Part IV

Implications and Policy Options for Agriculture

Chapter 13

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The biotechnology and information technology revolution has been fostered by substantially expanded private sector investment in agricultural research, an investment complemented by increased public sector emphasis on basic research, The output of this revolution is in its infancy today but can be expected to blossom over at least the next 30 years.

te potential payoffs of this era include increased food production for domestic and export demand, a lower cost and more nutritious food supply, more agricultural exports, improved food quality, and reduced adverse environmental impacts. However, if current agricultural policies continue, this era also holds the potential for marked changes in the structure of agriculture and rural communities, ineluding the demise of many small and moderate-size farms, increased centralization and integration of farm production, and the degradation of many rural communities.

THREE FARM CLASSES

Major structural change in agriculture has already begun. Based on a continuation of current policies, past trends, and future technological expectations, the likely net result of this structural change would be the development of a farm structure composed of three predominant agricultural classes:

1. The *large-scale farm segment* will be composed of a relatively small number of farms that will produce the bulk of the production. By year 2000 there could be as few as 50,000 large-scale farms producing as much as three-fourths of the agricultural production. Some of these large-scale farms will be owned by agribusiness corporations and some will not. This large-scale farm segment will be highly efficient in production, marketing, financial, and business management functions. The farms will be run by full-time, highly educated business managers. Most of their land maybe rented. These managers will probably know their chances of making a profit even before planting or breeding.

2. *The struggling moderate-size farm segment* will strive to find a niche in the market and to survive in an industrialized agricultural setting. The difficulty for the moderate-size farm to find that niche is rapidly becoming the center of the farm policy debate. Traditionally highly productive, efficient, moderate-size, full-time farms have been referred to as the “backbone” of American agriculture, It is still true that a moderate, technologically up-to-date, and well-managed farm with good yields is highly resilient. One key to their success clearly lies in the management factor. But more often than not, management has to be willing to accept a relatively low return on invested capital, time, and effort. With ever-increasing educational requirements in farming, there will likely be less willingness by successful managers of moderate-size farms to accept a lower return for their services and for invested capital, Another key to their survival lies in access to state-of-the-art technologies at competitive prices. Cooperatives have traditionally performed that role. But today, cooperatives are generally not conducting or funding basic or applied research in biotechnology and information technology. Like their predominantly moderate-size farmer members, cooperatives, too, have encountered financial difficulty.

3. *The small, predominantly part-time farm segment* tends to obtain most of its net income from off-farm sources. However, this segment is highly diverse.[1] It includes wealthy urban investors and professionals who use agriculture primarily as a tax shelter and/or country home. It includes the would-be moderate farmers who are attempting to use off-farm income as a means of entering agriculture on a full-time basis. This modern version of the old farmhand-to-tenant-to-owner agricultural ladder is also fading. Finally, this segment also includes a number of poor, essentially subsistence, farmers, vestiges of the "war on poverty" from the 1960s. These farmers remain a significant social concern that needs to be dealt with from a policy perspective, although traditional farm price and income policy hold no hope for solving their problems.

[1]No analysis exists that accurately measures the diversity of this farm segment.

CONSEQENCES OF CONTINUING CURRENT POLICIES AND PROGRAMS VERSUS NO PR0GRAMS

Today's farm structure is partly the product of past policies and programs and partly the product of technology. Since the 1930s, farm program benefits have been allocated on the basis of cost of production. In the late 1960s the conversion of farm programs from supporting farm prices to supporting farm income resulted in the imposition of limits on the amount of payments a person involved in farming could receive. These payment limits proved largely ineffective at stemming the flow of benefits to large farms. Likewise, large farms have benefited disproportionately from other programs such as economic emergency credit and soil conservation. Large farms have been in the best position to take advantage of new technologies derived from the public sector agricultural research and extension system. If current farm policies and programs continue, the number of large farms will continue to grow and reap the majority of program benefits.

Without substantial changes in the nature and objectives of farm policy, the three classes of farms will soon become two—the moderate-size farm largely will be eliminated as a viable force in American agriculture. In addition, the problems of the small subsistence farm will continue to fester as an unaddressed social concern.

As this structural change occurs, the face of rural America will change. Large farms naturally tend to concentrate their activities in larger communities. Moderate-size and small rural communities inevitably die as the business conducted by farm implement, fertilizer, and chemical dealers as well as agricultural bankers declines. As a consequence, the rural-community tax base is eroded as business activity, employment, and property values decline. Children are bused longer distances to schools. The economic and social fabric of rural America erodes.

It is still unclear as to what the consequences of this change maybe, because the vast majority of Americans have little or nothing to do with agriculture other than consume its products. Clearly, an increase in rural unemployment results in an increase in costly Government social programs. The uncertainty, however, arises over food production efficiencies and costs. This study shows that large farms can indeed produce at lower cost than smaller farms. The question is whether the only way this lower cost can be achieved is through scale of operation. Can a moderate farm with adequate educational advice and assistance from existing institutions achieve the same low production cost without creating the adverse rural community economic and social consequences that are a result of current farm policies and trends? The answer is not clear.

In the much longer run an agriculture dominated by a few corporate giants may not be desirable from a general public, taxpayer, or

consumer perspective. A progressive, decentralized, competitive structure would be preferable. The task facing policy makers is to foster such a structure.

The results of this study clearly demonstrate that these adjustment problems would not be solved by a quick transition to no Government involvement in agriculture. In fact, the adjustment problems at the farm and rural-community level would be aggravated further by additional farm and rural agribusiness financial failures. While reduced Government involvement in agriculture may be a desirable long-term goal, longer term transition policies and programs are clearly required. Indeed, every industrialized nation manages their agricultural sector to some degree—none are free of Government intervention. In fact, the U.S. agriculture economy is managed less than most other industrialized nations.

The remainder of this chapter sets forth the policy changes that would be required if Congress and the related body politic decided that overt steps should be taken to foster a diverse, decentralized structure of farming where all sizes of farms had an opportunity to compete and to survive in a time of rapidly changing technology. It should be noted that the objective of giving every farm the opportunity to compete and survive does not imply an unchanging and stagnant farm structure. It does imply a political and social sensitivity to both the impact of current farm programs on farm structure and to the different needs of large, moderate, and small farms for Government assistance. It can be expected that regardless of what Government does, fewer commercial farms will exist in year 2000 than today. But at a minimum, Government can do much to ease the pain of adjustment.[2]

[2]The policy options presented are not all inclusive; e.g., international trade dimensions of agricultural policy are not covered in detail.

REQUIRED POLICY ADJUSTMENTS

Previous attempts to deal with the agricultural structure issue have been limited to actions such as limiting direct income support payments to some fixed amount per farmer, like the $50,000 cap in present programs. Such marginal policy changes, though thought to be beneficial, are not discrete enough to separate or distinguish between the different farm segments effectively.

More substantive changes in policy direction are required for addressing the structure issue. Specifically, separate policies and programs need to be pursued with respect to each of the three farm segments—large farms, moderate farms, and small farms. The choice of any one set of policies would imply that Congress desired to selectively enhance the status of one farm segment.

Policy for all farmers implies two basic policy goals:

1. All farmers need to operate in a relatively stable economic environment where they have an opportunity to sell what they produce. Restrictive trade policies or misguided macroeconomic policies impede this basic goal.
2. All farmers need a base of public research and extension support whereby they can maintain their competitiveness in the markets in which they deal. A loss of U.S. comparative advantage in the world agricultural product market would be a serious blow to the American economy. Similarly, a loss of consumer confidence in the abilit y of the food system to produce a safe and nutritious food supply efficiently would undermine public support for all of agriculture.

Policy for large farms need address only these two goals. Policies for moderate and small farms

must address these same goals plus additional problems now facing these farm segments.

Policy for Large Commercial Farms

A basic conclusion of this study is that large-scale farmers do not need direct Government payments and/or subsidies to compete and survive. However, there is still a need for a commercial farm policy.

Criteria for determining what constitutes a large-scale farm are important but somewhat arbitrary. The dividing line developed from this study is about $250,000 in sales for a crop or dairy farm unit under single ownership or control. This level of sales is generally required to achieve most economies of sizes Overtime, this optimum size has had, and will continue to have, a tendency to increase. As this occurs, criteria for limiting program benefits according to farm size will likewise have to increase.

Creating a Stable Economic Environment

The policy goal of creating a relatively stable economic environment where farmers have an opportunity to sell what they produce implies the following major farm program initiatives:

- Direct Government payments would be eliminated to all farms having over $250,000 in annual sales. This implies the elimination of the target-price concept, at least for this sales class. Elimination of payments to these farms would significantly reduce Government expenditures in agriculture.
- The nonrecourse loan would be converted to a recourse loan. The nonrecourse feature has resulted in the accumulation of large Government commodity stocks. The recourse feature would provide a continuing base of support for the orderly marketing of farm products. It would encourage year-long producer marketing inasmuch as farmers could not avoid interest payments by forfeiting commodities to the Government.
- Government credit to farms having over $250,000 in sales would not be available, except for the recourse price support loan.
- An expanded international development assistance program would be established. Such a program would have to include an optimum balance of commodity aid and economic development aid. Its primary objective would be to help developing countries reach the takeoff phase of economic growth, and thus become better future customers of American agriculture.
- A balanced macroeconomic policy that facilitates growth of export markets and maintains a relatively low real rate of interest would have to be maintained. Reduced deficits, combined with more expansionary monetary policies, would have the effect of expanding the growth of agricultural export markets and would result in reduced interest payments on the record agricultural debt.

Maintaining Technological Competitiveness

The technological competitiveness of American farmers would be assured by continuing a policy that encourages public and private investment in agricultural research. The major thrust of the research and extension programs as they affect large farms would be as follows:

- The trend toward increased public sector emphasis on basic research would be continued. Increased reliance would be placed on the private sector for applied research in the development of new products.
- While the public sector would emphasize basic research, an important problem-solving component would be maintained to adapt new technologies to various agro-ecosystems and to maintain newly achieved productivity from pests and disease, decline in soil fertility, and other factors.
- Extension's role in the direct education of, or consultation with, large farmers would be deemphasized. Private consultants would play an increasing role in technology transfer to the large farm segment.

[3] The $250,000 figure is based on census data and the economies of size analysis discussed in previous chapters.

Policy for Moderate-Size Farms

Policy for moderate-size farms must include not only the elements of policy postulated for large farms, but also additional elements that are specific to the more complex needs of this farm segment. For example, OTA finds that moderate farms having $100,000 to $250,000 in gross sales face major problems of competing and surviving in the biotechnology and information technology era. Some moderate farms will survive and some will not. This latter group should be assisted in their move to other occupations.

The following are specific policy goals for moderate-size farms:

- The risk of moderate farms operating in an open market environment needs to be reduced.
- New and easily adopted technologies should be made available to moderate farms.
- Opportunities for employment outside agriculture should be created for those farmers who are unable to compete.

Diligent enforcement would be needed to assure that the benefits of programs established to assist moderate farms are limited just to those farms.

Risks to Moderato-Size Farms

The most difficult obstacle to survival facing the moderate farm is that of managing risk. The initiation of market-oriented farm policies in the early 1970s greatly increased the amount of price and income risk facing the moderate farm. Large farms are better able to manage risk generally because of the higher level of their management's formal training and because of their greater diversification. The potential advantages of diversification by moderate farms commonly are offset by diseconomies associated with smaller scale, multiple enterprises. Similarly, managers of moderate farms often lack the skills associated with operating in the futures market or understanding various forms of contracting.

Three possible options exist for reducing the risks confronting moderate farms, One involves offering moderate farms a higher level of price and/or income protection than would be available to large farms. It maybe argued that such policies foster inefficiency, but this may be a price that must be paid to maintain a decentralized agriculture. The three options are:

1. Income protection could be provided through either a continuation of the current target-price concept for moderate farms only or through a device known as the marketing loan, Like the current nonrecourse loan, the marketing loan is a loan from the Government on commodities in storage. If the commodity is sold for less than the loan value, the farmer pays back only those receipts to the Government in full payment of the loan. The marketing loan, in essence, becomes a guaranteed price to the producer. The level of the marketing loan should be no greater than the average cost of production for moderate farmers.
2. The nonrecourse loan concept could be continued for moderate farms. However, the level of the nonrecourse loan should not be set any higher than the recourse loan suggested previously for large farms; otherwise, the Government could end up acquiring most of the production from moderate farms.
3. The public sector could provide significantly increased assistance as a means of reducing risk to moderate farms. Such assistance could be in the form of, for example, educational programs on risk management, futures markets, contracting, and cooperative marketing, In addition, special assistance could be provided for cooperatives that offer marketing and pooling programs designed to reduce risk. While such programs might also benefit large farms, cooperatives have tended to be institutions used primarily by moderate and small farms.

Technology Availability and Transfer to Moderate Farms

OTA finds that agricultural research generally is not inherently biased against moderate farms. Rather, moderate farms maybe seriously disadvantaged either by lags in adoption or by lack of access to competitive markets for the products produced by new technology. The following initiatives could help minimize such problems of technology availability and transfer:

- Extension's evaluation of the increasing number of new products entering the market would be extended. This increased effort would play a dual role of providing a check on the efficacy and the efficiency of new products of biotechnology and information technology, and would eliminate the costs associated with individual farmer experimentation with them. These test results would be available to all farms, regardless of size.
- Extension technology transfer services would be specifically aimed at moderate farms. The primary goal of such programs would be to make technologies available to moderate farms on the same schedule as large farms. Farming systems encompassing new technologies would have to be adapted specifically to moderate farm needs and made available through extension programs. Where this requires special research initiatives, the U.S. Department of Agriculture (USDA) and the Experiment Stations would provide the support. In States where technological change threatens to displace large numbers of moderate farms, such as in Midwest dairying, special initiatives by State and local governments to support research and extension would also be warranted.
- The development of cooperatives that emphasize technology supply and transfer services to moderate farms would have to be undertaken. Unlike private sector agribusiness firms, cooperatives do not appear to conduct or fund any aspect of biotechnology and information technology research. Current financial stress in the cooperative sector suggests that this sector may not be able to marshal the capital needed for such research. At a minimum, there seems to be a need for cooperatives to have a strong applied and developmental program of research in biotechnology and information technology buttressed by land-grant university basic research. To achieve such a research objective cooperatives should consider carefully the formation of a research agency in common (RAC). USDA or land-grant university research along with RAC could receive special public sector Federal and State appropriations and support. Formal links might be encouraged between research, extension, and cooperative institutions to maximize the effectiveness of technology transfer to cooperatives and their moderate-size farm members.
- Ample credit would have to be made available to moderate farms that have the potential to survive. Government credit, in concert with cooperative credit, should be aimed specifically at filling the needs of moderate farms. Emphasis should be placed on credit required to keep moderate farms technologically up-to-date.

Transition Policy to Other Agricultural Enterprises or Nonfarm Employment

Regardless of the effectiveness of the initiatives discussed above, there will bean accelerated need to move farm families either to other agricultural enterprises or out of agriculture into new occupations. The need arises, therefore, for specific public action to facilitate adjustment of resources from the current farm operation into gainful, productive employment elsewhere. Adjustments in rural community business activity and social service will be directly affected by such changes. (The specific nature of these adjustments and potential public policy considerations are treated in greater detail later in this chapter.) Specific initiatives to ease this structural adjustment process include the following:

- As a continuously evolving industry, new opportunities for employment of displaced farmers need to be explored and developed within agriculture. Aquiculture, for exam-

pie, is becoming an important and viable agricultural industry. A more urbanized society has resulted in the growth of a large horticulture and nursery industry. Changing population demographics, particularly in terms of aging, suggest marked increases in the demand for fruits and vegetables. Land-grant universities and the Extension Service bear an important responsibility for fostering the growth of these industries through education and training. Displaced farmers, having prior experience in agriculture, are logical clientele for such education and training activities.

- Special skills training programs aimed at those areas where significant employment opportunities exist need to be designed to assist with the transition to nonfarm jobs. Jobs in rapidly growing service, health care, or care-for-the-aged industries provide contemporary examples.
- Financial assistance from Federal, State, and local governments, similar to the famous G.I. bill, might be established to assist displaced farmers or rural residents during the period of transition while they receive skills training. For example, the Federal Job Training partnership Act Title III program is a federally funded, State-administered program that assists displaced workers in obtaining vocational retraining and counseling. Such a program could be made available to displaced farmers.
- In areas of severe financial stress, assistance may be provided in the form of Government purchase of land or production rights from displaced farmers at its "long-term fair market value. " The returns from the land could be used by the displaced farmer for relocation and retraining. The Government could retain the land in conservation reserve status until it might be needed for future production.
- An alternative program to ease the transition for farmers leaving agriculture is a self-financed agricultural transition loan. Its objective would be to allow a farmer to leave agriculture without having to worry about generating the funds needed to live on while seeking new employment. Such a program could involve the following: 1) farmer terminates the farm operation and becomes eligible for a Federal or State guaranteed living loan, 2) farmer liquidates the farm business over time and ultimately finds other employment, and 3) farmer uses the net proceeds from liquidation and earnings from new job to repay the loan.

Policy for Small/Part-Time Farms

policy for small/part-time farms includes the elements of policy for large farms plus additional elements.

With few exceptions, small farms having less than $100,000 in sales are not viable economic entities in the mainstream of commercial agriculture—nor can they be made so. However, even a small increase in their farm income could have a significant multiplier effect on the local economy because of the large number of small farms. These farms survive because their operators have substantial outside income (part-time farmers), or because they have found themselves a niche in marketing a unique product with special services attached (often direct to consumers), and/or because they are willing to accept a very low return on resources contributed to the farming operation.

The Government's role would be severely restricted for the small farms who either have substantial outside income or who have found a niche in the market. They are as much able to take care of themselves as large farms are.

However, subsistence farmers who have limited resources, and often limited technical abilities, represent a genuine problem for which public concern is warranted—these indeed are the rural people left behind. Commercial farm programs have done and can do little to solve their problems. These impoverished individuals are a social and economic problem for which only social programs can help. However, while programs such as food stamps, social security, and aid to families with dependent children are important to many subsistence farmers, these programs do not serve the farmers' unique agricultural and related needs. The following sug-

gestions are made for dealing with the problems of subsistence farmers:

- Initiate a special study to identify these individuals and their specific status and needs. Develop social programs to meet those needs.
- USDA and the land-grant universities bear a special burden of responsibility y for serving the needs of these subsistence farmers. This responsibility has not generally been realized and, therefore, has not been fulfilled. In the South, this responsibility falls particularly on the 1890 land-grant universities along with the statewide extension education programs and the 1862 land-grant universities. In the North, the responsibility for serving the agricultural educational and research needs of subsistence farmers falls exclusively on the 1862 land-grant universities.
- USDA and the land-grant universities could be directed to develop a joint plan for serving the agricultural research and educational needs of these farmers. Such a plan should include the delivery of farming, credit, and marketing systems designed to maximize the small farms' agricultural production and earning capacity.
- Farming systems must be developed specifically to serve the needs of small subsistence farms. Such systems should, to the extent practicable, encompass the use of new technologies. Special USDA and land-grant research program components must be designed specifically to develop and/or modify technology for use by small subsistence farms.
- Credit delivery systems for small subsistence farmers must be specifically developed by USDA through the Farmers Home Administration. Such systems should consider the unique capital and cash flow limiting factors associated with subsistence farmers who commonly are not in a position to take advantage of other farm programs such as price and income supports.
- Marketing programs geared to subsistence agriculture are essential for providing hope for this farm segment. The difficulty lies in the inability of these farmers to obtain access to the mass markets through which most agricultural production moves. Cooperatives and direct marketing to consumers offer two potentially viable alternatives. USDA and the Extension Service should play a critical role in assisting in the establishment of such markets.

Policy for Rural Communities

The impact of adjustment in agriculture to changing technology will by no means be limited to the farm sector. Rural communities will be at least equally affected by increasing farm size, integration, and moderate-size farm displacement. Although these effects will initially be felt by implement dealers, farm supply and marketing firms, or bankers, the reverberations will extend throughout the community in terms of employment levels, tax receipts, and required services. Rural communities should be assessing these impacts and preparing to make needed adjustments. To ease the pain of adjustment the following actions are suggested:

- Comprehensive programs for community redevelopment and change need to be initiated throughout rural America. Such development plans should be fostered and facilitated by both Federal and State government agencies. Rural community development research and extension programs must be revitalized to serve the needs of communities in transition.
- Increased employment opportunities in rural areas should be fostered b y aggressively attracting new business activities to rural communities. Particular emphasis would be placed on attracting those businesses that develop technologies and serve the needs of high-technology agriculture in rural areas.
- Rural communities should be assisted in developing and modernizing the infrastructure needed to be a socially and economically attractive place to live. Some rural communities can serve as an attractive retirement residence for an aging popula-

tion. But a higher level of social services would clearly be required,

- To attract new industry to these areas, rural communities need to play a vital role in skills training for displaced farmers and rural community employees. School and university outreach programs can be modified to serve this important role.

Policy for Technology and Environmental Resource Adjustment

Technological change inherently creates a disruption or imbalance in the allocation of resources. Much of this study has been devoted to analyzing these effects. Some may question whether this degree of change is either necessary or desirable.

One of the major reasons that American agriculture has been so productive is because technological change has been fostered by the public sector and nurtured by a profit-seeking private sector. Consequently, American consumers have enjoyed a plentiful supply of low-cost food and natural fiber. In addition, agricultural exports have made a major contribution to the overall development of export markets, to the benefit of the general economy. Biotechnology and information technology offer more of the same, with the added bonus of using less chemicals in the production of food—whether for the control of pests, disease, and weeds or for the production of commercial fertilizer.

Maintaining the productivity and competitiveness of U.S. agriculture in the public interest requires a delicate balance between public and private sector support for technological change. Yet it would be wrong to imply that there are no risks, The conferring of property rights on discoveries of the agricultural research system has shifted the agricultural research balance to the private sector. While the effects of this shift appear to be positive, concerns exist that a substantial portion of the benefits of even public research could be captured by private firm interests, In addition, no scientifically acceptable methodology exists for weighing the risks or hazards of biotechnology research. To deal with such issues, the following policy suggestions are made:

- Steps should be taken to secure the public interest social contract on which the USDA and land-grant university agricultural research system has been based. Assurance needs to be provided that the benefits of publicly supported research and extension are not inappropriately captured in the form of private monopoly rents. The effect would be to stifle the process of discovery and the dissemination of new knowledge,
- Major investments need to be made to foster the development of human capital that is in a position to cope with the process of rapidly changing agricultural technology, This need extends from the training and development of the most basic biological research scientists, through the extension specialist and county agent, to the farmer who adopts the new technology and the banker who supplies the loan for its purchase. At a time when agriculture is in a low-income crisis state, there maybe a tendency not to make such investments in the future, Such a strategy would clearly be counterproductive,
- Biotechnology is not likely to replace land and water as vital agricultural resources. In recent years, soil conservation has taken aback seat from a policy perspective to full-production policies. Such a strategy would appear to be very short-sighted. Likewise, the inability of policy makers to establish a national water policy runs counter to maintaining the competitive edge of U.S. agriculture internationally,
- Little is known about the adverse impacts of potential biotechnology developments on the ecosystem. These risks must be *care*fully assessed, monitored, and, where necessary, regulated. Care must be taken, as well, not to overregulate and thereby stifle the potential competitiveness and productivity of U.S. agriculture.

CONCLUSIONS

While the biotechnology and information technology revolution will create many adjustment problems, it has the potential for creating benefits in a safer, less expensive, more stable, and more nutritious food supply. The substantial costs of these improvements to farming and rural communities can be minimized by careful policy analysis, planning, and implementation. This study is only the first step in that direction.