A LOOK AT MAJOR EVENTS IMPACTING PRODUCTIVITY AND UNCERTAINTY IN SOUTHERN AGRICULTURE DURING THE 1970'S

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In view of the breadth of the topic, coverage is limited to identifying the events and commenting on the types of impacts on agriculture rather than stating specific empirical estimates of impacts. Numerous researchers in agricultural economics have examined the quantitative dimensions of impact from particular scenarios of future courses of some of the events identified here.

With only one or two notable exceptions, the current commodity output mix of southern agriculture is similar to that for U.S. agriculture as a whole. Ranking the top eight farm enterprises of the south in dollar value (1976) shows tobacco in the southern region replacing wheat in the national ranking; dairy, corn, and hogs are more important nationally and broilers and eggs are more important in the southern complex. Therefore, if those dimensions of agriculture associated with geographic location, such as population, climate, or transport net, are excluded, the major events affecting southern agriculture in the 1970s can be discussed in terms of U.S. agriculture.

TRANSITORY EVENTS: FOOD CRISIS AND CLIMATE SHIFTS

Two events during the 1970s, the food crisis and the climate shift issue, seemed at the time of their occurrence to be major events in terms of their potential impacts on agriculture. The later turned out to be transitory.

The significance of the food crisis of the early 1970s, with record high prices for U.S. farmers, ranked substantially higher in middecade than it does today. A similar comment could be made about the earlier sensing of potential world food shortage to be found in Administration pronouncements of the 1966-67 period. The food crisis of 1973-74 was not an event which in itself had lasting effects on productivity, although it may have changed some elements of uncertainty through shifts in price and/or income expectations of producers, and heightened public awareness of the possibilities of recurrence.

The climate shift issue achieved a significant degree of public awareness in the wake of two phenomenally cold winters, 1977 and 1978. The subject of the controversy was the projection of long-run dramatic changes in climatic conditions on a global scale. Though climatological experts disagree on both cause and direction of the temperature change, all agree that a few degrees' change in average temperatures worldwide in either direction would portend total calamity. It is encouraging that a majority of the climatologists recently questioned on this point by the National Defense University foresaw only a slight warming trend—not to exceed ½ degree Celsius by the end of the century [9]. The absence of a clear consensus for radical change in climate leads to the conclusion that the net effect of the climate issue on agriculture is a slight increase in uncertainty for the normal farm planning cycles.

Among the events of the 1970s which affect agriculture, four major changes in the economic environment of agriculture are worthy of comment: (1) the growth of interdependency in international trade and associated developments, (2) domestic inflation and its consequences, (3) the energy crisis, and (4) environmental regulation.

INTERDEPENDENCY IN INTERNATIONAL TRADE

The shift to a substantially greater involvement and interdependency of agriculture in international trade during the 1970s is perhaps the most far-reaching event of the decade. At the turn of the 1970s, U.S. agricultural exports were valued at about $6.7 billion annually, and had not changed significantly in value since the mid-1960s. Imports of farm products at $5.6 billion left agriculture's net contribution to the balance of payments at just over $1 billion, well below the peak contribution for the 1960s of $2.3 billion in 1967. Dramatic growth has occurred during the 1970s in volume and

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value of U.S. exports of agricultural products to an estimated $27.3 billion in 1978, with a net contribution of about $14 billion to the balance of payments. This growth has exceeded the rate of growth of U.S. production of farm products. The share of dependence of U.S. agriculture on international markets has grown from about 13 percent to more than 22 percent last year.

All recognize the important benefits of this gain in agricultural trade for the U.S. economy because of the substantial and growing national dependence on petroleum imports. However, this foreign trade also increases the vulnerability of domestic markets for farm products to the variability in international markets. U.S. market price experience with wheat, corn, and soybeans earlier in the 1970s adequately illustrates this risk.

The impressive growth of U.S. agriculture's export markets occurred during a period when the United States made a change in monetary policy which carried significant consequences for international trade. After years of retaining the policy of fixed exchange rates with the dollar tied to gold, the United States moved early in the 1970s to a system of floating exchange rates with other currencies. Schuh [11] analyzed the consequences of this changed role of foreign exchange rates and the increased international mobility of capital. He finds that these two features cause the consequences of changes in government fiscal and monetary policy to be channelled primarily into export sectors, such as agriculture.

The application of Schuh's analysis shows agriculture in the early 1970s to have been in an economic squeeze; the over-valued currency served as an implicit export tax and the government resorted to monetary and fiscal policies to stem gold outflow and raise interest rates. More recently, the precipitous decline in the value of the dollar has undoubtedly worked to U.S. agriculture's short-run advantage in international trade. Today many view the dollar as undervalued, and consequently functioning as an implicit export subsidy, giving rise to extra strength in agricultural export markets. However, when the dollar recovers its equilibrium, a substantial adjustment will be forced upon U.S. agriculture.

Schuh concludes that, "in the future we can expect to have an unstable demand for agricultural output in marked contrast to the past, with the source of that instability coming from the foreign sector, even though those fluctuations of foreign demand are an indirect consequence of domestic monetary and fiscal policy" [11, p. 76].

Though changes in international trade barriers and other impediments to trade as well as changes in domestic agricultural policy to shelter food prices from external influence may modify these conclusions somewhat, the instability suggested may well be a continuing economic risk factor for southern as well as U.S. agriculture, causing greater price variability in farm products.

Carter and Johnston [1] identified another feature of the interdependence of U.S. agriculture in the world economy which bears upon agriculture's price stability. They observed that many of the United States' international trading partners place greater reliance than this nation does on some form of government intervention or participation in a trading bloc. Thus, U.S. efforts at nondiscriminatory reduction of trade barriers, which are important to U.S. agriculture, are viewed differently depending on the individual country's or trading bloc's economic and political goals. As a consequence, the U.S. may be less successful in negotiating reductions in trade barriers, the effects of which are conceded to be destabilizing. Hence, the interdependence which has brought the positive benefits of greater trade in farm products internationally carries the potential for greater price and income instability.

INFLATION

The domestic economic environment for agriculture during the 1970s featured one easily agreed-upon "major event" — inflation. After the decades of the 1950s and 1960s during which inflation averaged less than 2.25 percent annually, as measured by the CPI, the rate of increase in the general level of prices climbed to nearly 9 percent in 1973 and just over 12 percent for 1974. Food prices, with a similar history of very modest increases in the 1950s and 1960s, rose an astonishing 20 percent in 1973 and equaled the CPI climb for 1974. After declining to less than 6 percent in 1976, the rate of inflation resumed its upward climb and approximates 9 percent as measured by the CPI for 1978. Food prices have followed directionally and seem likely to have increased by nearly 11 percent in 1978. Record farm prices achieved during 1973-74, though associated with reduced agricultural production abroad due to a number of climatic aberrations worldwide as well as an upheaval in international currency exchanges, created a lasting impression in the minds of many people in farming. In effect, a new level of price expectations was established, a level which, regardless of its original cause, may have played some part in the agricultural activism and resurgence of the parity concept in the thinking of the members of some agricultural groups, such as the American Agricultural Movement, in the late 1970s.

The consequences for agriculture of a period of inflation depend on the specific circumstances. If farm prices keep up with the rate of inflation, the price impact may be minimal, particularly if agricultural productivity growth offsets greater rates of gain in prices of production items farmers must buy. The evidence on this point is somewhat mixed. Tweeten and Griffen [14], in a study of price experience in the years 1920-69, conclude that national inflation does have the effect of reducing real prices in the farming industry, and reduces the parity ratio. Gardner [5], examining a more recent but shorter time span, 1967-78, and using monthly data, found that both farm product and farm input prices respond quickly to changes in the general price level. Gardner's analyses also suggest that, on the basis of 1948-77, both net income and farm asset values have grown in real terms during periods of inflation. Such conclusions do not respond to the question of effects of inflation during a period of rising real farm costs due to resource scarcities; these effects are likely to be unfavorable to agricultural producers. Further, the uncertainty over interest rates and the problems of intergenerational transfer of farming operations, as well as cash flow difficulties and risks with low equity land transfers in the face of inflated asset values, are readily apparent. As Gardner concludes, the overall result of inflation is an extraordinary element of risk for agricultural producers.

One may speculate also on the effects of inflation on productivity via the limitations which its continuation may create. For example, insofar as inflation continues to fuel the rise in the price of farmland (the perfect inflation hedge), it may also severely limit the growth of the family farm size as usually conceived. This point is difficult to deny because average asset values per farm exceed a quarter million dollars today for more than one of the states of the region.

Carter and Johnston [1, p. 745], surveying the factors which have caused rapidly rising land values in the 1970s, identified the rising commodity price expectations, persistent inflation in the general economy, and the consequences of international market interdependence as contributing factors. They also note increased difficulties of entry and the problem of intergenerational transfer. Their observations suggest the possibility of increasing risks in farming as the pressures mount for greater dependence on capital markets and larger farms rather than the family farm as the typical unit, a unit which has shown greater capacities to absorb and adapt to risk.

THE ENERGY CRISIS

The event which in some ways provided the greatest shock to the U.S. economy in the 1970s was the energy crisis—the exposure to the scarcity of a common consumer good. The background of the energy crisis is well known: the decline in new discoveries of petroleum and natural gas, the increased demand for energy, the regulation of air pollution practices, and the OPEC embargo with its aftermath of rapidly rising energy prices.

In spite of these developments, which portend substantially reduced fuel availability in the future, the reaction in terms of changes in input costs was rather modest through 1978. A sharp climb in nitrogen fertilizer costs occurred in the mid-1970s in association with natural gas limitations, but these costs have since declined. Though farm fuel costs have risen substantially since the beginning of the 1970s, the increase in costs of fuels and energy since 1970 has been less than the rise in cost of the other items in the farm production complex. Clearly, the federal government's controls on petroleum and natural gas prices have held this cost increase in check. Fuel and energy costs, which represent about 8 percent of the total costs of farm production, will begin to rise more rapidly in the wake of such developments as the recent OPEC decision to raise oil prices and the governmental decision to partially decontrol energy prices domestically.

The energy crisis has spawned a variety of studies examining the consequences of alternate scenarios with respect to energy availability and pricing, ranging from reversion to on-farm sources of power to the consequences of technological breakthrough by development of plants as oil sources [10]. Van Arsdall and Devlin [16] project an increase of 27 percent in real energy prices to farmers between 1975 and 1985 with no energy legislation, and a 37 percent increase with the President's National Energy Plan (May 1977 version). An unpublished study for Resources for the Future [15] used the NIRAP model to project energy use and impacts on a national basis for the years 1985, 2000, and 2025.

Clearly, for at least the next decade or so the energy situation will be cost-increasing for American agriculture and may affect capital outlay, production practices, and nonpetroleum input availability to the detriment of productivity levels and with increasing risks. The direction of change, as real energy costs rise, will be toward substitution of land, labor, and capital inputs for energy in the product mix of farming.

ENVIRONMENTAL RESTRICTIONS

Linked closely to the limitations on availability and use of energy in agriculture are several regulatory restraints related to the environment that were enacted during the 1970s [7]. Each of these enactments embodies, in different aspects, a broad concern with which everyone can agree, i.e., it is worthwhile to preserve and improve the environment and to protect people's health with necessary safety measures. However, each of these pieces of legislation involves costs to achieve its ends and the costs are not uniform in their impact.

The National Environmental Policy Act was passed into law January 1, 1970. It established the federal government's intent to protect the natural environment and to take positive steps to improve it. It resulted in the creation of the Environmental Protection Agency, which consolidated into one agency all the federal programs for air pollution, water pollution, solid waste disposal, pesticides regulation, and environmental radiation.

Among the acts which the EPA administers is the Federal Environmental Pesticides Control Act of 1972 [3, p. 183]. The Pesticide Control Act basically strengthened the authority of the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, and moved from only regulating the labeling of such products to the authority for the restriction of use of the products. The activities of EPA in the pesticide area resulted in bans on the use of DDT, aldrin, dieldrin, Mirex, and others [2, p. 4]. Though the constraints represented by restricting pesticide use have undoubtedly created some hardships for agriculture, it is difficult to estimate the full effect of such withdrawals on agricultural productivity. The pattern of build-up of resistance in insects to these chemicals had already been observed and had occasioned shifts from chemical to chemical in an attempt to find a more effective means of insect control in the face of growing immune reactions.

On the positive side, these EPA efforts at regulation have resulted in the development of a program known as Integrated Pest Management [3, p. 186] which maximizes the natural control of pest populations through knowledge of each pest, its environment, and its natural enemies. Indications are that this approach often provides better pest control at a lower cost and with fewer environmental problems than reliance on chemical pesticides alone.

The Federal Water Control Act amendment of 1972 aims at strengthening the clean water program by regulating both point and nonpoint water pollution [3, pp. 168-171]. The Act is administered by EPA and involves the regulation of point source discharge of effluents by requiring permits which specify the allowable amounts and constituency of effluent discharge. In agriculture, feedlots would be a primary target depending on the applicable definitions of size and scope. A second objective of this act is to control agricultural nonpoint sources of water pollution. The goal is elimination of pollution in navigable waters by 1985. Such goals could affect agriculture in terms of cultivation practices, nitrogen fertilizer restriction, and restrictions on uses of herbicides. Hurt and Reinschmiedt [6] indicate a severe economic impact on southern agriculture if nonpoint pollution goals are met. Under this act, the primary authority for management lies with the states, but the EPA retains authority to impose more stringent requirements. The real question with this act is how extensive restrictions will be. Though it may not be an expression of EPA intent, a recent study under EPA sponsorship examined, among other things, of such possibilities as (1) a complete ban on the use of all insecticides, [2] restriction of fertilizer application to 150 pounds per acre, and (3) elimination of straight row cultivation [13].

The Clean Air Act Amendments of 1970 are also of interest to agriculture. This act, too, is administered by EPA, and one of its concerns is the prevention of crop damage due to high levels of photo-oxidants in the atmosphere. An indication of the importance of this development is evident in the EPA estimates for 1973 of crop losses nationally due to high oxidant levels, which are as high as $3 billion [4, p. 346].

Finally, the Occupational Safety and Health Act of 1970, known as OSHA, has been an irritant to the commercial farming population. The goal of the act is the elimination of hazards to safety and health occurring in a work situation. OSHA, the agency of the Department of Labor established for the administration of this act, has levied numerous requirements, ranging from requiring roll bars on tractors and sanitary facilities for workers to re-entry standards for workers engaged in the application of agricultural chemicals.

Most of the provisions of environmental legislation are of concern to agriculture because of the potential for restrictive regulations [12]. The environmental legislation affecting agriculture involves, to an important degree, giving a public agency the responsibility of preparing specific guidelines for the accomplishment of overall worthwhile objectives. Many of the improvements that are possible under these acts will be limited very clearly by the tradeoffs between environmental ends and the competing end of energy use conservation [7]. In summary, these environmental acts represent sources of irritation and potential for reduction in efficiency in agriculture as well as some elements of uncertainty as to whether

specific practices will be acceptable. They will add to the feeling of producers in agriculture that they are over-regulated and over-constrained in ways that are less than appropriate for the ends sought.

OTHER EVENTS

Other events of the 1970s that are significant to agriculture in terms of potential effects on productivity and uncertainty are the resumption of diplomatic and trade relations between the U.S. and the People's Republic of China, the changed patterns of migration to rural nonfarm areas, the modifications of inheritance tax laws affecting family farms, and the wave of consumer activism which appeared in the 1970s.

Though most estimates of overall productivity change for agriculture indicate a slowing in the rate of growth of productivity [8], one must not overlook the specific developments in the 1970s in the physical and biological sciences affecting agriculture. Some examples follow.[1] Agricultural engineers cite the commercial development of a pasture renovator for interseeding legumes into grass with a single machine operation that will permit the efficient management and utilization of approximately one-half of the U.S. farmland which should or must remain in grass. This machine will allow an increase in productivity of that land by a factor estimated to be about 4. Animal scientists have identified selenium as an essential element in animal nutrition and it has markedly reduced disease losses in cattle, hogs, sheep, turkeys, and poultry. The success of the hog cholera eradication program nationally has reduced the cost of pork production significantly through reduced death losses and costs of vaccination. Agronomists point out that the popularization in the 1970s of minimum tillage practices originating in the 1960s has materially improved agriculture's ability to cope with reduced fuel availability in the years ahead, and has expanded the land base adaptable to row crops (for indications of productivity impacts of some emerging agricultural technology, see [8]).

CONCLUSIONS

The major economic events delineated here seem to have impact on uncertainty in agriculture than on productivity. Further, they tend to support the conclusion that agriculture's increased uncertainty is predominantly in the marketplace, as international developments become ever more important in determining price for an increasing share of U.S. agricultural output. Developments and decisions among the OPEC nations combined with legislative and administrative judgments at home increasingly jeopardize that part of the technological progress of agriculture which is based on cheap fossil fuel. Inflation threatens to disrupt agriculture's structure as well as increase the uncertainty of its cost and price environment. And environmental legislation, on balance, has tended to increase the uncertainty of the cost complex of agriculture and the continuance of some production practices which may be barred by environmental restrictions at some future date.

These events challenge agricultural economists to provide useful insights upon which producers can base decisions in this increasingly uncertain economic environment. With sophisticated analytical methods facilitated by computers, agricultural economists can simulate potential outcomes from regional and national models under a range of different scenarios. As always, success in this effort will depend upon the relevance of the alternatives identified and the effectiveness of the information delivery systems.

Finally, even with the help of agricultural economists, designers of public policy must call forth their best efforts to solve the problems generated by the events of the 1970s.

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