FINANCIAL SURVIVAL IN AN ERA OF TECHNOLOGICAL CHANGE

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I would like to set the stage for this paper by quoting from the summary of a March 1986 report by the Office of Technology Assessment titled "Technology, Public Policy, and the Changing Structure of American Agriculture."

The summary of the report concluded that: "The biotechnological and information technology revolution in agricultural production has the potential for creating a larger, safer, less expensive, more stable, and more nutritious food supply. Yet, it will exact substantial costs in potential adjustment problems in the agricultural sector and in rural communities."

The purpose of this paper is to bridge the gap between the biotechnological and information technology revolutions and the economic world of farmers and lenders. Understanding this linkage is the key to financial survival in an era of technological change. In so doing, I will raise some larger policy questions; questions that will be answered either by action or by inaction as these changes develop.

Technology Horizon: What's Ahead?

The new technologies have a heavy emphasis on biotechnology and information. On the biotechnological side, OTA concludes that breakthroughs in animal technology, such as gene insertion and embryo transfer, will likely emerge at a faster pace than in plant technology. The information side is ripe for exploration and development, not only for automation, but for monitoring plant growth and performance of individual animals, economic planning, financial management, and a host of business and operational functions.

In many cases, the advances in agriculture are spin-offs from applied research in other fields. Private firms are looking for ways to capitalize on what they or others have learned in such areas as medical research and remote sensing. Much of what you have heard and read about is well underway and, in animal biotechnology, for example is in the testing stages.

The application of biotechnology in plant agriculture could significantly modify crops, making them more nutritious, resistant to insects and disease and less dependent on chemical fertilizers. These types of advances are apparently not as imminent as those for animal agriculture, but over the longer term the impacts of biotechnology may be substantially greater for plant agriculture, especially on a worldwide basis.

Technological change has often been characterized as either output enhancing or cost lowering. Unlike the prior mechanical (1920-1950) and chemical (1950-1980) eras, the emerging biotechnology and information technology era has a greater emphasis on lowering input requirements or otherwise contributing to improved operating margins. In periods of low commodity prices and tight operating margins, the ability of a new technology to lower a producer's average cost of production is the ultimate determinant of how widely and rapidly it will be adopted.

The new technological era differs from the previous ones in several important ways. Much of the current activity is in the hands of private firms rather than the public sector via the Land Grant Universities and the U.S. Department of Agriculture.

Thus, the cost and benefits will be shared differently than in the past. The new technologies are likely to be more neutral with respect to farm size than were the prior types. Many of the new developments are less of a problem by being consistent with a producer's current plant and equipment, i.e., not quickly outdating much of the firm's capital items.

The evidence suggests that existing technology in agriculture will allow U.S. farmers to easily satisfy domestic demand and contribute significantly to world demand over the next 20 years. The new technology, in this sense, is not necessary for survival.. However, the new technology will enhance U.S. efforts to remain competitive in world markets. Clearly, from a purely physical viewpoint, the United States will have the technology to satisfy all of the potential demand for farm products we can forsee for the rest of this century.

Effect on Agriculture and Rural Communities

It is clear that American farmers will be offered a large technological menu over the next 15 years.

Plant and animal production could be revolutionized if the new technology is widely adopted. However, changes of this magnitude generally cannot be absorbed without fostering major economic adjustments -- and frequently these extend well beyond the production sector. To put this issue in better perspective, it is necessary to make some critical assumptions about the future.

1. The demand for food will continue to be price inelastic, with domestic growth in demand approximately parallel to population growth, or about 0.7 percent per year.

2. The growth in foreign demand will recover from its 5 year slide. It will be dependent on both per capita income growth and population growth in developing countries, but only on population growth in developed countries.

3. Total market growth for U.S. farmers will average 2 to 2.5 percent per year assuming we can maintain market share both at home and abroad. An increase in market share would improve the growth prospects, but the odds for a large gain are not favorable.

Most of the evidence suggests that current technology is capable of sustaining prospective demand growth for the next 15 years. Thus, the tight balance between adding to the surplus situation and working it down likely will be maintained. Or to put it differently, the difference between strong and weak economic conditions for farmers and their lenders will be relatively small, which will increase the risk factor for all parties.

However, when one factors in the developing technologies, our picture of the future becomes even more clouded. Many of these technologies, especially those involving biotechnology, will tend to increase output and, consequently, depress prices. If history is any teacher, these technologies are usually highly profitable for those who adopt them early, so we can assume they will be adopted. But the impact of widespread adoption tends to shift the supply curve to the right, depress prices, and erode the initial wide profit margins of the early adopters. Everyone has the incentive to eventually adopt the technology to survive but anticipated profits are an illusion. This forces significant resource adjustments; it also ultimately improves the food bargain for consumers.

Again, if history is any teacher, it follows that new attention will be turned to the export market as the way to avoid making some of the painful adjustments. However, we need to recognize that many of the emerging technologies have a worldwide dimension. Other countries are making good progress in achieving better production technology, and even where they lag behind the United States, we find that the technology is highly transferable. We should note that during the 1965-85 era, the technological revolution has transformed several countries from importers of grains and food products into net exporters. Clearly, efforts by some countries to attain self sufficiency in food production are not so far fetched as they once were.

Some structural changes are already evident: farming is becoming more centralized, more vertically integrated. Large farms, though small in number, now produce most of this country's agricultural output. Although small operators are generally inefficient, they have strong staying power because of off-farm sources of income. The moderate size farmers, however, are becoming less able to compete, partly because they lack access to the information and financing needed to adopt new technology effectively. Many of these farmers face the prospect of changing to other kinds of farming or abandonimg farming altogether.

These adjustments are causing major repercussions in many rural communities and for the labor pool in general, which must absorb all those whose livelihood depended on agriculture.

Most of the evidence suggests that these trends will continue. If technology effectively reduces costs and enhances output, economic forces likely will drive agriculture toward greater concentration; that is, toward fewer but larger farms. This suggests that many rural communities will struggle for survival. We may see the emergence of rural service centers, located mostly in county seats and larger towns offering employment opportunities. The development of electronic hardware and software packages will accelerate this shift, for with a home computer the operator will be able to make important marketing and financial decisions with firms all across the country. The convenience of dealing with local merchants could become less important, which could cause many smaller towns to lose their economic viability. This is not a new process in rural America; towns have been dying ever since the automobile replaced the horse as the primary means of transportation.

Although I am convinced that many of the long-term trends in agriculture will

continue, I have serious questions about the magnitude of the changes. Earlier in this paper, I indicated that some of 'the new technology,' especially in the information area, may be size neutral. In addition, the biotechnologies may cause operators, as a group, to reduce resources rather than expand output. Given the current level of financial stress in agriculture, together with the less-than-optimistic economic prospects for the future, the financial risks associated with agricultural production could increase substantially and might slow the trend toward larger farms. Alternatively, I expect farm size to continue growing on average, but with fewer of the assets controlled by the farmer owned by the farmer. This is a policy area that deserves further consideration and analysis.

Financial Implications and Credit Availability

Let us now move toward the financial area of this paper by looking at capital requirements and the related issue of credit availability. The farm of the future will be treated like any other business -- it will have to demonstrate profitability to receive financing.

Technology will be a key factor in future profitability, and that technology will have to pass the test of economic feasibility.

Over the years, much of the technology has tended to be capital intensive, leading to a massive substitution of capital for labor, larger farms, and eventually to serious adjustment problems. For the most part, the adoption of technology was profitable, especially for the early adopters. It lowered production costs so lenders were happy to finance capital purchases. Their risk was that the technology would fail to generate enough income to service the debt.

The 1980s demonstrated how serious credit problems can arise through the financing of technology. Increases in productivity and land prices during the 1970s resulted in a sharp expansion of debt that later brought on the stress of the 1980s. Of course, inflation and the erroneous expectation that world food supplies would remain tight were major contributors to the debt growth problem.

In my judgment, the pending wave of technology will not have the same financing implications as the old technology. For the most part, the new technology is not capital intensive, so there will be less substitution of capital for labor. As before, however, the technology will be adopted because of the initial payoff, and later out of necessity.

And, like its predecessors, it will cause adjustment problems. But the key to the future will be the management factor instead of the capital/labor factor. In other words, success will be determined by the management requirements accompanying the technology and the management skills of those who control the capital.

The skills involved in the delivery and use of biotechnological improvements will be quite different from those involved in the delivery and use of information technology. Simply put, injecting an animal with serum or feeding it premixed feed is quite different from running a spread sheet and using the data to make business decisions. But this presumes that the biotechnology is neatly packaged in a "black box" and that it has no impact on the processes or the management skills required in the rest of the operation. We really do not know at this point which will be the case.

Obviously, lenders will continue to look at profitability when making the credit decision, and to the extent that emerging technologies promise to reduce costs, there will be an incentive to lend money. For the most part, the new technology should pass the economic feasibility test.

There are, however, some important differences between the new technology and the old. Previously, the credit decision focused on whether the operator could service the debt on a high-cost item. In the future, the decision will likely be based on whether the operator has the management ability to handle state-of-the-art, albeit low cost, technology and remain profitable.

Another important issue concerns the distribution of gains from new technologies. When technological changes came out of the land grant university system, the supplier took virtually nothing. All the gain went first to the early successful adopter and later to the consumer. In the future, it seems likely that the private sector suppliers of technology will retain a good portion of the gain, with farmers and consumers settling for less. Only the higher value innovations are likely to be profitable for farmers. So while capital requirements for new technologies may be less than for the old, the financial consequences could still be extremely important.

Credit Availability and Its Cost

As a starting point, consider that 40 percent of the 1,400 commercial banks on the "troubled" list of the Federal Deposit Insurance Corporation are classified as agricultural banks.

Thus, with continued mergers and consolidations of financial institutions, loan decisions in the future could be made at headquarters locations far removed from the farm. And those decisions won't be shaded by neighborly good will, but by hard business evidence of potential profitability.

If the headquarter bank perceives that risk has increased as a result of the adoption of new technologies, large supplies, and low prices, the cost of credit could increase to cover the risk.

And the changing regulatory and competitive forces, including the preference for greater privatization of some credit institutions, means that the cost of agricultural credit will probably be higher and more volatile than in the 1970s and will follow market rates more closely. Although the cost of credit may increase in real terms from the 1970s, one must remember that decade was characterized by real interest rates to farmers that were seldom much higher than zero. Conversely, in the mid 1980s real interest rates are quite high. On balance, even though real interest rates escalated substantially from the 1970s, there may be some opportunity for reductions from mid 1980s levels. I believe that well managed farm operations will be able to compete effectively for credit and use it profitably.

In summary, the financing consequences of new technologies will depend on the relationship among three factors:

1. the financing characteristics of new technology -- how much does it cost, what is the payoff period, and what is the effect on costs of production and on prices received?

2. the management skills required of the operator in implementing the technologies.

3. the changing forces in the capital and credit markets that affect the cost and availability of capital.

These, of course, are in addition to credit factors usually considered by the lender.

Emerging Policy Issues

There are three larger questions related to new technologies.

1. Will excess agricultural supply get worse and force an alteration in farm policy that eliminates the historic kinds of programs that have cushioned agricultural adjustments? The pending list of technologies shows every prospect of expanding production and worsening the supply/demand balance. However, the advances should help keep the U.S. competitive in world markets or at least keep the U.S. from falling further behind.

   The prospect of increasing our output of program crops currently in excess supply could help hasten the day that farm program benefits are more clearly separated from a producer's current production level, and, in fact, come up with an incentive system to curtail such output. Nevertheless, it appears that agricultural sector income and adjustment problems will be with us for the rest of the 20th century.

2. Are agricultural lenders going to experience greater risks and will the cost of capital increase to farmers? Lenders will be less vulnerable when financing many of the technological packages because of their low cost. But they could be more vulnerable in selecting which businesses to finance in an environment of new technology. A producer who is highly successful in managing old biological and information technologies may or may not be able to handle the developing ones.

   This is an impact somewhat independent of size, but one which can turn a successful operation into one that will skid toward exit due to dropping commodity prices. The prospect is a major risk for lenders.

3. What is the Land Grant University's role in this process? Does it become rather irrelevant? The new technologies are generally the product of industry rather than the universities. Hence there is the prospect of greater gain for the industry and less for the farmer and consumer. A proper balance of benefits will be struck. But the determination of the fairness of that balance could become a public policy issue.

Finally, we must not forget that this paper addresses the agricultural sector only. Viewed in its broader context, technology is the engine that increases economic well-being. Despite potential adjustment problems, the result is the freeing up of resources that can be put to still other uses for the good of mankind.

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