agricultural policy causes uncertainty as Congress reacts to crisis situations such as farm financial stress in the 1980s, and as administrators make discretionary changes within the legislative authority granted them.

Yes, agriculture is a risky business. But no clear, generally agreed upon answer emerges as to how to respond to risk. Several approaches have been taken to reduce risk, but for one reason or another no single solution to the problem has emerged. New proposals to reduce risk and uncertainty have been made, but are untried.

In most of the new proposals, there is more reliance on individual producer action to manage risk. The transition from current policies could be painful for some. Perhaps a different blend, with more private and less public responsibility is the most likely direction for risk management over the next few years.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

CONSUMER DEMAND FOR AGRICULTURAL PRODUCTS IN THE U.S.: A MOVING TARGET

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The way Americans live, work and eat has changed over the past 30 years. Thirty percent of meals are eaten alone. Sixteen percent of dinners and 41% of lunches are eaten away from home. New lifestyles and new information about linkages between diet, health and longevity have changed consumers' preferences for various types of food. Changing preferences, rising incomes, and changing relative prices have resulted in consumers demanding more variety and convenience, fewer calories, less animal fat, more lean protein, and more fruits and vegetables.

Changes in domestic food consumption patterns have implications for agricultural producers, processors, consumers, and taxpayers and raise key policy issues including:

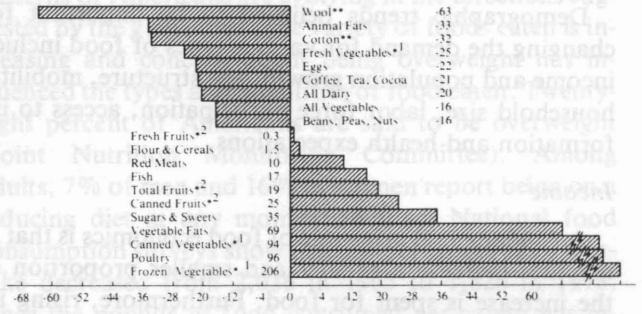
- What guidelines should be provided relative to health and nutrition and food safety and quality?
- What is the impact of farm price and income support policies on consumers' food and tax costs, especially for foodstuffs already in excess supply?
- What are the implications of changes in food consumption patterns, especially those induced by government, on the future structure of agriculture?

Changes in Domestic Food and Fiber Consumption

Changes in income and relative prices, as well as demographic, social, and educational trends influence consumption patterns of food and fiber.

Figure 1 illustrates the change in per capita consumption of major food and fiber groups between 1960 and 1984. These long-term trends reveal little change in fresh fruits and cereals, but significant declines in animal fats, especially in the form of eggs and dairy products. Consumption of the natural fibers, cotton and wool, also declined dramatically. Large increases occurred for vegetable fats, processed vegetables and poultry. Within each of these categories, diverse consumption patterns have evolved for individual food products. For example, beef increased 22.3% over the 24 year period, but has declined 16.7% from its peak consumption in 1976. Refined cane and beet sugars declined 31% while corn syrups increased 658%. Counteracting a general decline in dairy was a 161% increase in the per capita consumption of cheese and a 1700% increase in yogurt. A widespread perception that the consumption of fresh fruits and vegetables is increasing is based on a 23% increase in fresh fruit and a 66% increase in fresh vegetables since 1972 when their per capita consumption was at an all-time low.

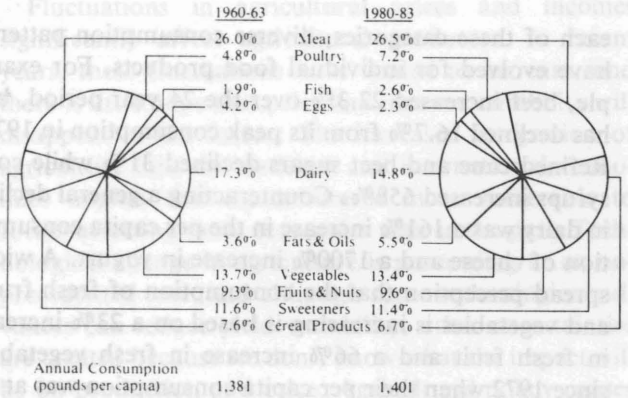
Figure 1. Percentage change in per capita consumption of major foods and fibers in the United States, 1960-1984.



Source: U.S. Dept. of Agriculture 'Food Consumption and Expenditures,' Statistical Bulletins No. 565 & No. 736, and 'Background for 1985 Farm Legislation,' Bulletins No. 466 & No. 476.

Figure 2 may not seem to imply dramatic changes in food patterns between 1960 and 1980. However, a 1.9% decrease in the share of total food consumption attributable to eggs means a decrease of about 63 eggs per person per year. Given the growth in the population between 1960 and 1980, this translates into 1.2 billion dozen fewer eggs demanded in 1980 than would have been the case had the pattern of food consumption not changed. For poultry a 2.4% increase in the share of total food consumed translated into an increase of 7.7 billion pounds more chicken and turkey being consumed in 1980 than 1960. Hence, small percentage changes in the mix of foods being consumed generally imply large changes in the quantities of foods sold.

Figure 2. Twenty year change in food consumption patterns.



Source: U.S. Department of Agriculture, Economic Research Service.

Forces Changing Consumer Demand

Demographic trends believed to be important for changing the demand for various types of food include income and population growth, age structure, mobility, household size, labor force participation, access to information and health expectations.

Income

A fundamental priniciple of food economics is that as incomes increase a smaller and smaller proportion of the increase is spent for food. Furthermore, rising incomes tend to decrease the responsiveness of the quantity demanded to changes in price. Middle and upper income people purchase about the same quantity (though not the same quality) of food regardless of small price changes. They also spend a significantly smaller proportion of their incomes for food. For example, upper income households in the United States spend about 11% of their incomes on food, while lower income households spend 40% or more.

Real per capita disposable income rose about 2.5% per year over the past 30 years in the United States. A 2.5% increase in aggregate income led to about a 0.7% increase in real food expenditures. During the 1980s income growth slowed. One factor was the relatively higher growth rate in low paying service sector jobs compared to higher paying manufacturing and professional jobs. As aggregate real incomes rise more slowly, factors other than income will be increasingly important for explaining and predicting changes in food demand.

In those households where incomes do rise, however, consumers will demand a greater variety of foods and more convenience in their delivery and preparation. Forty-two percent of the food dollars spent by U.S. households is for food prepared and eaten away from home (FAFH). Since 1954, real expenditures on FAFH have increased twice as fast as expenditures for food prepared at home (2.7% vs. 1.3% per year). While the rate of increase in FAFH expenditures is expected to slow in the next decade, FAFH consumption will continue to be popular.

Although studies disagree about the impact of rising incomes on the demand for specific foods, there is general agreement that rising incomes increase the demand for meat substitutes, cheese, nuts, fresh and frozen fruits and vegetables and their juices. In contrast, the demand for fluid milk, cream, cereals, sugar, variety meats, eggs, and potatoes is **not** expected to increase with rising incomes (Smallwood and Blaylock).

Increasing Population

Increases in the overall demand for food in an affluent country depends largely on an increase in population. The United States' population growth has averaged about 1.3% per year for the last 30 years but is expected to grow at half that rate over the next 30 years. Consequently the rate of growth in domestic demand for feedgrains to be fed to livestock will slow. Since increases in the efficiency with which animals will use feed will offset increases in the per capita consumption of animal products, the increased domestic need for feed grains is expected to be about the same as the rate of growth in the population - less than 1% per year (Burbee, *et al.;* in Kinsey).

Aging Population

The number and proportion of elderly persons in the population continues to increase. By 2030, more than 20% of the population is expected to be over age 65 with an increasing number over age 80. The median age was 30.6 years in 1982, an all-time high, and is expected to be 40.8 by 2030. In addition, the elderly segment of the population is increasingly healthy, affluent, and predominantly female.

An aging domestic population has several implications for food consumption patterns. Elderly persons typically: (1) spend relatively more for poultry, fruits,

vegetables, bakery products, and cereals; (2) spend relatively less for milk, soft drinks, and red meat; (3) spend a smaller portion of their food dollars eating out, and (4) spend less per person for food since daily caloric needs decline with age. For example, the recommended daily allowance of calories for women drops from 2100 at age 19 to 1650 at age 65.

Mobility and Ethnicity

Increased immigration, regional migration, foreign travel, and a growing proportion of nonwhites in the U.S. population increases the variety of foods consumed. The nonwhite population is growing twice as fast as the white population. Nonwhites spend less per person on food in general, but more on pork, fish, eggs, and poultry. By the year 2000, three out of five Americans could be living in the South and West. If current regional food and eating habits continue, food expenditures away from home will increase even further, as will expenditures on fruits, vegetables and fish. The growing popularity of Mexican, Oriental, and Italian and other ethnic foods reflects an increasing preference for variety that is expected to continue.

Decreasing Household Size

The average household size has decreased from 3.8 persons in 1940 to 2.7 persons in 1985 and is projected to decline to 2.4 persons by the year 2000. Nearly a quarter of U.S. households have only one member while 55% have two or fewer members. Factors influencing this trend are lower birth rates, increased divorce rates, marrying later or not at all, and increased longevity.

Studies show that smaller households: (1) spend 44% more per person on food; (2) spend a larger portion of their food budget for convenience including food away from home (singles spend up to 50% of their food dollars eating out); (3) consume relatively large quantities of poultry, fruits, vegetables (except potatoes), cheese, fish, soft drinks, and bakery products (except bread and cereal); and (4) consume relatively small amounts of fresh dairy products, pork, beef, eggs, sugars, sweets, and processed vegetables (Smallwood and Blaylock; Sexauer and Mann).

Women in the Labor Force

Almost 70% of women age 25-44 are in the labor force and 73% of them worked full-time in 1986 compared to 86% of working men. The time spent in the labor force is declining for men but studies show that women still do the majority of housework. Relative to men, women are losing leisure time, that is, time not working in the home or working for a wage. The main impacts of these trends on food consumption patterns result from the increased value of time and higher household income.

Households with working wives had average median weekly earnings 51% higher than households where only the husband worked; one-fifth of working wives earned more than their husbands in 1984. The increased income and decreased leisure time in dual earner households increases the demand for variety and convenience in foods. As a result, increased demand for relatively inexpensive and fast service restaurants and for carry-out foods has occurred in the FAFH sector. More men are shopping for groceries and doing some cooking. These trends have affected food retailing practices but there is little evidence about how it impacts foods purchased. Single men are known to eat out more and buy more convenience foods and more meat than the average food shopper (Sexauer and Mann).

Health and Educational Forces

Recent research has heightened awareness of the relationship between diet, health, and longevity. Food habits change slowly but health related trends are apparent - specifically a decline in the consumption of fresh whole milk, red meats, and eggs following increased information about cholesterol. Increased consumption of cheese and some seafoods defy these health concerns but the relative increases in poultry, whole grains, fruits, and vegetables support them, as does the growing per capita consumption of vegetable oils versus animal fats. These changes in the preferences of American consumers are partly attributable to education. The publication of "Dietary Guidelines for Americans" by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services has been a major force in this educational process. The seven guidelines suggest: (1) eating a variety of foods, (2) maintaining a desirable weight, (3) avoiding too much fat, especially saturated fat and cholesterol, (4) eating foods with adequate starch and fiber, (5) avoiding too much sugar, (6) avoiding too much sodium, and (7) limiting the intake of alcoholic beverages. There is evidence that the eating patterns of Americans are evolving in the directions suggested by the guidelines. The variety of foods eaten is increasing and concern about being overweight has influenced the types and quantities of food eaten. Twenty-eight percent of Americans are said to be overweight (Joint Nutrition Monitoring Committee). Among adults, 7% of men and 16% of women report being on a reducing diet at any moment in time. National food consumption surveys show that the per capita calorie intake decreased from 2,036 in 1965 to 1,826 in 1978. Since the pounds of food consumed per capita has increased (Figure 2), intake of higher caloried foods must be on the decline.

Consumption of cereals and flours (starches) appears to be holding steady (Figure 1) while an increase in fruits and processed vegetables should help increase the amount of fiber in the diet. Studies done by the Food and Drug Administration show significant increases in the number of persons who buy low sodium foods but dietary intake data on sodium or fiber has yet to be

tracked over time. Although alcoholic beverage consumption increased 33% since 1964, most of the increase has been in beer which has considerably lower alcoholic content per volume than wine or distilled spirits. Americans have increased their total per capita intake of fats by 6% and sweets by 35% but the composition of the fats and sweets has changed in the directions suggested by the dietary guidelines. Between 1960 and 1984 the proportion of total fat attributable to vegetable fats and oils increased from 58 to 78%. The proportion of caloric sweeteners attributable to refined cane or beet sugars dropped from 86 to 46%.

Impacts of Changes in Domestic Food Demand

Consumer preferences for convenience, variety, fewer calories, less animal fat, lean protein and more fruits and vegetables are changing the mix of foods bought in the domestic market. Farmers cannot assume that all food produced is desired by the consuming public or that consumers have the capacity to eat the quantities of food being supplied. These changes will impact production decisions, farm prices, incomes, marketing practices, and the structure of the agricultural production sector, especially for those producers who depend heavily on domestic demand.

Farm Prices and Income

Farm prices and income from basic agricultural commodities such as grains depend less on trends in domestic food consumption than on national farm policies and macroeconomic conditions, international trade, and world food demand. However, to the extent domestic food demand does impact on agricultural commodities, it likely will be in the form of downward price pressure on commodities such as feed grains, fed beef cattle, and milk.

Declining per capita consumption of red meats in the form of steaks, chops, and roasts suggests a decreasing demand for feed grains. Increased consumption of poultry and hamburger, a substitute for corn fed beef, tends to push corn prices down and limits relative price increases of fed-beef and pork (Cornell and Sorenson). The continued consumption of poultry and the use of high fructose corn sweeteners in soft drinks partially offsets this trend by using large quantities of corn.

USDA studies indicate that the domestic demand for feed grains will only grow at about the rate population increases. Yet, government (CCC) and farmer owned reserve stocks of food and feed grains and manufactured dairy products are substantial and growing. Other *things equal, farmers specializing in commodities with* excess supplies can expect lower income growth than those specializing in commodities in which domestic demand is growing. Disregarding government income support payments, farmers who specialize in crops such as fruits and vegetables, poultry and fish, or those who tailor farm commodities for specialized processing and retail markets are likely to find good price and income opportunities.

Structure of Agriculture

The trend in recent years toward a distribution of a relatively few very large farms and a large number of very small farms will continue. More branded fresh foods (fruits, vegetables, meats) will increase contract farming and make it increasingly difficult to market surplus commodities on generic commodity markets. Food processors, retailers, fast food chains, and the institutional trade are continuing to vertically integrate up and down the marketing chain via contractual arrangements. These arrangements increase the opportunities for logistical control, risk management, and market power.

The types of food eaten in restaurants and the specific food characteristics required by various types of food service establishments will affect the magnitude and nature of farm level procurement. FAFH suppliers typically provide food products aimed at specific types of consumers, e.g., leisure diners in luxury restaurants, college students, travelers, or families with young children. Such food products are often heavily advertised and promoted, implying at least a tacit commitment to the continuous availability of foods of consistent quality. FAFH merchandisers thus will place demands on their providers for products that meet their special requirements. Through contracts or agreements, specification buying increasingly will extend back through the supply channel to the farm. Markets for many farm products, in turn, may become specialty markets with few, if any, alternative buyers. This contrasts sharply with mass markets that have typified trading in basic commodities in the past.

Production for specialty markets will increase the need for sophisticated farm management and marketing skills. The production of specialty foods, without assured markets, entails considerable price and income risk. Size economies in production, marketing, and coordination of specialty products may induce differential impacts by region and size of operation. Market access could become more problematical for many smaller or autonomous farm operations.

Agribusiness firms

Agribusiness firms should continue to profit from research and development on new products, market segmentation, and product differentiation. Advances in the technology of flavors, colors, emulsifiers, food substi*tutes, and additives as well as production processes and* packaging will enhance the abilities of agribusiness firms to adjust to consumption trends.

Agribusiness firms and food processors are likely to maintain sizable research budgets to document and/or alter product characteristics and to promote or attack

research on health issues such as the cholesterol linkage to heart disease or the benefits of calcium for diminishing the effects of hypertension, osteoporosis, and colon cancer.

Nutrition, health, safety and quality concerns will continue to demand that agribusiness firms and food retailers provide information about food product characteristics both in procurement (grades and standards, health and safety inspections) and marketing (nutritional and ingredient labeling and advertising). To provide these products, agribusiness firms will demand more precise specifications of farm products.

Issues and Trade-offs

What Guidelines Should be Provided Relative to Health, Nutrition, Food Safety and Quality?

Continued emphasis on personal health, nutrition, food safety, and quality raises several policy questions about how guidelines are set for these matters.

- The U.S. Department of Agriculture and the Food and Drug Administration have turf battles concerning dietary needs, health and safety guidelines, and product specifications. Will these need to be resolved in the interests of protecting consumers?
- Industry supported research in these areas has become an essential strategic weapon to defend product characteristics and image. Will these research results need to be verified by independent and neutral research entities?
- Federal guidelines and recommendations as well as consumer behavior ultimately reflect research findings. How will the process by which health related research is funded, evaluated, and disseminated impact on its usefulness to consumers and producers?
- Continuous reevaluation of grades and standards, federal/state inspection procedures, and labeling requirements for a wide range of food related products will continue to be demanded as a public service. How much are we willing to spend for information about our food? What is the most effective way for this information to be transmitted?
- Voluntary regulations and standards are being advocated by both government and private firms. Can they be put in effect more quickly than government standards? Will they have credibility?

What is the Impact of Farm Price and Income Support Policies on Consumers' Food and Tax Costs?

An overriding policy issue concerns the role of the U.S. Government in subsidizing the production of agricultural commodities that are in excess supply and are expected to remain so in the foreseeable future. It is generally believed that agricultural price support policies that have encouraged abundant production have favored consumers in the market place by putting downward pressure on food prices. Except during the 1940s and again in the 1970s real food prices have fallen throughout this century. The portion of household incomes spent on food has fallen as well.

On the other hand, programs which have sought to limit the quantity of certain foods in the marketplace tend to raise both their farm and retail prices. The indirect costs of food and agricultural policies to consumers have been estimated at about $7 billion per year (Heien, in Kinsey). Other estimates show that if the government were to stop all attempts to keep surplus food and fiber off the market, the farm price of commodities would fall 15 to 20% over a three- to four-year period and the price of food (particularly meat) would decrease about 3% (Johnson, *et al.*). Of course, if price and income supports which accompany acreage reductions were also dropped, then many excess production resources would eventually leave the industry, bringing production more in line with use.

Consumers also pay taxes to support commodity price and income support programs. These costs rose dramatically in the 1980s, averaging about $18 billion per year in the 1981-1986 period. A roughly equal amount was spent on food and nutrition programs, primarily food stamps. In the 1981-86 period, these food and agricultural programs cost the average U.S. household $350 to $400 per year in taxes.

A major policy question arises regarding taxpayers' willingness to pay for price supports on commodities that are in excess supply. If these costs are minor compared to potentially higher food prices and/or alternative public costs of unemployment and retraining, they may be justified. There is a strong possibility, however, that such justification will be called for in the future by taxpayers who are predominantly nonfarm in background and are increasingly removed from their agrarian heritage.

In the face of abundance, policy options involve cutting back supply or expanding demand. The effectiveness of policies to expand domestic food demand for domestic agricultural commodities will be limited since most Americans are eating as much as they want and in some cases more than they should.

Domestic food aid programs targeted at nutrition and income deficit population sub-groups help reduce surplus commodities and improve health and nutritional well-being. There is some concern that direct commodity distribution significantly displaces commercial sales and, therefore, does not increase total demand. Available evidence indicates some displacement has, in fact, occurred especially in the sale of cheese and margarine (Zellner and Traub). When measured against the gains in health and nutritional status among the target populations, however, displacement of sales may or may not be considered a policy problem.

What Role Will Government Have in Altering Consumption Patterns and the Structure of Agriculture?

Government policies could foster more research leading to development of technologies that increase the desirable characteristics of food. For example, decreasing the cholesterol content of eggs and beef or increasing the nutrient characteristics of snack foods may help bring healthier food to consumers as well as improve the balance of supply and demand.

Not all producers, however, will have the capacity to produce these specialized and innovative products. Producers who cannot adopt quickly will not benefit - and may even be hurt - by such developments.

Some suggest that research and development of nonfood uses of agricultural commodities hold hope for expanding demand. Perhaps the most prominent of these efforts has been the production and sale of ethanol, a gasoline additive derived mostly from corn. In 1985, 240 million bushels of corn were converted into 625 million gallons of ethanol. However, questions remain about whether this is an economically viable use of corn without government tax subsidies (USDA, 1986).

It is possible that economically viable nonfood uses of agricultural products will be found but it should be noted that research and development of new technologies that are economically viable take a long time to perfect. They are hardly a short-term solution for farmers suffering from low prices and incomes.

Another option would be to pursue policies based on nutritional needs. In essence, this would entail providing government support for agricultural commodities that contributed the most to human nutrition and were in the highest demand. Dropping price supports for commodities in excess supply and those that contribute little (or negatively) to nutrition would be a radical departure from historical policy goals and procedures. It would cause large dislocations in agricultural production and profitability in the short run. It is an idea, however, that offers an optional framework for future food and agricultural policy.

Policy options responding more directly to changing domestic demand include providing incentives for farmers to switch into commodities for which there is a growing demand. There are some obvious geographical and agronomic problems with this. It is tantamount to occupational retraining and (literally) retooling for many farmers. This has potential for success as long as the total quantity of specific foods that can be consumed is kept in mind. It would be just as easy, for example, to overproduce broccoli as wheat.

Adjusting to Change

Domestic food consumption trends respond to changes in demographics and preferences for product characteristics. Evolving concerns about nutrition, health, safety, food quality and lifestyles that demand convenience and variety make domestic food demand something of a moving target. Although it is always dangerous to predict tomorrow's events from yesterday's, the total domestic food market is expected to grow about as fast as the (declining) rate of population growth. The variety of foods consumed and the mix of farm commodity and marketing services embodied in the food consumed suggest a declining share of farm value in the food dollar. The possibilities for expanding total domestic food consumption will be limited.

The government will undoubtedly continue to play a major role in ensuring an abundant, nutritious, and safe food supply but the policy instruments for achieving these goals may vary. Consumers' and taxpayers' willingness to pay for various types of food and agricultural policies will depend not only on their cost, but on how equitably distributed they appear to be. The merits of subsidizing the production of commodities for which there are limited markets will be examined more closely. The alternatives of paring down supply to meet demand or expanding demand to use up the supply both pose difficult adjustment problems. Short of a miraculous expansion in exports, however, these difficult policy choices must be made.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

TRADING FOR PROSPERITY IN AMERICAN AGRICULTURE: A POLITICAL PIPEDREAM OR A PRACTICAL PLAN?

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International trade is critical to the agricultural economy of the United States. In the 1970s it contributed to farm prosperity and in the 1980s it has contributed to farm despair. Key issues regarding international trade are:

- How can domestic policies affecting agriculture be structured to support, not discourage exports?
- How can international trade barriers be reduced?
- What is the proper U.S. role in the economic development of other countries?

Forces Causing Changes in Trade

U.S. agricultural trade is affected by a wide range of forces, some of which help, while others harm our trade balance.

Technology

Adoption of new technology has stimulated growth in agricultural productivity throughout the world in the past 15 years. If this growth continues at past rates, the world's producers may continue to produce more food and fiber than consumers can afford to buy.

The source of much technological change in developed countries (DCs) will be genetic engineering and other biological advances leading to more productive animals, and, perhaps to a lesser extent, higher yielding plant varieties. Many less developed countries (LDCs) also will be to apply new technologies to agricultural production. Even in the absence of such capabilities, they can increase yields significantly through more widespread use of existing technology.

Comparative Advantage and Production Costs

The United States has not lost its ability to be price or cost competitive in world agricultural markets, although it is weaker than it was in the 1970s (Dunmore). Thus, there is still the opportunity for the United States to continue to be a major factor in world agricultural trade. However, the product mix and level of trade have changed and will change further.

Other countries have combined modern technologies, particularly for labor-intensive crops, with low cost labor and land to make a competitive impact on trade. Examples include wheat produced in France, corn in Argentina, orange juice concentrate in Brazil, textiles in China, tomato paste in Turkey, and vegetables in Mexico.

Population Growth and Distribution

World population is expected to expand by 1.8 billion persons over the next 20 years, with 1.6 billion added to the population of LDCs and 200 million added to DCs (Food and Agricultural Organization of the United Nations). This will add significantly to global food needs and further accentuate the importance of LDCs as potential markets for food.

Economic Development and Income Growth

Economic growth rates in the mid 1980s dropped and the rate at which they will recover is uncertain. As problems creating the drop are resolved, average annual growth rates in real personal income per capita ranging from 1.5% to over 3% are expected in various world regions (International Monetary Fund). Market opportunities will be good in many regions but the ability to pay for food imports will continue to be inadequate in areas where population increases are greatest. This will focus attention on economic development programs as a means to improve incomes in poorer countries and thus to stimulate import demand.

Macroeconomic Factors and Policies

The dollar's value declined five out of six years following its devaluation in 1971 because low or negative real interest rates made dollar investments unattractive. The reverse of this happened after 1981 when macroeconomic policies brought inflation under control and large federal government budget deficits boosted the demand for dollars.

Trade suffered. From 1981 to 1985 the U.S. dollar appreciated by more than 40% in trade-weighted real terms, U.S. agricultural exports declined by one-third and agricultural imports increased by 19%. Although U.S. soybean prices declined from $7.73 per bushel in 1980 to $5.98 in 1985, the price to German buyers actually increased from DM 15.8 per bushel to DM 18.4 per bushel. As a result, U.S. sales to West Germany declined. Similar developments occurred in other markets for U.S. farm products.

The dollar began a significant decline in 1985 against currencies such as the yen, deutsche mark, and pound sterling. However, it continued to increase against the currencies of principal competitors such as Australia, Canada, and Argentina. Thus, the United States did not gain an exchange rate advantage in seeking to increase its share of world agricultural trade. The price effects of dollar devaluation vis-a-vis selected importers were masked further by global over-production and excess supplies, weak economies, and counter strategies by other exporters.

LDC debt, accumulated during the latter half of the 1970s, had a negative impact on agricultural imports from the United States during the 1980s. LDC purchases declined by $4 billion between 1981 and 1985, accounting for 28% percent of the drop in U.S. farm exports during that period. As LDCs reduced imports, they also sought to increase exports in order to earn "hard" currencies needed to service debt. This, in turn, increased competition for U.S. products in export markets.

Public Policies Affecting Trade

Many trade policies are designed to insulate domestic markets and producers from international competition (Blandford). Protection is prevalent in the global trade of food products (Table 1). Major buyers of U.S. products, such as the European Community (EC) and Japan, use a variety of devices to protect their domestic producers from foreign competitors. The United States, in turn, uses protective regulations or agreements to limit the imports of dairy, meat, sugar, textiles, and other agricultural products.

Table 1. Major nontariff barriers on food and beverage imports in selected industrial countries, 1981.

Type of barrier	Country					
	France	Germany	Italy	Japan	U.K.	U.S.
	Percentage of imports affected					
Import licensing	11	14	1	9	—	38
Variable levies	40	39	44	—	44	—
Global quota	—	—	—	—	—	26
Country quotas	2	—	3	—	—	—
Other quotas	15	9	21	12	3	41
Other quantity restraints	22	—	4	—	—	—

Source: International Monetary Fund, "Developments in International Trade Policy," Washington, DC, 1982.

Trade policies and other policies often are in conflict. Export embargoes on U.S. agricultural commodities tend to reduce the credibility of the United States as a reliable supplier. The Food Security Act of 1985 implicitly subsidizes U.S. grain exports at enormous expense to the economies of countries such as Canada and Australia, competitors in wheat trade but important political and economic allies. Another example where policies may be in conflict is the agreement the United States has with Israel to trade better access to U.S. speciality crop markets for strategic military objectives.

Institutions Affecting Trade

Many institutions affect trade although their impact is difficult to measure. The General Agreement on Tariffs and Trade (GATT), is perhaps the most prominent of these institutions. It is the mechanism for developing "rules of the game" for world trade. Its benefit lies in its role as a forum in which countries may negotiate their trade interests and attempt to settle disputes. Its principal drawback is its inability to enforce trade regulations and settle disputes. The U. S. has traditionally been a strong proponent for the adoption of GATT rules that reduce barriers to trade among member nations. Particular emphasis will be given to agricultural products in new negotiations scheduled to begin in 1987.

The World Bank, International Monetary Fund (IMF), the Agency for International Development (AID), the Food and Agricultural Organizations of the United Nations (FAO) and similar agencies influence trade both positively and negatively. The long term effect of their economic development projects is to increase the demand for food and fiber products and the level of world trade. Some countries and product groups gain because export demand is increased, but others lose because of newly developed competition from subsidized agricultural sectors. In the short run, the necessity to export farm products to insure debt repayment and economic stability may continue to reduce U.S. export opportunities.

The Net Effect of Supply and Demand Trends

The continuation of current supply and demand trends will lead to more intense competition in world trade as major producers vie for market share. This suggests higher trade levels, but relatively low prices; more market uncertainty; increased policy conflicts; and aggressive food aid programs.

Policy Issues and Options

Export trends from 1981 to 1986 reflect the interaction of economic and political forces. World grain production expanded in the face of stagnating demand. Grain stocks grew to a record 338 million metric tons at the end of the 1985-86 marketing year with the United States holding more than 50% of the total. Grain trade dropped to the 200-225 million ton range annually and U.S. agricultural exports dropped more than $17 billion in five years.

The interaction of U.S. and foreign policy will strongly influence agriculture's response to these trade problems. Moreover, resolution of problems will be ineffective over the long run if we fail to recognize the economic realities of shifting competitive advantage between countries, the compelling need to adjust the level of resources used in agriculture, and the dismal results achieved by applying short run remedies to long run problems. Resolution will involve trade-offs between the interests of groups within and outside the agricultural sector.

How Can Domestic Policies Affecting Agriculture be Structured to Support, Not Discourage Exports?

Domestic policy choices that might be made in response to international trade concerns are wide-ranging. Each choice would bring results that would please some, but not others. Three examples of potential policy choices are:

The drop-out solution. The argument for dropping out of agricultural trade is similar to that for political isolation. Proponents of this solution argue that the United States should look after its own food needs, just as it should take care of its own political needs. The immediate effect would be the loss of product sales from millions of acres and an accompanying drop in land values, employment, and related economic activity. An export embargo might be needed to prevent individuals from seeking foreign markets. To complete the picture, import bans would be required on competitive products to allow U.S. producers to fill the nation's needs. The economic and political costs of such a policy would be substantial. The production of nearly one farmer in three would be displaced.

Restructuring of the farming sector also would be expected. If exports were eliminated by trade restrictions, the most competitive farmers would be the expected survivors. If, on the other hand, trade is halted as a consequence of rigid production quotas on individual farms, the structural implications would be a product of the political and legal decisions made regarding how the quotas are distributed.

Separating price and income supports and income policy. A basic objective of farm policies throughout the world is to assure an adequate income for farmers. Price and income supports, based on the level of production, have been used to achieve this objective. Unfortunately, supports need to be set at a high level to have a meaningful impact on the income of small scale producers. It is evident in the U.S. and the EC that high support levels have not solved the income problems of all farmers. At the same time high supports appear to have encouraged excess production, created surpluses, and distorted trade.

Another way of dealing with income problems is to make direct payments to those with inadequate income. This might be through a "negative" income tax for those farmers with incomes below a specified target level. This could diminish the need for export subsidies and other devices to deal with high internal supports and surplus production.

Monetize the debt. A recent study evaluated the likely consequences to U.S. agricultural exports of an easy money - inflationary policy (Rausser). The study suggests that if 15% of the federal deficit was monetized each year, it would produce good results for exports of basic commodities over a 4-year period. Projected exports of wheat and feed grains in 1988/89 would be higher than in any year during the 1980s. The model does not project beyond 1989, but after that point such a policy might have adverse impacts such as a return to "double digit" domestic inflation rates. To the extent that such a policy would generate another boom in commodity exports, it could again provide a viable, if short term, market for basic agricultural commodities.

How Can International Trade Barriers Be Reduced?

Suggestions for reducing international trade barriers span a range from GATT negotiations to threats of increasing domestic tariffs.

GATT negotiations. Participants in the eighth round of multi-lateral trade negotiations under GATT will focus on reducing the level of agricultural protection worldwide (including protection arising from domestic agricultural policies), liberalizing trade in LDC tropical products, and lowering tariff barriers in forestry and fisheries products. A major question to be addressed is whether countries will partially dismantle or significantly modify farm programs that restrict trade. Questions for U.S. negotiators include what parts of U.S. policies and programs can or should be given up in return for concessions by other countries.

Improve the existing system. Two options stand out for improving the present international agricultural trading system. They are revamping the GATT and

changing the procedures followed by the U.S. International Trade Commission(ITC).

The GATT does not provide a system for timely and equitable resolution of trade conflicts nor a means for enforcing compliance. However, these changes in procedures could help:

- Mandate a mediation role for the Director General of the GATT.
- Develop a process for binding arbitration.
- Establish mandatory time tables for dispute settlements.
- Change voting rules to prevent single country vetoes of panel-recommended dispute settlements.
- Establish a procedure for dealing with arbitrary technical standards that become a barrier to trade.

Changes could be made in U.S. trade procedures as well. For example, the requirement that U.S. firms must prove damage from illegally subsidized imports in order to claim relief could be revoked. Legislative action also could define rules and standards for the ITC that recognize the cyclic and seasonal nature of agricultural production.

Reciprocal tariff policies. The development of a reciprocal tariff policy is affected by several factors:

- Trade does not occur in identical commodities.
- Most existing tariffs are bound under the GATT.
- Most favored nation agreement requires non-discriminatory treatment of trading partners.

Since changes require compensation under GATT rules, it is unlikely that a universal reciprocal tariff system could be developed without completely rewriting the world's tariff structure. Some changes might be achieved under bilateral negotiation but these would tend to undermine the GATT and could lead to further and less desirable changes. The question for policy makers is whether the risk is worth it.

What is the Proper U.S. Role in the Economic Development of Other Countries?

The U.S. may want to reexamine its role regarding LDCs and continued support of global agricultural development. It is sometimes argued that transfer of U.S. food production technology to developing countries makes them more self-sufficient and leads to a reduction in food imports and the displacement of American farm products in third country markets. Others maintain that economic development and agricultural development are closely linked and that food production actually stimulates food imports. The latter conclusion is supported by numerous studies that demonstrate that economic development is the machine that produces the income needed to pay for imports. It is clear, of course, that some commodity interests gain and some lose in the development process.

Impeding technology transfer. The advantage to U.S. producers of not sharing our technology with other countries, is that our producers would be protected during the time required by foreigners to develop an equivalent or better technology. The disadvantages are that it would foster an improvement in foreign research and development activities and that it could deny U.S. access to newly developed foreign technologies.

Implementation of such a policy would be difficult. While it might be possible to restrict the activities of university and other public sector researchers to prevent them from consulting on foreign projects, it would be extraordinarily difficult to restrict private sector organizations in this regard. It would require a fundamental change in public policy to prohibit the education of foreign scientists in U.S. universities and other exchanges of knowledge.

Food aid and development. Food aid is seen as a humanitarian policy designed to alleviate suffering. From a selfish standpoint, it provides an outlet for surplus production without fostering competition for U.S. food producers. However, it does little to stimulate the longer term economic development that generates the income necessary to convert future food need to effective demand for food and fiber products.

Economic aid and development. Economic aid is a much more sensitive political and economic issue. Recent U.S. policy has been to shift the burden more to international agencies such as the World Bank with the expectation that stringent financial controls will be applied. These expectations are often ill-founded because borrowing countries are no more willing than the United States to deal realistically with debt problems. This alternative has an advantage in being less expensive for the United States than those projects financed exclusively by the United States. However, U.S.-financed projects can be chosen to more nearly reflect U.S. political as well as economic interests.

Adjusting to Change

World agricultural trade will increase over the next two decades in response to larger populations and higher incomes. Trade shares will change as new producers emerge, relative costs shift, and government policies intervene. The critical policy issue for the United States is how to respond to these changes in a way that is compatible with its agricultural goals.

The U.S. trade share will depend on costs of production and marketing relative to competitors, the impact of government policies affecting trade, and changes in the dollar's value. That share will be higher if costs are low and not offset by trade barriers or currency fluctuations or if government price subsidies are high and not matched by competitors.

Many of the cost advantages held by U.S. agriculture have been eroded by rapidly spreading technology. It is argued that an unrestricted "free market" orientation to U.S. agriculture would help regain these advantages and would allow the United States to compete effectively in world agricultural commodity markets. Even if

domestic policies supported such an orientation, its success would depend on policies adopted by foreign producers.

To the extent that the U.S. can aggressively negotiate for a reduction in foreign subsidies and trade barriers, then trade might flow according to economic comparative advantage. Economic efficiency would dictate the number and size of U.S. farms and would favor the growth of large and technologically advanced producers at the cost of smaller sized farms. Within this trend, however, may be the opportunity for small but efficient bulk commodity producers to serve export markets and remain relatively independent of the increasingly coordinated domestic food system.

If foreign subsidies and barriers cannot be negotiated down, then the success of a free market policy would depend on a political willingness to subsidize the difference between world commodity prices and costs of production. The battle for trade shares would become a contest between national treasuries and national commitments to agriculture. This is the situation that faced world agriculture in the mid-1980s. It leads toward more protectionism and probably would cause a further drop in the U.S. share of world trade.

The United States faces important policy choices as it adjusts to the changed structure of world agricultural trade. The following questions summarize some of these choices.

Should the United States drop out of agricultural trade altogether and concentrate on its own food self-sufficiency? What policies would be necessary to do this?

Should the United States decouple prices from income policy and leave pricing to the international market? What policies should protect small farms and rural communities?

What concessions should the United States be prepared to make in order to gain changes in GATT rules and procedures?

Should the United States move away from GATT and towards more bilateral or multilateral trade arrangements?

What is an appropriate U.S. role in global agricultural development that is consistent with export enhancement?

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

LAND, SOIL, AND WATER FOR AGRICULTURE: WHOSE INTERESTS WILL COUNT?

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From a national perspective, neither the lack of natural resources nor environmental regulations will be a constraint on the nation's total agricultural production in the next decade. However, in many regions and localities, specific natural resource and environmental issues will help determine agriculture's future.

Urban competition for water will determine whether irrigated agriculture will continue to exist in some parts of the West. Urban competition for land will be important for the future of agriculture in counties near urban areas in all parts of the country, but particularly so in New England, Florida, and parts of the West. Soil erosion control policies, such as those contained in the Food Security Act of 1985, could remove land from production in several regions of the country. Environmental regulations to protect the quality of surface water or groundwater also could restrict agricultural production in some regions.

Agricultural production may be phased out in some local areas, and shifts may occur in the amount and type of production among regions. Some farms will disappear as land or water is used for urban growth or as soil conservation or environmental regulations make farm operation unprofitable. In short, conflicts over natural resource or environmental issues will be extremely important for some producers, even if the overall implications for agricultural production are not large.

Forces Which Affect Natural Resource Allocation and Utilization

The Market vs the Political System

Natural resources are allocated to different uses through both the market and the political system. Each system plays a distinct role in allocation.

The market allocates natural resources to different uses, depending on which potential buyers are willing and able to pay the prevailing price. Occasionally, a buyer or seller is able to control a large enough share of a particular natural resource to influence the price, such as happened after formation of the international oil cartel in the 1970s. Some natural resources are unique in quality, quantity or location and the owner is able to demand a high price. However, this does not keep the laws of supply and demand from applying to natural resources just as to any other commodity.

The political system establishes the rules for market interaction and defines who has what property rights in the resource. For example, the political system establishes the laws that define who has rights to water in a stream, determines how water rights can be sold, and limits owner's or user's ability to use the water for disposal of wastes. Land is sold through the market but the use of land is restricted by the laws of nuisance, zoning regulations, and sanitary codes.

The political system is an important factor in the use of natural resources is that the market does not take into account all impacts of natural resource use. Using a natural resource in farming may affect others who are not involved in the farm operation. Yet, the resource user has no economic incentive to take account of the effects of his resource use on others. The effect of livestock production and manure run-off on downstream water quality is a good example.

In other cases the use of the natural resource has some effect on future generations who are not present to have their wishes represented in market prices. For example, soil erosion may decrease the quality of the land base left to future generations, but the owner has little economic incentive to take account of the productivity effects of erosion unless the effects are reflected in market prices of land or in decreasing productivity and income. For these and other reasons, government and the political process have always been important in determining natural resource use.

Technology

Agriculture's use of natural resources will be directly affected by technological change over the next 10 years. Some technological change can be considered "land-saving" because it allows the same output to be produced using less land. Examples are the use of improved crop varieties, better pest control systems, and improved fertilizer placement techniques. Other innovations, such as minimum tillage farming, have helped conserve the soil. New technology can also increase the efficiency of water use. A good example is drip irrigation systems that allow decreased use of water for crop production. In the next decade or two, technological change will probably increase agricultural productivity even more. At least part of this technological change is likely to help save land, soil and water resources.

Issues and Trade-Offs

Agriculture faces some important issues with respect to both the availability of natural resources and their relationship to the environment.

Will We have Enough Land?

The most basic natural resource for American agriculture is its land. Citizens have two basic concerns about agricultural land: (1) some worry that the agricultural land base may not be adequate to meet future demand for food and fiber or that land may become so scarce that opportunities to enter farming will be limited, and (2) urban competition for agricultural land may limit agriculture's future in some areas of the nation.

Land Adequacy. Between 1949 and 1970 land in crop production decreased steadily from 387 million acres to less than 340 million acres. This reflected both the post-war decline in demand for U.S. farm products and the adoption of new technology that made it possible to maintain or increase crop production levels while using less land.

Things changed quickly after 1972. Rapid increases in export demand, inflation, competition for land from nonfarm uses, and several other factors combined to cause a sharp increase in cropland use, farm real estate prices, and the rate at which agricultural land was converted to urban and other uses. Cropland increased to a record 391 million acres in 1981 and average values increased 15.8% annually between 1972 and 1981. From 1981 to 1986, however, agricultural exports dropped 40%. Land prices declined. Commodity stocks increased. Several provisions of the Food Security Act of 1985, including the conservation reserve program, were designed, at least in part, to remove land from agricultural production.

The U.S. clearly has enough cropland to meet future domestic demand. Whether the cropland supply is adequate to meet a high level of export demand in 50 years or so is less certain, but there are many policy options to help with any necessary adjustments. Growth in land-saving technology can be influenced by public investment in agricultural research. Water and energy costs and the use of chemicals in agriculture also can be influenced by public policy.

Urban Competition for Land. Regardless of the future adequacy of the U.S. agricultural land base, protection ranks high on the political agenda of some elected officials and their constituents. People are concerned over urban competition for agricultural land for several reasons. Some farmers simply want to continue to farm and do not want nearby development to interfere with their operation. Some agribusinesses do not want to lose customers. Others are concerned about the cost of sprawling development patterns. Many urban people regret the loss of nearby environmentally desirable areas or even open scenery.

Federal, state, and local governments have enacted programs to discourage conversion of agricultural land to nonfarm uses. Policies range from new uses of traditional planning and zoning powers to efforts to buy development rights, limit government actions that would encourage conversion, and provide incentives to local governments to preserve agricultural land. Even so, it is clear that farms on the urban fringe will continue to be displaced.

Agricultural land policy is controversial. People disagree about how land ought to be used, and they disagree on whose opinions should be heeded when land use decisions are made. Key questions are: Who holds what rights in property? What is fair to the landowner? What is fair for the whole community or to future generations?

State and local governments likely will continue to act as the major non-market forces influencing the outcome of competition for land between agriculture and urban uses. The manner in which this competition will affect agriculture in the future depends on state and local land use policy and how that policy is carried out.

Is the Soil Eroding Too Rapidly?

Soil erosion will be a major policy issue for U.S. agriculture in the next decade. It is possible that soil conservation policy could lead many farmers to change the way they operate their farms. It also could shift production of some agricultural commodities to other localities. From a national perspective, it is unlikely that soil erosion in the next decade will pose a major threat to the ability of U.S. agriculture to meet domestic and export demand. However, the long-run effects of soil erosion are uncertain. The productivity gains from applying new technology in agriculture have greatly exceeded the productivity loss from soil erosion. But on thin soils, future technological change may not offset the inherent loss in productivity from soil erosion.

Soil erosion increased after commodity prices increased in 1973-74 in response to rapid increases in U.S.

farm exports. Production on existing cropland was intensified, pasture and grassland was converted to cropland, and many wind and water erosion control practices and structures were abandoned. Erosion increased greatly, and led to a policy debate over soil conservation policy.

The two major outcomes of the debate were that soil conservation expenditures should be targeted to land with the greatest erosion problems, and farmers who participate in federal price and income support programs should be required to practice at least some minimal level of soil conservation. Both of these ideas are contained in the Food Security Act of 1985. The conservation reserve program (CRP) is designed to remove the most highly erodible lands from production through 10-year agreements with farmers. Another provision discourages the conversion of highly-erodible land to crop production (the "sodbuster" provision). It also requires soil conservation plans for highly erodible land already in production. Producers who do not meet these requirements will not qualify for farm program benefits. The "swampbuster" provisions similarly restrict farm program benefits for those who drain wetlands for crop production.

Over time, these conservation provisions of the 1985 legislation could affect the regional distribution of crop production. Eventually, it is possible that crop production will shift away from areas with concentrations of highly-erodible lands. To the extent that resulting conservation practices do not blend well with management practices on large farms, this could be a factor limiting future growth in the size of crop farms. The CRP will include land in all parts of the nation, but areas and regions with a higher proportion of highly-erodible lands will eventually have a larger share of their agricultural land in the CRP.

Important questions with respect to soil conservation policy remain to be answered: Does a landowner have the right to erode the land? Does he/she have the obligation not to erode the land? Who should pay for soil conservation — producers, citizens through taxes, or consumers through food prices? Should good conservation practices be an eligibility requirement for participation in farm programs? Will soil conservation requirements be a factor in determining who survives in farming? Answers to these questions are expected to evolve slowly, although it would appear to be a good bet that there will be more emphasis on good soil conservation practices in the future than in the past.

Will We Run Out of Good Water?

Agriculture faces many water resource issues. Quantities available for agriculture will be limited in some areas by urban competition, in others by increased cost of pumping groundwater. Water quality issues, stem from concerns about the effect of erosion or salinity on surface water quality and from concerns about chemicals in groundwater.

Water Quantity. While irrigated cropland accounts for only about 10% of cropland in the United States (41 million acres), it accounts for more than 25% of the value of all crops produced. The importances of irrigation varies among states: California irrigates 87% of its harvested cropland, but such cornbelt states as Illinois and Iowa irrigate very little cropland.

Recent growth in irrigated acreage is partly explained by the fact that irrigation technology improved, making irrigation more versatile and effective. Second, as pesticides, fertilizers, machinery, and land grew more expensive and more productive, the returns for having sufficient moisture at the right time became greater. In many cases, investment in modern machinery and chemicals could be justified only if a reliable supply of moisture could be assured.

Irrigated agriculture accounts for almost half of all withdrawals of freshwater and more than 80% of all consumptive water use in 17 western states. Renewable water supplies locally are inadequate to satisfy that level of water demand in some areas for precisely the same reason that water demand for irrigation is so strong in the first place - it doesn't rain much in the west compared to the moisture requirements of most crops. The result is a depletion or "mining" of available groundwater supplies on a large scale in the southern Ogallala Aquifer region of western Texas, Oklahoma, and Kansas; the Gila River Basin portion of southern Arizona; and several of the agricultural valleys of central California.

Agricultural development in the west received a boost from the federal government many years ago with passage of the Reclamation Act of 1902. By 1982 water from 150 Reclamation projects irrigated nearly 12 million acres in 17 western states. Historically, irrigation water from these projects was provided at prices below the total cost of delivery. Clearly, farmers who have gained access to water from these projects have enjoyed a substantial advantage over others. Congress recently has criticized the apparent inconsistency of federal programs that, on the one hand, try to restrict production and, on the other hand, increase the productive capacity of the agricultural resource base.

An important issue involves the rules about who gets project water and how much they must pay for it.

Some people have argued that irrigation use rights to water from publicly funded water projects should be limited to small and medium-size farms. However, some irrigation technologies may not be practical on small operations.

In some western parts of the country miners and farmers developed a water rights system based on the doctrine of prior appropriation - the first person to use the water had the future right to use it. In more recent years, Indians have begun to assert rights to water, based on the argument that the United States, in creating Indian reservations, also reserved water sufficient

for the reservation. Increased pressure to recognize these claims is significant because the claims arise with water in basins that have been fully appropriated under the prior appropriation system. The two legal bases for claims on water are in conflict.

Competition for water between agriculture and other uses operates partly, or sometimes totally, through the political system. The areas of most intense competition in the future likely will be in the same areas in which large urban populations compete with agriculture for water now - the arid west, especially Arizona and southern California, the front range of the Rocky Mountains, and parts of Florida. For the major agricultural commodities this competition is not likely to greatly affect aggregate production or have any great impact on commodity prices. In local areas, the competition could easily displace all agricultural production as water is diverted to urban use. In the long run the geographic distribution of production could shift toward areas where rainfall is sufficient to produce crops now grown with irrigation. However, given the large amounts of capital already invested in irrigation, little reduction in total irrigated acreage nationally is likely in the short run, except in areas affected by lowered water tables.

Water Quality. Major water quality issues facing agriculture in the next decade are: (1) salinity, in conjunction with irrigation in the west; (2) surface water pollution from agricultural run-off and soil erosion; and (3) groundwater pollution from leaching of agricultural chemicals and wastes.

Salinity is a major concern in parts of the West. In water used for irrigation, sodium and other salt content increases as water evaporates or is used by plants, or as the water passes through soil that contains soluble salts. About 25% of the irrigated land in the West is affected by salinity problems but salinity prevents production or greatly reduces productivity on only a small percentage of the land. The effect on some individual farms may be severe. Management practices can reduce the effect of salinity and affected producers who can develop and/or adopt such practices will have an advantage. A related policy issue is whether economic incentives or regulations should be adopted to control salinity problems and if so, should they be targeted to specific classes of farms (for example, mid-size farms)?

Surface water pollution from agricultural run-off has several negative effects on downstream water users. For example, public water supplies could become polluted and require costly measures to purify drinking water. Run-off degrades water quality for the recreational user and can accelerate the process of lake eutrophication. Toxic run-off can harm animal life especially aquatic species. A major policy issue is the extent to which individual producers should be required to reduce agricultural pollutants from run-off.

Groundwater pollution has occurred in many areas of the nation, especially where irrigation is used extensively on sandy soils. Farmers' own drinking water may become contaminated, along with the wells of many neighbors and surrounding communities. Once polluted, groundwater resources may require many years to recover.

There are many ways to attack groundwater problems. One is to improve our understanding of how agricultural chemicals interact with compounds in the soil and design chemicals to reduce the probability that the chemicals will reach groundwater in a harmful form. Second, farmers can improve their management practices to decrease chemical usage or change the timing, amount, or methods of use to reduce the possibility that the chemicals will reach groundwater. More research on the effects of chemicals, more detailed product labeling and better enforcement of use guidelines and restrictions could help reduce the likelihood of pollution. In areas with potential contamination problems, restrictions could govern amounts, timing, and methods of application. In areas with actual pollution problems, use of certain chemicals could be limited or banned altogether. Regulations can also be used to limit development or chemical use in sensitive groundwater recharge areas or in special problem areas. Taxes could be imposed to discourage use of particularly troublesome chemicals, or could be used to generate funds to compensate those whose drinking water is harmed by pollution.

There are numerous policy options for dealing with agriculture's effect on groundwater quality. The major questions are: (1) Who is responsible for maintaining groundwater quality? Individual citizens, the local community, the county or state, or some/all of the above? (2) What regulations, if any, should be used to protect groundwater? (3) Who should be liable for damages caused by the use of agricultural chemicals? Producers, manufacturers, distributors, no one?

Will Environmental Regulations Dictate Who Farms?

Environmental restrictions will continue to affect agricultural activities but these regulations should have relatively little effect on the total output of major crops, especially from a national perspective. However, pesticide restrictions may change the production system for individual crops, forcing the use of a less effective or more expensive pesticides, or restrict farming to those who have demonstrated competency in the use of chemical pesticides. It is possible, for example, that groundwater pollution from pesticides will eventually force major changes in the type of crops or the production systems used in areas with deep sandy soils where irrigation or heavy rainfall produces fairly rapid leeching of pesticide or residues. The effects of environmental regulations may be extremely important for some individual farm operations or for localized areas.

Adjusting to Change

Natural resources should not pose a significant constraint on total agricultural production from the national perspective. However, local and regional effects of particular natural resource issues may be quite significant for individual farms, local areas, and the structure of agricultural production.

But American agriculture and natural resource use are also affected by events in the world economy, as our recent experience with international trade has illustrated. Anything that changes the competitive position of U.S. producers can have strong price and profit ramifications. For example, pesticide restrictions in the production of specialty crops could affect the ability of U.S. producers' to compete with foreign producers. Strong export demand can lead to high farm commodity prices, and neutralize the incentives for soil conservation that are incorporated in price and income support programs. Energy prices, which are determined internationally, may affect the profitability of irrigation, which in turn may influence the geographic distribution of production of various commodities in the United States.

The effect of natural resources on agriculture's future also depends on some fundamental worldwide relationships between man and the biological and physical environment. If the burning of fossil fuels and the resulting "greenhouse effect" bring significant climatic change, the availability of natural resources for agricultural use might change greatly. The nation and world may be faced with a very different level of scarcity than is now the case. This would mandate the development of new farming technology, with all of its attendant implications for the future structure of American agriculture. Also, the relationship between agriculture and natural resources in the U.S. may be quite different with a world population of 10 billion than it is today with a population of less than 5 billion.

For the next decade or two, it appears that natural resource and environmental issues will affect agriculture largely through the interaction of agriculture and the political system. It seems unlikely that natural resources will have many singular, nationally significant effects on agriculture through market forces. Agriculture uses many natural resources, and agriculture's future will be shared with other parts of our society that also seek to use those same natural resources in different ways. The conflicts over natural resources use will be largely resolved in the public policy arena. Resolution of these conflicts seems sure to have important implications for who farms in the future.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

AGRICULTURAL PRODUCTION CAPACITY: HOW MUCH IS TOO MUCH?

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Commodity surpluses and the plight of financially stressed agricultural producers have received much attention in the 1980s. Though the direct causes of stress may vary from producer to producer, a major contributing factor has been excess agricultural production capacity. When excess capacity exists, the price of a commodity in the open market is too low—without government intervention—to cover out-of-pocket production costs, debt-servicing costs, and at the same time provide a reasonable return to equity in land and equipment, labor, and management for the average producer.

Excess capacity in American agriculture is not new. After World War I, demand for food and fiber dropped. The introduction of tractors and other new technology began to improve agricultural productivity. With the exception of periods during and immediately after World War II and again in the 1970s, excess capacity has been a continuing problem since then.

Many observers believed that American agriculture finally had overcome the excess capacity problem in the 1970s. In fact, as trade in grains and oil seeds expanded. Much attention was given to the possibility of chronic world food shortages. However, by the early 1980s, key indicators of agriculture's financial status began to drop below expected levels. Increasingly, the problem appeared to be long-term, worldwide excess capacity.

Excess capacity in agriculture is the difference between potential supply and commercial demand at prevailing prices. The measurement of excess capacity depends on three things: production potential from acres removed from production by government programs; noncommercial exports, such as those under the PL-480 program; and unsold output (stocks). For the 7-year period, 1979 through 1985, excess capacity for U.S. agriculture is estimated to have averaged 6 percent of production (Dvoskin). However, excess capacity for seven major crops (wheat, corn, oats, barley, sorghum, cotton, and soybeans) averaged 13 percent and for dairy products, 9 percent of production. Overall, the real (inflation-adjusted) value of excess capacity in the recent 7-year period was significantly greater than when the previous peak in excess capacity was reached in the 1960s.

What Causes Excess Capacity?

Any change in the economic environment that contributes to long-term increases in production or shortfalls in demand may cause excess capacity. Equally important are the unique characteristics of agricultural production, particularly with respect to the type of competition and resource commitments.

Changes in the Economic Environment

In the 1970s, the rapid expansion in international demand and other factors provided incentives for expansion of domestic production. The subsequent investment in land and equipment could not be sustained in the economic environment of the 1980s. Excess capacity in the current decade is the product of several factors:

- Domestic farm price and income support programs continued to encourage high levels of production after market incentives began to decline in 1981.
- Domestic monetary and fiscal policies generated low real interest rates and high inflation in the 1970s, followed by high real interest rates and low inflation in the 1980s. As a result, the economic incentives first encouraged, but then penalized investment in agricultural land and other production resources.
- The exchange value of the dollar in international trade rose to high levels in the early 1980s. This discouraged foreign customers from buying U.S. exports and encouraged competitors to produce more. When the exchange value of the dollar declined from its peak in 1985, global excess capacity remained.
- Advances in agricultural productivity continued to increase in the U.S. and elsewhere. As a result, some nations that were once food importers became food exporters.
- World economic growth in the first half of the 1980s averaged 2.7% annually, well below the 4.4% annual growth rate for 1968-77. This slowdown in

economic activity has reduced the purchasing power of importers generally. The problem has been especially acute for importing nations with substantial international debt and shortages of foreign currencies. Other nations increasingly have emphasized food self-sufficiency and protectionism.

The increased reliance on international markets has altered the effectiveness of domestic agricultural programs. In the 1960s, most of our agricultural production was used in domestic markets. Production controls created higher prices and incomes. In the 1970s and 1980s, however, a larger share of U.S. production is available for international markets. Reducing domestic production may not increase prices if competitors increase their production to fill in the gap. Therefore, the effectiveness of our ability to reduce excess capacity is reduced and depends in part on decisions made by others over which we have little control.

Unique Characteristics of Agriculture

The causes of excess capacity also are rooted in the goals of producers, the nature of technology adoption, and the types of resource commitments made by producers.

The Fallacy of Composition. The incentives and actions of individual producers are often contrary to the goals of the group as a whole. This is referred to as the "fallacy of composition."

While it may make sense for producers as a group to reduce excess production capacity to increase commodity prices, each individual producer has a strong incentive to maximize returns and produce at full production. For most commodities, no producer or producer group controls a large enough share of production to affect the price.

For example, a single midwestern corn or wheat producer cannot push prices up by cutting his/her production. Thus, in the absence of supply management programs, the individual producer has little incentive to reduce production capacity even if excess capacity is known to exist. To do so would mean selling less without higher compensation.

Often, a similar contrary relationship exists between the goals of individual exporting nations and the community of nations that export. A single nation may try to increase its market share and (raise domestic income and employment) by subsidizing exports. However, if a number of exporting nations adopt this strategy, global excess capacity is increased and income is transferred from exporting nations to consuming nations.

The Technology Treadmill. Competition encourages agricultural producers to adopt new technology as it becomes available. The essence of the word "competition" implies a process for testing different approaches to determine which method of production survives in the market place. Because new technology reduces production costs or allows additional production without increasing costs, those who are early adopters benefit. As more adopters respond to this economic incentive, production capacity increases and prices fall.

In a competitive system, the profit from increased productivity eventually may decline to zero. However, the capacity to produce will be larger than it was prior to the introduction of the technology, or some resources (land, labor, capital and management) will have been forced out of production.

Rigidity of Fixed Assets. Tractors and specialized farm equipment often have few uses outside of the agricultural use for which they were designed. Most agricultural land has few uses beyond crops and rangeland. Farm labor may also have few equivalent opportunities outside of agriculture. As a result, once resources are committed, they tend to become "fixed" and stay in agriculture, even if returns are low for an extended period of time.

In a similar vein, some producers and their families have shown a willingness to remain in agriculture in spite of low or negative farm incomes received over many years. These producers may simply accept low returns or rely on off-farm income. They choose to farm in spite of excess capacity.

Impacts of Excess Capacity

One way to measure the impacts of excess capacity is to compare recent returns to resources to historical returns (Table 1). Total returns to equity in farm assets fell dramatically in the 1980-84 period after having been at historically high levels in the 1970s and at moderate levels during the 1950s and 1960s.

Returns on farm assets also may be compared to alternative investment opportunities. In the 1950s, total returns to a portfolio of common stocks were more than double returns to farm assets (Lins). In the 1960s, common stocks averaged a one percent higher return than agricultural assets. In the 1970s, returns on common stocks averaged a negative 4.5 percent compared to large gains occurring in agriculture. But by the 1980s, common stocks were again recording large gains while agriculture sustained losses.

Table 1. Returns to Equity in Farm Assets, Excluding Operator Households, Averages for Five-year Periods, 1950-84.

Period	Residual Income to Equity	Capital Gains to Equity	Total Return to Equity
		-percent-	
1950-54	4.5	0.5	5.0
1955-59	2.6	4.3	6.9
1960-64	3.8	3.1	6.2
1965-69	3.8	3.0	6.8
1970-74	5.6	6.7	12.3
1975-79	3.3	9.4	12.7
1980-84	1.4	-7.0	-5.6

Source: USDA-ERS *Economic Indicators of the Farm Sector, National Financial Summary, 1984.* ECIFS 4-3, p. 75.

In short, returns to investments in agriculture have been higher than common stock during only one out of the past four decades. Furthermore, because investments in production agriculture are not easily withdrawn and moved to other economic endeavors, the losses become magnified when excess capacity exists.

Impacts by Commodity. Excess capacity varies by commodity. In recent years, excess capacity has been most noticeable for such commodities as wheat, feed grains, cotton, rice and milk. The federal government has spent record sums of money on programs that are designed to support incomes of those who produce these commodities. However, carryover stocks for many of these commodities reached new highs in the mid-1980s.

Beef cattle, swine and poultry producers in turn are affected by excess capacity in the grain sector through lower feed prices. This encourages more meat production. The supply of meat also can be increased by excess capacity reduction in the dairy diversion and dairy whole-herd buyout programs.

Impacts on Individual Farmers. The impacts of excess capacity also vary among individual producers. In particular, those who produce in sufficiently large volumes to take advantage of all economies of size will receive higher returns to resources than those who do not. As a result, programs that support prices tend to provide more aid to those with the lowest per unit costs of production.

To the extent that excess capacity reduces commodity prices, it is harmful to those producers who have large amounts of debt to be serviced. Because high levels of farm debt are not confined to any particular farm size group, the resulting stress due to excess capacity also is not confined to any one farm size.

Impacts on Agribusiness. Agribusiness firms primarily are concerned about the volume and market share of production inputs to be purchased or the volume and market share of agricultural commodities to be marketed. They are less concerned with commodity prices, at least initially. As excess production occurs, agribusiness profits may at first be helped by larger production volumes. However, if excess production persists, it tends to create excess capacity in the agribusiness sector as well or cause concern about whether producers can pay bills owed to agribusinesses.

Generally, agribusinesses favor reducing excess capacity by attempting to expand demand. Large production reduction programs typically are opposed because agribusiness volumes and margins may be dramatically reduced. However, concern about production reduction programs may be moderated if low farm profitability creates a rising number of unpaid customer accounts.

Impacts on Consumers and Taxpayers. Consumers may benefit from excess capacity because it assures that an ample quantity of quality food products will be available at reasonable prices. The existence of excess capacity provides a measure of security and stability because production can be rapidly increased in the event of war or catastrophe.

Finally, excess capacity affects taxpayers because farm price and income support programs are funded through the U.S. Treasury. In 1986, these programs cost $26 billion. While this was a record amount, the U.S. spent a higher percent of the total federal budget on farm programs in the 1960s.

Issues and Trade-Offs

The various impacts of excess capacity raise several issues.

Is Long-Term Excess Capacity Acceptable?

Equity and efficiency questions are often raised in conjunction with excess capacity in agricultural production. Excess capacity may be acceptable if the distribution of income is deemed more important than economic efficiency. Some persons believe that excess capacity is not only acceptable but may be required to maintain traditional values, family farms and the social and economic stability in rural areas.

Others argue that excess capacity in agriculture should be reduced. The primary basis for this argument is that resources should be used in the most efficient way possible. If returns are low, resources should be encouraged to move to alternative uses outside agriculture. Efficient use of resources also may allow the United States to remain competitive in worldwide markets and help reduce the cost of price and income support programs.

Should Excess Capacity Be Reduced by Expanding Demand or Restricting Supply?

Market enhancement tools include marketing loans, generic certificates, export bonuses, and lowering price supports. The purpose of these tools generally is to encourage consumers to buy more because of a lower price. Farm receipts may or may not be affected to the same degree as purchase prices, depending upon the tool and its implementation. At some point, if all exporters use such tools and if little increase in exports occur, enhancement tools simply become income transfers from exporting nations to consuming nations.

Other tools attempt to reduce excess capacity by limiting market access. Depending upon the restriction, excess production is either destroyed, stored for next year or used in unrestricted markets. Marketing restrictions tend to raise commodity prices by lowering the quantity marketed.

Marketing restrictions include marketing orders and quotas, which have been used for commodities such as milk, fruits and vegetables. Voluntary marketing quotas provide participants with a payment in return for restricting the quantity marketed, although non-participants are free to increase production. Mandatory quotas use fines and penalties to enforce restrictions on

all producers. In either case, government may tie the quota to each land parcel or allow quota certificates to be sold to other producers. Therefore, the benefits are either capitalized into the price of land or the price of the certificate.

Should Excess Capacity be Reduced by Retiring Land?

Land retirement has traditionally been used to reduce excess capacity in wheat, feed grains, rice and cotton. A key difference from marketing restrictions is the "slippage" associated with land retirement. Most land retirement schemes have encouraged producers to retire the least productive acres. Thus, it is often necessary to idle as much as 10% of the cropland base before significant production reduction occurs.

Should annual or long-term land retirement be used? The Food Security Act (FSA) of 1985 provides for both. The Conservation Reserve Program is an example of a long term program designed to take highly erodible cropland out of production for ten years.

Annual retirement programs allow the government to maintain more flexibility in adjusting to annual market conditions. However, the annual cost per acre often is higher than for long-term land retirement programs. Thus, a combination of the approaches reduces program costs and maintains flexibility (Bottum).

Is partial or whole farm retirement most desirable? Partial farm retirement forces producers to spread their fixed machinery and labor costs over fewer acres until they find more acres to rent or buy. However, whole-farm retirement encourages farmers nearing retirement age to retire the farmland, sell their machinery and retire from farming as well. A combination of the two methods was demonstrated to be the least costly for government in the early 1960s (Bottum).

Alternatively, government may restrict or zone certain lands from being used for agricultural purposes. For example, the 1985 farm bill includes conservation compliance, sodbuster, and swampbuster provisions that restrict what farmers can do with designated land if they want to retain government benefits. Others have suggested restricting use on additional lands, such as liquidated farmland acquired by lenders. However, this likely would require compensation.

Should Excess Capacity be Reduced By Restricting Non-Land Inputs?

The consequences of restrictions on inputs other than land would vary, depending on the type of restriction and the input restricted. Proposals such as reducing irrigation subsidies and imposing relatively low taxes on fertilizer and pesticides may not effectively reduce excess capacity. Voluntary dairy cow reduction proposals may only reduce excess capacity temporarily. Other proposals, such as relatively heavy taxation of fertilizer and pesticides or restrictions on technology and capital, may effectively reduce excess capacity. But these restrictions may also reduce the competitiveness of the restricted producers.

Competitiveness of the restricted producers would likely be reduced if the input restrictions significantly lowered farm income and production efficiency. Any non-restricted producers who are free to sell in the same market would have a competitive advantage if they were able to operate in a less restrictive environment.

Finally, the benefits of imposing restrictions on inputs are capitalized into the price of the input restricted. Therefore, restrictions on purchased inputs may or may not enhance farm income. If the restrictions result in input prices that are higher than otherwise would have existed, farm production costs may rise more than farm revenues. This would reduce rather than increase farm income for the restricted producers.

Should Excess Capacity be Reduced by Reducing the Number of Farmers?

When other industries face excess capacity, early retirement incentives and severance pay are not uncommon methods of reducing excess capacity and long-term financial commitments. A whole-farm retirement option would provide farmers with a one-time severance bonus or a five-year retirement or retraining grant in return for an agreement to leave agricultural production.

A related proposal is to "decouple" farm income payments from production. Payment levels would continue for five to ten years regardless of how much the farmer produced. By that time, the farmer must find other employment, retire, or be ready to compete under a market oriented policy and in a global market. The benefits of restricting the number of farmers would be capitalized into the returns of those who continue to farm.

Future Directions

The number of contributing factors and the nature of agricultural production assures that no magic formula for reducing excess agricultural production capacity is likely to be devised that would be acceptable to everyone. Some may even be content to continue excess capacity indefinitely into the future.

Since 1933, a succession of "farm bills" have been passed into law. These farm bills have had many objectives, but an overriding purpose has been to solve the recurring problem of excess capacity while supporting farm prices and incomes.

The Food Security Act (FSA) of 1985 is the most recent comprehensive farm bill ever. It addresses excess capacity by 1) voluntary acreage reduction programs, 2) a voluntary dairy herd buyout program, 3) demand expansion programs, and 4) reduced price supports. On the other hand, target prices were retained at fairly high levels to provide income protection for farmers.

The FSA attempts to price U.S. commodities more competitively in world markets, to increase the U.S. share of world markets and to force more of the production reduction adjustment to other exporters. So far, demand in importing nations has been weak and other exporters have shown a reluctance to give up market share.

Suggestions have been frequently made to address the excess capacity problem in the United States by shifting away from the approach taken in the 1985 farm bill. Three options capture the essence of the debate.

Return to the Free Market. The market approach is to allow "survival of the fittest" to take place. The least competitive producers would exit from agricultural production to other endeavors. This approach would tend to increase exports and place increasing pressure on other exporters to increase subsidies or reduce their excess capacity.

If current programs were phased out as suggested in one of the decoupling proposals, the impact would vary by commodity. In the short run, producers of commodities with excess capacity and high supports would face dramatically lower returns. Many would be forced to reorganize their operations or leave farming altogether. However, livestock producers may experience short-run profits due to lower feed prices directly resulting from program elimination.

In the longer-run, the number of producers would decline. Some of the excess capacity simply would be left idle or used for forests, range reserves, and wildlife habitat. This does not imply that production of supported commodities would cease. Some resources would remain in production because some farmers would still be earning a profit or anticipating higher future returns. Off-farm income would allow many part-time farmers to continue producing.

Fine-tune Current Voluntary Programs. A moderate approach is to keep the current legislative framework in place but make selected legislative amendments or administrative rule changes that would address the excess capacity problem.

One possibility is to reduce incentives for excess capacity. Price supports for milk could be cut further. Target prices for wheat, feed grains, cotton and rice could be cut at a faster rate than called for in the FSA of 1985. Reducing target prices would have a particularly large impact because loan rates already have been reduced.

A second possibility is to shift emphasis from land retirement to marketing orders and/or voluntary quotas in order to reduce the slippage costs associated with land retirement.

A third possibility is to increase the acreage reduction required for annual program participation.

Another option is to increase the rate of acceptance of erodible land into the 10-year Conservation Reserve Program (CRP). Alternatively, the CRP qualification requirements could be reduced to allow more land to enter the program.

A whole-farm land retirement program could be implemented for land that is not erodible. One possibility is to provide deficiency payments for whole farms taken out of production.

Incentives for excess capacity could be reduced. Price supports could be restricted to production intended for domestic use by imposing a two-price plan. Deficiency payments or payment limitations could be graduated or made to be made to be more restrictive.

Move to Mandatory Production Controls. Mandatory programs reduce excess capacity by enforcing penalties on those who do not comply with the restrictions. This approach may increase farm income and be less expensive for government than voluntary programs. If mandatory production controls do not bring about the desired market prices, excess capacity may still exist and government would be forced to increase spending on price support loans and export subsidies.

The acreage reduction required to create higher prices using mandatory controls is likely to be higher than under current voluntary production controls. Import restrictions may be needed if domestic prices rise above the international price levels.

In the short-run, mandatory controls may greatly reduce production efficiency. Eventually, the more efficient farmers would rent or bid production resources away from other producers rather than produce at less than full capacity. The effects on resource adjustment may depend on whether the mandatory program is viewed as long-term or annual.

Adjusting to Change

Each of the three policy directions discussed above eventually may reduce excess capacity in American agriculture. Each option would have different gainers and losers, depending on such variables as farm size, commodities produced, debt obligations, and the ability to tolerate risk.

Excess capacity increasingly must be viewed from an international perspective. Three options exist for reducing excess capacity. The United States by itself can attempt to absorb the global excess capacity. We could attempt to force others to absorb more of the excess capacity. Or we could coordinate the allocation of excess capacity reduction among all major producing nations. Our domestic strategy may depend upon the initiatives and reactions of those in the international arena.

At least some excess capacity seems likely to continue in U.S. agriculture due to the international economic environment and the unique characteristics of agriculture. However, dramatic events have led to periodic shortages in the past and may do so again.

Perhaps the ultimate policy question relates to how much excess capacity we can afford. Public reaction to

spending under the 1985 farm bill indicates that we may be approaching the peak level of public spending. Thus, the debate over policy goals, policy tools and future directions will continue.

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POLICY CHOICES FOR A CHANGING AGRICULTURE...

PUBLIC POLICY: WHOSE VALUES AFFECT AGRICULTURE?

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Public policy has played a major role in shaping the American farm and food system. Thomas Jefferson believed that family farms had a unique place in our society. Jeffersonian philosophy continues to have many adherents, despite significant changes in both the structure of our society and the nature of agricultural production. Fundamentally, the unique position of the family farm in the evolution of American public policy is at the heart of many policy initiatives on behalf of agriculture.

Agriculture has been influenced by public policy since the earliest days of the Republic. Land policies guided frontier settlement. Public education was founded on the needs of an agrarian population. Since the early 1860s, publicly supported agricultural research and education have contributed greatly to increases in productivity. Since the early 1930s, the federal government has provided price and income supports to many farmers. A wide range of policies relating to farm credit, natural resources, and product markets could also be cited. The assurance of an adequate, safe, and reasonably priced food supply has become an enduring thread running through the fabric of contemporary American public policy.

This publication will present information to build a more comprehensive understanding of factors that help shape public policies directed toward agriculture. Our thesis is that how the public perceives itself, including its needs and desires strongly influences its attitudes toward agriculture. Public policy is the means by which these perceptions are translated into guidelines for change. The greater the diversity in these perceptions, the less certain the outcome of the public policy process.

Forces of Change

Public policy is the broad view of what society accepts as guiding principles for organization of the economy and functioning of social order. It includes laws, government procedures, customs, traditions, and judicial decisions.

Public policy is both incompletely cataloged and dynamic. Specific actions such as laws and court decisions help catalog parts of it, just as they document changes in it. Arguments for a new law or for a change in government programs are part of the revolutionary pressures which, in turn, bring changes in the public's perception of what society ought to be. However, not all arguments for change are successful. Some act as seeds, sown before an idea gains widespread acceptance. Some new ideas simply are not accepted because they are not consistent with the broader perceptions of society.

What is society's perception regarding the organization and functioning of its economic system in general, and the agricultural sector specifically? How is this perception changing, what is causing it to change, and how does this affect public policies that influence agriculture? Before focusing on these questions, it is appropriate to examine some broader public perceptions.

The concepts of laissez-faire and individual entrepreneurship are basic economic principles that guided our nation's founding. The work ethic, the enterprise code, the democratic creed, agricultural fundamentalism, and a minimum role for government in economic affairs were values and objectives that people commonly held, and were reasonably consistent with these basic economic principles. These principles were also

compatible with the Jeffersonian notion of a family farm agriculture.

In essence, the Jeffersonian concept is one of a farmer who, virtually inseparable from his family, owns the farm, does most if not all of the farm labor and management, and works essentially full time at farming. The farm, in turn, provides for the needs of the farm family. Belief in the fundamental value of hard work, stewardship of the land, and a high moral ethic at one time provided a strong social acceptance of the Jeffersonian concept. Because much of the nation's earlier population was agrarian, this concept and the values and beliefs associated with it had much to do with society's perception of how its economic system ought to work.

Substantial changes have occurred in society's basic economic philosophy since those early concepts. Expectations of laissez-faire have given way to a mixed economic philosophy, which encompasses explicit roles for government in the operation of the economic system. The most obvious governmental interventions are in monetary and fiscal affairs and in the provision of personal economic security; for example, social security, unemployment compensation, food stamps, and health care insurance. Likewise, expectations of individual entrepreneurship have evolved into an acceptance of a mixed system with some large scale corporate-administered operations blending in with smaller units operated by individuals or partnerships.

Society's perception now accommodates such seemingly inconsistent public policies as those that facilitate growth and concentration of production among large scale commercial farms but at the same time provides income supports and concessionary credit terms to operators of small and/or less efficient farms. It accommodates agricultural policies that both encourage increased production through the development and application of new technology, and decreased production through limits on cropland use. In a broader context, both the accumulation of economic power, and income transfers to the economically disadvantaged are concurrently embraced.

Why has such a change occurred in basic economic philosophy? There is no single answer. In part, it relates to the evolution from an agrarian to an industrialized society.

Agrarianism traditionally has been linked to self-sufficiency. It has overtones of a subsistence agriculture. Industrialization, on the other hand, is the division of production into increasingly finite components, each of which is performed by a specialist. As agriculture industrializes, many functions once performed on farms are restructured into non-farm industries, witness the substitution of chemical herbicides for the hoe and the displacement of on-farm hog butchering and sausage making by large meat packing firms. Today, less than 15% of the final product value in the food and fiber system originates on farms. Moreover, farms have become specialized, such as the separation of grain production from cattle feeding and the separation of egg hatching from broiler feeding.

In an agrarian society citizens tend to have much in common. That makes for a common societal perception, and general agreement on many matters of public concern. Specialists, by contrast, tend to have things in common only with similar specialists. Differences can and often do develop between different groups. This leads to segmentation of special interest groups.

Frequently, no group is large enough to sway the collective perception of society. In turn, this leads to the formation of coalitions to influence public policy. But, as special interest groups become more specialized and segmented, coalitions become more transitory. Thus, it is increasingly difficult to find common ground. The process of influencing public policy changes from one based upon a widely shared societal perception of what ought to be, to one based upon tenuous coalitions tied to special interests.

Again, agriculture is illustrative of broader changes in the nation's socio-political fabric. Some general or broad-based coalitions can be identified, such as consumers, taxpayers, agribusiness, and family farmers. But it is often an error to assume a commonality of perception and purpose even within such a coalition.

For example, while there may be agreement within certain coalitions that family farms should be preserved as a matter of public policy, there can be substantial disagreements as to what constitutes a family farm. Some people equate the family farm with subsistence agriculture. Some argue that a family farm is any farm operation managed predominately by a group of people who are related. Others suggest that it is a business owned and operated by members of the same family. Still others hold that it is a farm where most of the management and some of the capital and operating labors are provided by a farmer and spouse, siblings, children, parents and/or in-laws. Some believe that, if a farm business doesn't earn sufficient income to support a family, it is not a family farm. Incidentally, this latter view would mean that about 85% of the nation's farms are something other than family farms.

Impacts of Public Policy on Agriculture

Although agriculture provides one of the necessities of life and makes a contribution to the nation's economy, misconceptions and outright myths are often associated with its overall importance. Some myths allow citizens to ignore the maturation of our economy. For example, much dogma surrounds the view that agricultural prosperity is the driving force in American economy. Certainly, there are settings in which agriculture is the dominant force in the local economy. But, these do not accurately characterize the relative importance of the agricultural sector in the national economy. In 1985,

farm population was about 2.5% of the total U.S. population. Farm sales were about 5% of the gross national product (GNP), and total receipts for food at retail were just 10% of the GNP. Net farm income accounted for only about 1% of total national income.

Today, one of agriculture's most rapidly evolving characteristics is its integration into the broader economy, both domestically and internationally. There is a concurrent loss of the perception that agriculture is a unique factor in American society. Policies beyond the farm gate frequently have more effect on agriculture than farm programs *per se*, and are typically of greater interest to the public. Monetary, fiscal, international, and humanitarian policies, as well as farm policies, all have significant impacts on the agricultural sector. All are influenced by perceptions that may be only remotely related to agriculture.

Monetary and Fiscal Policies. Principal links between farms and the broader economy include purchase of inputs, sale of output, and acquisition of capital. Farmers purchase more than 80% of their production items from nonfarm industries. Nearly all of their production is purchased and used outside the farm sector, and a substantial amount goes to international markets. Interest payments are currently the single largest farm cash production expense.

Monetary policy deals with the supply and value of money. If the money supply is too great, inflation results; if too small, deflation and losses in economic output occur. Generally, agriculture as a heavy user of capital has benefitted more from low interest rates, inflation, and a "loose" rather than "tight" money supply. Monetary policy also influences exchange rates. When tight monetary policy strengthens the dollar, U.S. exports become more expensive. Thus, actions taken to reduce inflation have foreign trade consequences that reduce demand for U.S. exports and create agricultural surpluses.

Fiscal policy combines the effects of taxation and government spending, including spending on farm programs. The direct effects of fiscal policy alone on agriculture are clear, but the interaction of monetary and fiscal policies has a great impact. Much present day concern relates to the federal budget deficit and the mix of monetary and fiscal policies taken in response to it. Short term deficits can stimulate economic activity, increasing demand for agricultural products. In the longer run, prolonged deficits in an era of tight monetary policy may increase interest rates which raise agricultural production costs and decrease the demand for food and fiber.

The impact of tax policies on the agricultural sector has been widely debated over the past 20 years. Many charge that tax policies have influenced investment strategies in agriculture to the detriment of traditional family farmers, by enabling the use of certain agricultural investments as tax shelters for persons with large nonfarm incomes. Others argue that tax policies stimulate capital investment, thus enhancing agricultural productivity and lowering food prices.

International Policies. U.S. trade policy was historically designed to protect American industry. But, in recent decades the U.S. has assumed leadership in developing institutions to facilitate international cooperation and economic integration. The General Agreement on Tariffs and Trade (GATT), the International Monetary Fund (IMF), and the International Bank for Reconstruction and Development (the World Bank) are examples of world economic institutions developed primarily at the initiative of this country.

While the United States still enjoys a leadership role, it no longer has the dominance which permitted it to virtually impose institutions and policies on the international community. Many countries are emerging as competitors in international agricultural markets as they use agricultural exports to finance industrial development, service external debt, and offset unfavorable balances of payments. Recently, several countires have joined the U.S. in experiencing excess capacity in agricultural production. Each country must balance off the need to protect its domestic producers against the interest in greater international economic integration and cooperation. Thus, U.S. public policy with regard to international affairs is constrained by the perceptions and policies of others around the world, as well as by the American perspective.

Humanitarian Policies. Initially, disposal of accumulated agricultural surpluses was a primary force behind both domestic and foreign food assistance programs, although the humanitarian objectives of curbing funger and malnutrition and helping the poor was important. Domestic programs initially emphasized direct distribution of surplus commodities to poor families and school children. Later, emphasis shifted to food stamp allowances based large on income and food costs. By the 1980s more than 20 million Americans received food stamps and annual program costs exceeded $10 billion. Another program combines direct food distribution with nutrition education targeted specifically to needy expectant mothers and those with small children. These programs have had greater impacts on recipients than on farmers.

On the international front, foreign food and agricultural assistance programs have been a matter of public policy throughout othe last half of the 20th century. In recent years programs have emphasized the impacts of food assistance on stimulating economic development and thus the demand for U.S. exports through improved incomes and diets in developing countries. South Korea and Taiwan often are cited as examples where this has occurred.

Farm Policies. Price and income supports and acreage reduction programs are widely recognized as our "farm policy." But farm policy includes other programs. Agricultural credit policies led to the establish-

ment of the cooperative Farm Credit System, serving the commercial credit needs of agriculture, and the Farmers Home Administration, serving as a farm lender of last resort.

Other policies have been designed to give farmers some of the same marketing advantages achieved by nonagricultural firms. Farmer cooperatives have been sanctioned to help farmers obtain advantages of size in market activities. Marketing orders allow producers of certain products to collectively manage supplies and regulate quality of commodities marketed. Promotion programs have allowed producers to combine their efforts to finance programs aimed at increasing consumption of individual commodities.

The dependence of U.S. agriculture on natural resources, particularly soil and water, has long been addressed in public policy. A comparatively recent development, however, is the recognition of the interrelationships between agriculture and the rest of society with respect to natural resources. Society appears to be increasingly concerned with the quality and quantity of soil, water, and air as those natural resources are affected by agricultural practices such as irrigation, tillage, fertilization and the use of chemical pesticides.

The food and fiber sector has grown so diverse that a single set of agricultural policies cannot address all of its needs. Today's large scale commercial farms are so different from small and part-time farms that they don't even use many of the same inputs, or buy them in the same ways. Producers, processors and distributors of different commodities and food products have different and often conflicting goals: high prices for feedgrain producers and low feed costs for livestock growers is one example; high farm incomes and low retail food prices is another. Further, domestic farm policies aimed at maintaining relatively high prices for agricultural commodities are in conflict with policies to promote commercial agricultural exports. To achieve both goals may require government subsidies which, in turn, contribute to federal budget deficits that must be dealt with through monetary and fiscal policies.

Often, people in the agricultural community believe that nonfarm policies which impact on agriculture in a negative manner are established without concern for such impacts. Just as often, policy makers (and the general public) believe that impacts on agriculture have been duly considered and, perhaps, are overly lenient. Generally, most people accept such policies as consistent with the broader perception of what is in society's interest. The challenges for the agricultural community are to: (1) understand the broad societal perception and how this influences public policy, (2) to use this understanding as a guide to the evolution of policies that meet both their specific objectives and the broader goals of society, and (3) to influence the public perception in ways that will achieve desired longer term changes in agriculture.

Policy Issues

What are the persistent concerns confronting those who try to reconcile change in agriculture with the broader perception of what society ought to be? First, the structure of the agricultural economy has changed dramatically. No longer is the majority of output produced by small family farms. The majority of the nation's farms—the 70% that produce less than $40,000 worth of farm products annually—contribute only marginally to the nation's commercial food and fiber system. The first order of business is to decide who is supposed to benefit and, realistically, who wil benefit, from public policies that affect American agriculture.

Second, since agriculture is now closely intertwined with the national economy, it is vulnerable to general economic changes, more dependent on world markets, and also able to exert more influence on world markets. It must be decided, as a matter of public policy, how much farmers should be protected from events that originate outside agriculture and outside the country. Should, for example, the agricultural economy bear a disproportionately large cost of a policy of flexible exchange rates because it is export oriented?

Third, while world agricultural supply and demand balances will be tenuous and tend towards oversupply, the balance is sufficiently close that instability is likely to be the norm. What should be U.S. policy for assuring reasonable levels of reserve stocks to simultaneously contribute to stability and safeguard against potential food shortagse? Is it a reasonable policy for the United States alone to carry stocks that incur storage costs and threaten international market shares?

Fourth, while agriculture's relative contribution to the overall economy has declined, the food and agriculture sector remains important not only as a source of domestic food but of export earnings and as the steward of much of our renewable natural resource base. Given these contributions, what should be public policy regarding research and technology development, resource conservation, and environmental quality? To what extent should policies be considered in a long-term context rather than in terms of short run payoff?

Different policies may be needed to accommodate changes which have already occurred in agricultural structure—changes which may continue or even accelerate in the years ahead. For example, as food and fiber production is increasingly concentrated on a relatively few large commercial operations and the vast majority of U.S. farms are relegated to parttime, specialty, or hobby status, perhaps more policy attention should be directed to stimulating nonfarm employment opportunities in rural areas.

All of these issues suggest that flexibility should be a dominant characteristic of new policies. Flexibility, in turn, requires clear statement of goals, a very difficult political task. Focusing on short-term commodity

problems could lead to a series of bandaid, short-run compromises that are unlikely to generate long-run public policy that is coherent, just, and workable. Can the agricultural community focus its policy initiatives on responsive, flexible solutions that are both consistent with, and viable long-term guideposts for the future evolution of society's perception of what is desirable? This is the most basic challenge of all.

Alternatives for addressing the public policy issues of concern to American agriculture must be framed with reference to the public's goals. Important goals would appear to include (1) reducing federal budget allocations to agriculture (in connection with the overall concern over the size of the federal deficit) and (2) providing an abundant supply of wholesome food at reasonable consumer prices. It is not clear, however, how society ranks these goals relative to the alternatives for resolving the issues identified above, specifically:

1. The desirability of maintaining (or returning to, depending on one's perspective) an agricultural sector dominated by relatively small, diversified family farms.
2. The extent to which American farmers should be protected from the impacts of events beyond their control.
3. The appropriate role for the U.S. in world markets: Will we be commercial competitors or will we view world markets as a way to dispose of our excess production?
4. The balance between the bounty of agricultural production and the stewardship of the nation's natural resources.

Quite different policy options can be advanced. Each has some different implications for how the above issues are resolved. Each has features which may appear consistent with the broader perceptions of society as well as some which may be inconsistent. No single option is likely to be widely accepted. These goals, issues and options all demand serious discussion.

Several different policy options have been identified in the other publications of this series. These options are summarized in Table 1, and their possible impacts on the above policy issues are indicated. You are encouraged to discuss and even disagree with these potential impacts. There are no clearly "right" or "wrong" answers.

In addition to the differential impacts of various policy options on the policy issues identified, there is the question of the consistency of each of these options with broader societal goals. If we disagree with the impacts of these options, we must review what we have identified as key factors of change and revise our expectations.

The point is that few policy options adequately address all issues. These are no simple solutions to the public policy issues that affect American agriculture.

Table 1. Potential longer term impacts of selected policy options.

Policy option	Impact on: Maintaining family farms	Risk protection	Competing in world markets	Balancing production and stewardship of natural resources
Policy option				
1. Free market/ no programs	-	-	+	-
2. Mandatory controls	+	+	-	+
3. Target benefit to smaller producers	+	+/-	-	+
4. Facilitate removal of excess resources from agriculture	-	+	+	+
5. Promote maximum international competitiveness	-	-	+	-
6. Provide easy credit policies	+	+	+	0
7. Provide credit for best managers	-	-	+	0
8. Promote improved nutrition	+/-	0	+	0
9. Reduce risks in farming	-	+	+	0
10. Encourage natural resource conservation	+	+	-	+

\+ Favors
\- Does not favor
0 Neutral

Adjusting to Change

It is clear that a range of government policies exist that affect agriculture. Many of these are not viewed as agricultural policies; by like token those that are identified as agricultural policies are the ones that can be most directly influenced by the agricultural community and thus are the focus of most policy discussions within the agricultural sector. The broad perception of society loosely defines the boundaries for acceptable changes in public policies, and the political risks are great if one presses for too rapid a policy change or resists policy changes that are reflections of changes in society's view of itself. Yet also at risk is a vital part of our economy, agriculture—peopled with families who feel they are trying to do right for their country as well as for themselves. The evidence seems to point to the fact that we will likely continue to find short run "solutions" to perceived economic and social problems in agriculture. Longer-run policy, which tackles the core issue of fundamental change in American agriculture, is unlikely to emerge until the agricultural community, and those who are influential in establishing public policy, come solidly to grips with a realistic view of what society perceives to be acceptable as an economic system.

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