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Agricultural-Food Policy Review

U.S. Agricultural Policies in a Changing World

Agricultural-Food Policy Review:
U.S. Agricultural Policies in a Changing World

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Preface

This review brings together background information for assessing today's agricultural sector and the programs of the Food Security Act of 1985 and for looking to the future for new agricultural, environmental, and rural development issues. This information sets the stage for debating omnibus agricultural and rural development legislation to take effect when the 1985 Act expires in 1990.

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Chapter 1

Introduction

Milton Ericksen*

The 101st Congress must renew omnibus legislation that authorizes the Nation's agriculture and food programs. This task is not new. Agriculture and food legislation that defines national agricultural policy in terms of programs and regulations that affect individual farms has been regularly updated since the first Agricultural Adjustment Act in 1933. This task attracts wide interest because commodity producers, consumers, groups with domestic and foreign food aid interests, soil and water conservationists, environmentalists, foreign governments, and taxpayers all have a stake in the outcome.

Policymakers have continued to build upon a foundation of beliefs and values that have changed little over the intervening years:

- Providing an adequate supply of food and fiber at reasonable consumer prices such that farmers receive income comparable to what nonfarmers earn with similar skills and capital investment;
- Encouraging and supporting soil and water conservation;
- Maintaining reasonably stable market prices;
- Believing that independent farms operated under family proprietorship are fundamental to the productivity and responsiveness of U.S. agriculture; and
- Believing that markets, including international markets, efficiently allocate resources and income among sectors and should be promoted.

Elected and appointed officials exercise their prerogative of establishing a consensus view of how well the agriculture and food system is functioning given society's objectives and beliefs. A disparity between what beliefs and values suggest ought to be and what is perceived as the actual situation justifies enacting legislation designed to close the gap. There is a common perception of disparities in agriculture as a result of bad weather, continued

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adoption of new technology, actions taken by foreign governments, a structural imbalance between factor and commodity markets, and particularly in the case of conservation, a disassociation of benefits and costs from the resource management standpoint of individual farmers. Lawmakers have often passed legislation to authorize program provisions or regulations to counteract or offset those conditions. Their actions often involve transfers of tax dollars from taxpayers to farmers.

The political process of debating and renewing omnibus legislation begins with a review of existing legislative programs in relation to conditions and issues that have transpired. Policymakers then assess how well individual program provisions have performed given the conditions under which those programs operate. Finally, policymakers evaluate anticipated conditions in terms of emerging disparities between reality and political ideals and the extent to which existing programs can respond.

This *Agricultural-Food Policy Review* presents a compendium of information relating to each of these stages. The first section focuses on the current policy framework in relation to conditions, events, and issues that have affected the agricultural system. The first chapter traces the recent evolution of U.S. agricultural policy and explains how demand-led optimism of the 1970's gave way to surplus-based pessimism of the 1980's and how the Food Security Act of 1985 was designed to respond to the emerging conditions. Subsequent chapters in the first section address particular issues that came to the forefront in the 1980's. The chapter on macroeconomic policies focuses on the increasing importance of the links between traditional agricultural commodity programs and macroeconomic policy. The message is that agriculture and food policymakers can no longer ignore this dimension.

The third chapter discusses the 1985 Act's expanded soil conservation provisions and other legislation that heightened the focus on water and the environment in general. A fourth chapter focuses on tax policy and Federal credit. The final chapter in the first section focuses on agricultural trade policy. Agricultural trade was singled out for special consideration under the current negotiations within the General Agreement on Tariffs and Trade (GATT). The United States pushed the issue even higher on the agenda by proposing to multilaterally phase out trade-distorting practices by the year 2000.

The second section spotlights the performance of the traditional loan rate, target price, and acreage reduction programs. It also deals with food aid, food assistance, and export-related programs which have a history of being a part of farm program legislation. The section also features chapters on the use of generic payment-in-kind certificates and on the Conservation Reserve Program (CRP). Certificates were used in innovative ways under the authorities of the

1985 Act, and any assessment of programs under 1985 Act provisions must also include generic commodity certificates. The 1985 Act also established the CRP which, in some respects, is a reincarnation of Soil Bank provisions first introduced in the 1950's and which is a major element of 1980's policy. The second section concludes with a chapter that discusses the uneven distribution of benefits under current programs and a chapter analyzing the factors that contributed to recent growth in wheat exports.

The issues in the third section—international trade policy emphasizing liberalization, water quality, rural development, biotechnology, food safety, and government intervention or free markets—will all arise in the coming debate.

The first chapter discusses the conflict between growing world interdependence and domestically focused agricultural policies. Cycles of substantial surpluses accompanied by huge budget outlays followed by fears of shortages reinforce the contention that existing programs may be part of the problem and thus deserve yet another look by policymakers.

The second chapter continues the theme of emerging issues and conflict. Liberalized trade would lead to higher world prices, if other things are equal. The continued emergence of production-enhancing technology, however, may lower prices, and falling prices are often used to justify protectionist trade policies. Even if policymakers can sort out the offsetting product price effects of trade liberalization and technological change, they may still be pressed to compensate those agricultural producers who would lose under trade liberalization. Everyone can be as well or better off under liberalized trade theoretically, but can policymakers assure that it works out in reality?

Conflict arises on the food safety front because of increasingly sensitive tests that can now detect microorganisms or chemical residues that previously went undetected. In some cases, the presence of such substances triggers legal restrictions, unduly heightening consumer fears. New data on chemicals may show risks with residues so small that they were not previously detected. Many food safety policies and regulations were adopted before these developments. Thus, policymakers face the challenge of incorporating new knowledge and testing technology into the food safety realm.

Biotechnology poses many unknowns. These unknowns go beyond production effects even though production is often the dominant concern. The biotechnology chapter touches on the structure of the biotechnology industry, patent rights, liability insurance, Government regulation, pricing of biotechnology products, and the fundamental output or input substitution effects. Policymakers may ask if programs are flexible enough to accommodate biotechnological shocks.

"Farm programs are ineffective means of addressing most rural economic problems," according to the author of the chapter on agricultural policy and rural development. The chapter examines the relationship between farms and rural communities as background to assessing the needs of rural communities and the role of farming and farm programs in meeting them.

Surface water and ground water supplies are subject to nonpoint-source contaminants that originate from agricultural activity. Concern about the safety of water supplies has raised the issue of the degree of contamination that originates from agriculture. The chapter on water quality discusses the issue from the perspective of agriculture. It addresses the difficulty in measuring contamination and in estimating economic costs associated with water quality.

Mandatory controls continue to be offered as an option that could apply to all commodities, even though the trend since the 1950's has been instead toward voluntary production adjustment programs. Each farm bill debate has also brought out the suggestion to eliminate all price and income supports and production adjustment provisions in favor of complete reliance on the marketplace. Many see the GATT proposal to remove all market distortions as a move in that direction. The authors of the chapter on governmental roles split the policy alternatives into a spectrum with one extreme being market orientation and the other mandatory controls. They use that spectrum to compare the various approaches in relation to indicators such as farm income, Government costs, stock levels, price and income stability, risk, and marketing opportunities.

Agricultural policy is much more than the summation of individual commodity programs. The ties with the macroeconomy, the importance of international trade, and the interaction between agriculture, the environment, and rural communities broaden the scope of agricultural policy. These areas add new constituents to the policy process and suggest new relationships to identify and measure. We hope that this *Agricultural-Food Policy Review* links tradition and a sense of history to the emerging issues and conveys a sense of the complexities inherent in future food and agriculture policymaking.

U.S. Agricultural Policies in the 1980's

Chapter 2

Evolution of U.S. Agricultural Policy in the 1980's

Suchada Langley and Harry Baumes*

Policymakers have tried various tools to deal with the agricultural turmoil of the 1980's. Both the Agriculture and Food Act of 1981 and the Food Security Act of 1985 introduced innovative approaches to ensuring adequate supplies of food and fiber for both domestic and international consumption and adequate income for U.S. farmers. The debate that will precede the development and adoption of new legislation in 1990 will be influenced by the events and recent issues of the 1980's. This chapter explores some of those influences and discusses potential outcomes in agricultural policy.

Agricultural policy is a product of philosophies, values, historical precedent, events, and reactions both to economic indicators and to political pressures. The U.S. Government has intervened in agriculture at the individual farm level for more than 55 years. The original intent of U.S. agricultural policy and programs, which included preserving the family farm and supporting prices and farm income, remains much as it was in the 1930's, even though emphasis and program tools have changed.

This chapter describes the evolution of U.S. agricultural policies in the 1980's, in conjunction with historical philosophy, objectives, and economic and political forces affecting these policies. The Agriculture and Food Act of 1981 (P.L. 97-98) and the Food Security Act of 1985 (P.L. 99-198) are the two most recent pieces of omnibus farm legislation. The 1985 Act was more innovative as it changed the direction of trade and conservation policies. This chapter focuses on the setting for 1990 farm legislation and highlights emerging economic and political events and issues that could affect it.

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Philosophy and Objectives for U.S. Agricultural Policy

The family farm has deep roots in our culture. The American family farm began in 1618 when the Head Right System authorized 50 acres of land for every colonist who entered the colony of Virginia. The Homestead Act of 1862 authorized up to 160 acres to the head of a family at 21 years of age and is a cornerstone of U.S. agricultural policy promoting the family farm. Early legislation provided a basis for research, extension, development, cooperatives, credit, and water subsidies which promoted agricultural production.

As farm numbers were declining in recent years, the Food and Agriculture Act of 1977 (P.L. 95-113) included provisions to "foster and encourage the family farm system." The credit provision of the 1985 Act emphasizes homestead protection. Although family farms are still declining, protecting them remains a basic objective of farm policy.

Farm policy in the 1980's has focused on price and income support, conservation and protection of cropland, and competitiveness in world markets.

Objectives of U.S. Agricultural Policy

The basic premise of agricultural policy over the years has been to protect the family farm, to support prices and farm income, and to conserve natural resources. At different times, the priorities and means of achieving these objectives have changed. From the 1930's through the 1970's, nonrecourse loan programs supported and generally raised commodity prices. Direct payments supplemented farm income, and production controls included idling farmland.

When the world economy went into recession in the late 1970's and early 1980's, U.S. inflation reached double digits, the value of the dollar was very high, and U.S. market share eroded. None of the basic objectives of farm polices were being achieved. The 1985 Act, a response to that situation, introduced flexibility to agricultural policy.

Conserving soil and supporting farm income, emphasized since the 1930's, remain basic objectives of U.S. policy. The Soil Conservation and Domestic Allotment Act of 1936 stated that "the policy of Congress is to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs, . . . protect public health, public land, and relieve unemployment." The emphasis on soil erosion stemmed from the drought that created the 1930's Dust Bowl. The Agricultural Adjustment Act of 1938 reiterated the objective:

"to provide for the conservation of natural soil resources and to provide an adequate and balanced flow of agricultural commodities in interstate and foreign commerce." Conservation also arose as a way around the Agricultural Adjustment Act of 1933 after the U.S. Supreme Court declared it unconstitutional.

Stabilizing and supporting prices and farm income and maintaining adequate supplies of agricultural commodities were objectives of the Commodity Credit Corporation Charter Act of 1948. That act also sought to ensure the orderly distribution of agricultural commodities through the Commodity Credit Corporation (CCC).

The 1981 Act continued programs and goals in effect since the 1930's: "to provide price and income protection for farmers, assure consumers an abundance of food and fiber at reasonable prices . . . ."

The Food Security Act of 1985 has been described as a departure from previous farm legislation, but it maintains the long-term basic objectives of U.S. agricultural policy: "to extend and revise agricultural price support programs, to provide for agricultural export, resource conservation, farm credit, and agricultural research and related programs, to continue food assistance to low-income persons, to ensure consumers an abundance of food and fiber at reasonable prices, and for other purposes."

The 1985 Act emphasizes farm credit and market orientation because of U.S. export and farm financial conditions during the first half of the 1980's. Conservation has also taken on a new perspective under the 1985 Act. Congress has annually amended the 1985 Act to accommodate the changing conditions in the farm sector.

Supporting prices and farm income, maintaining adequate supplies of food and fiber, preserving the family farm, promoting resource conservation, and being competitive have been philosophies and objectives of U.S. agricultural policies in the 1980's. The 1990 farm legislation must provide American farmers with cost-effective programs which accommodate the changing conditions in the farm sector and the world.

Agricultural Economic Indicators, 1970-88

Agricultural policy is a product of reactions to the economic and political environment and of conditions in the agricultural sector reflected in certain economic indicators. Some of these economic indicators are farm asset values, rates of inflation, real rates of interest, farm equity, farm income, and export market share. These economic indicators, major events, and program

announcements confirm that domestic and global adjustments have strained the capacities of U.S. policy. The 1981 and 1985 Acts were products of different sets of economic conditions.

Economic Setting for the 1981 Act

The economic trauma that faced U.S. agriculture in the first half of the 1980's was rooted in previous decades. Farm real estate values were bid up to a level that would yield low rates of return from farm operator income. Land price inflation was due to expectations of growing returns to agriculture, partly caused by the commodity price boom of the 1970's, increased nonagricultural demand for land, a period of rapid inflation, and low real interest rates during the 1970's. Farmers and investors considered farmland a hedge against the rapid inflation, and farmers were willing to accept low rates of current returns in anticipation of appreciating land values. Average farmland values increased over 350 percent during the 1970's (16).[1] Expanding landholdings seemed logical because agriculture was extremely profitable in the early to mid-1970's. Debt-financed expansion was financially rewarded, and many farmers borrowed heavily to finance new land purchases, and debt accumulated rapidly. For example, outstanding debt during 1975-79 grew to nearly 50 percent of total net cash income compared with 5-6 percent during the 1950's and 1960's.

High commodity prices and the rate of inflation were major influences on the 1981 debate on farm legislation. Major events of the 1970's were also instrumental: the Soviet grain purchases, the switch from fixed to flexible exchange rates, and the Arab oil embargo. The Soviet grain purchases increased demand for U.S. products. High oil prices just after the oil embargo created "petrodollars" that were loaned to developing countries and, in the process, stimulated demand for agricultural commodities. World agricultural trade rose from $50 billion in 1970 to more than $225 billion in 1980. Total U.S. agricultural exports grew from $7 billion in 1970 to nearly $44 billion in 1981.

Commodity prices and inflation jumped worldwide. In the United States, high commodity prices increased food prices 14.4 percent during 1973-74. Annual inflation had averaged only 6.3 percent during the first half of the 1970's (table 1). Annual inflation averaged 2.7 percent in the 1960's. Farm costs of production also increased with inflation. As land values rose and energy costs jumped because of the oil embargo, total production expenses rose rapidly, up 91 percent during 1973-79 and an additional 16 percent during 1979-84.

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

Annual inflation averaged 7.8 percent in the second half of the 1970's, more than a percentage point higher than in the first half.

Agricultural policy historically provided a safety net for farmers by supporting prices and farm income. The commodity shortages of the 1970's gave the appearance that U.S. agriculture had approached an equilibrium and that excess capacity no longer was a problem. Strong global demand for grains encouraged U.S. farmers and policymakers to produce more for fear of food shortages. Production could be increased by improving per acre yields, expanding the cropland base, or both. Production-inducing programs were needed in either event (3). Because inflation topped 9 percent before the 1981 debate, legislators also felt farmers should be guaranteed protection against rising costs. The 1981 Act thus established the inflation-adjusted minimum levels of loan rates and target prices for the 1982-85 crops. Loan rates had been tied to costs of production during the 1970's.

Table 1—Economic and farm indicators

Year	Net farm income	Change in food prices	Inflation	Unemployment	Change in real GNP	T-Bill rates[1]
	Billion dollars			Percent		
1970	14.4	0.5	5.5	4.8	-0.3	6.5
1971	15.3	3.0	5.7	5.8	2.8	4.3
1972	19.4	4.3	4.7	5.5	5.0	4.1
1973	34.3	14.5	6.5	4.8	5.2	7.0
1974	27.3	14.3	9.1	5.5	-.5	7.9
1975	25.5	8.5	9.8	8.3	1.3	5.8
1976	20.1	3.1	6.4	7.6	4.9	5.0
1977	19.9	6.3	6.7	6.9	4.7	5.3
1978	25.2	9.9	7.3	6.0	5.3	7.2
1979	27.4	11.0	8.9	5.8	2.5	10.0
1980	16.1	8.6	9.0	7.0	-.2	11.5
1981	26.9	7.8	9.7	7.5	1.9	14.0
1982	23.5	4.1	6.4	9.5	-2.5	10.7
1983	12.7	2.1	3.9	9.5	3.6	8.6
1984	32.0	3.8	3.7	7.4	6.8	9.6
1985	32.3	2.3	3.2	7.1	3.0	7.5
1986	37.5	3.2	2.6	6.9	2.9	6.0
1987	46.0	4.1	3.0	6.1	2.9	5.8

[1] Three-month Treasury Bill rates.
Source: (1, 9).

Economic Setting of the 1985 Act

Farm problems intensified during 1981-85. The 1980 embargo of U.S. grain sales to the Soviet Union, world recession, a tight monetary policy pushing interest rates to 10 percent and higher, and a high-valued dollar leading to stagnating trade contributed to a growing U.S. surplus, declining commodity prices, and poor farm income. Real interest rates rose from 3.8 percent in 1979 to 9.2 percent in 1981 and gradually dropped to 6.7 percent in 1985.[2] High interest rates and weak commodity demand contributed to a 34-percent decline in farmland values during 1981-86 (13). Farmland values reached their lowest level in 1986 when commodity prices dropped to the new lower loan rates. Total asset values dropped from a peak of $1,104 billion in 1981 to a recent low of $789 billion in 1986. Over 94 percent of the loss in asset values was due to the decline in land values (13).

Eleven percent of all farms had debt-to-asset ratios of 40-70 percent in January 1984 and held more than 30 percent of all farm debt. Almost 7 percent of all farms, holding 24 percent of all farm debt in 1984, had debt-to-asset ratios exceeding 70 percent (12). Although net farm income in 1984-88 exceeded $30 billion annually, more than 25 percent came from the Government. Agriculture's financial stress of the early 1980's made income maintenance a key objective in the 1985 Act. Farm program outlays historically were a small part of the total Federal budget, but their costs leaped from $2.7 billion in 1980 to $25.8 billion in 1986.

The 1985 Act was a response to both international and domestic pressures on U.S. agriculture. Some of the programs also reacted to characteristics of the 1981 Act. During the 1985 debate, the administration and the Congress tried to make agricultural policy more ". . . market oriented, flexible, internally consistent, long term in design, and sensitive to all elements of the production system" (10). A 33-percent decline in U.S. agricultural exports during the early 1980's made international competitiveness one of the most important issues during the 1985 debate. Thus, the 1985 Act reduced support rates to stimulate demand for U.S. commodities abroad and included trade-enhancing provisions.

Market Orientation

The U.S. market share in agricultural trade started to erode after 1981. Agricultural exports were almost 33 percent lower by 1985 than they had been at their 1981 peak and 23 percent lower than in 1984 (table 2). Weak export demand and bumper crops resulted in CCC 's unprecedented high volume of accumulated stock in all major commodities by 1982 (fig. 1). The

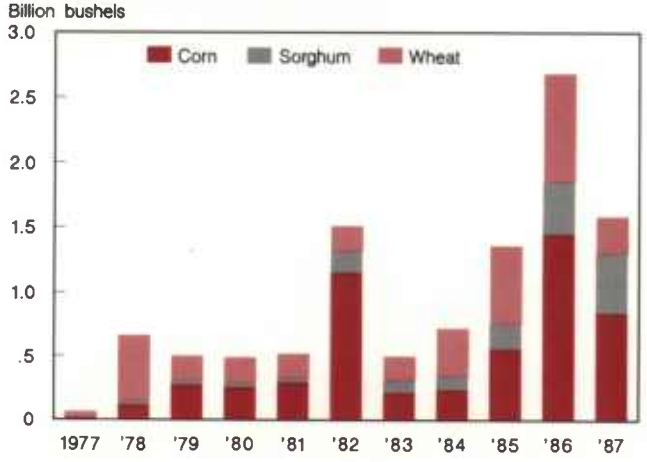
[2]Bank prime rates minus the percentage change in the rate of inflation based on the U.S. GNP deflator.

Table 2—U.S. agricultural exports and imports

Calendar year	Exports		Imports	
	Value	Change from previous year	Value	Change from previous year
	Billion dollars	Percent	Billion dollars	Percent
1978	29.38	24.28	14.80	10.12
1979	34.75	18.28	16.72	12.97
1980	41.25	18.70	17.30	3.47
1981	43.34	5.07	16.77	-3.06
1982	36.63	-15.48	15.39	-8.23
1983	36.09	-1.47	16.50	7.20
1984	37.80	4.74	19.33	17.15
1985	29.04	-23.17	19.97	3.31
1986	26.22	-9.71	21.44	7.36
1987	28.64	9.23	20.39	-4.89

Source: (14).

Figure 1
Ending inventories of grains held by the Commodity Credit Corporation



payment-in-kind program (PIK) in 1983 and drought lowered the CCC stocks of feed grains. The effective exchange value of the dollar appreciated over 40 percent during 1979-85, making U.S. commodities more expensive abroad at the same time domestic prices fell. U.S. farm exports fell to $26 billion in 1986 from a high of $43 billion in 1981. The U.S. agricultural trade surplus fell from $26 billion in 1981 to $9 billion in 1985 and dropped below $5 billion in 1986.

Agricultural economists and policymakers argued that the strong dollar hurt American agriculture and the higher loan rates and target prices of the 1981 Act kept American commodity prices above world market prices.[3] Three solutions emerged from the 1985 debate: reduce loan rates and target prices and tie them to market conditions; subsidize exports through the Export Enhancement Program (EEP, see Smith and Ballenger, page 169); and implement generic certificates to cope with excess stocks (see Bailey and Langley, page 103).

Flexibility

Reacting to the consequences of high and rigid loan rates in the 1981 Act, the 1985 Act gave the Secretary of Agriculture discretionary authority to set loan rates for the 1987-90 crops as a percentage of a moving average market price.

The 1981 Act's formulas for target prices and loan rates had proved too high, pricing the United States out of the world market for program commodities. The inflexible downward movement of target prices and loan rates under the 1981 Act generated discussion about how to reformulate price and income support tools in the 1985 Act to make them flexible and responsive to market circumstances. Loan rates were thus set based on a 5-year moving average of market prices, excluding high and low years. Both loan rates and target prices have moved downward under the 1985 Act.

The 1985 Act allows support levels to move according to market conditions. The act also gave the Secretary of Agriculture the discretionary authority to reduce loan rates even further (Findley loan rates; see the Glossary, page 383) to keep U.S. commodities competitive. Most major commodity prices moved downward soon after the 1985 Act was passed because loan rates were reduced by the maximum amounts allowed by law. As the dollar weakened in late 1985, foreign demand for U.S. agricultural products increased and, as use of

[3]The 1981 Act was in effect for the 1982-85 crops. The 1985 Act is in effect for the 1986-90 crops.

export programs such as EEP increased, U.S. agricultural exports started to increase in 1987 (table 2).

Continuity of Agricultural Programs in the 1980's

Policymakers and lawmakers hesitate to remove once-popular program tools or programs, even though they may no longer be relevant for current economic conditions. At least three historical precedents have influenced agricultural programs throughout the 1980's: policymakers' longstanding preference for voluntary rather than mandatory programs, target prices since 1973, and Government stock programs.

U.S. farm programs have emphasized the voluntary over the mandatory for at least two decades. For example, to deal with overproduction, the Food and Agriculture Act of 1965 imposed supply management programs relying strictly on voluntary programs. Some observers criticized the act's failure to impose mandatory programs, saying that the purely voluntary program offered would be ineffective. Farmers took about 60 million acres out of production in 1966 at a very high cost to the Government of $1 billion in acreage diversion payments in crop year 1966. Some observers feared that unexpected high yields could increase the costs of the programs if the level of farm income support remained unchanged. This economic and political dilemma was repeated in the 1980's. With Government stocks growing since 1982, the debate on the 1985 legislation centered on whether supply management should be mandatory or voluntary. Mandatory control proponents argued that such programs would be more effective and costs to the Government would be lower. Voluntary programs resulted in Government farm program costs of $25.8 billion for 1986.

Target prices were implemented in the early 1970's. In the face of projected high demand, the Food and Agriculture Act of 1973 introduced target prices (price levels established by law) to provide income supports and to encourage higher production. Target prices have remained a key program instrument (see Evans and Price, page 85). Direct income supports can be calculated in conjunction with market prices and loan rates. Deficiency payments which depend on target prices provided the main source of income support for eligible producers while nonrecourse loans, coupled with purchase programs, provided price supports. With low commodity prices to make U.S. exports competitive and high target prices to maintain farm income, deficiency payment rates were much higher in 1986 than under the 1981 Act. High deficiency rates and high program participation resulted in total direct payments of $11.8 billion in 1986 and $16.7 billion in 1987. For 1987-88, the

Major Events and Policy Announcements in the 1970's and 1980's

October 1973: Arab oil embargo. Petroleum prices rise 95 percent between late 1973 and 1974.

October 6, 1979: Federal Reserve announces a major shift in its technique for implementing monetary policy. Under the new approach, the objective of open market operations is to supply the volume of bank reserves consistent with desired rates of monetary growth. Greater variation in the Federal fund rate is permitted. The prime bank loan rate rises to 15.5 percent in December 1979 and tops 20 percent in December 1980.

January 1980: Carter administration embargoes grain shipments to Soviet Union because of that country's invasion of Afghanistan.

December 22, 1981: President Reagan signs Agriculture and Food Act of 1981. The act contains a number of cost-cutting measures and sets specific target prices for 4 years based on an anticipated inflation rate.

1981: U.S. agricultural exports reach record high quantity and value.

1982: Land values fall for the first time since 1949.

1983: USDA announces a payment-in-kind (PIK) program to idle additional land to reduce stocks.

1983: Drought hits U.S. Corn Belt, coinciding with a record level of idled acreage.

January 1, 1984: U.S. farmers face financial stress.

May 1985: Administration introduces Export Enhancement Program (EEP).

December 12, 1985: President Reagan signs Balanced Budget and Emergency Deficit Control Act of 1985 (also known as "Gramm-Rudman-Hollings") designed to eliminate the Federal budget deficit by October 1990. Farm program outlays are reduced by 4.3 percent for 1986 crop year.

December 23, 1985: Food Security Act of 1985 becomes law, establishing minimum price support levels for 1986 and market price-based formulas for 1987-90 crops. The act mandates marketing loans for rice and cotton, authorizes generic certificates as payment for some farm programs, authorizes EEP and Targeted Export Assistance (TEA) program and establishes Conservation Reserve Program (CRP) to idle 40-45 million acres by 1990.

December 23, 1985: Farm Credit Restructuring and Regulatory Reform Act of 1985 becomes law, implementing interest subsidy for farm loans and restructuring Farm Credit Administration (FCA).

1986: U.S. agricultural trade-weighted exchange rates depreciate 12.4 percent from 1985, the first significant decline in 3 years.

May 1986: USDA introduces generic certificates.

June 1, 1986: Wheat loan rate declines.

August 1, 1986: USDA implements marketing loans for rice and cotton.

September 30, 1986: Net CCC outlays reach $25.8 billion.

October 1, 1986: Loan rates for corn and sorghum decline.

1986: Agricultural export values fall to a decade low for the calendar year.

July 6, 1987: United States proposes agricultural policy reform in Geneva to the General Agreement on Tariffs and Trade (GATT).

1987: Land values increase for the first time since 1982.

January 6, 1988: Agricultural Credit Act of 1987 becomes law.

Spring/Summer 1988: Major drought hits United States and Canada.

August 11, 1988: Disaster Assistance Act of 1988 becomes law to assist farmers who suffered losses due to natural disaster in 1988.

August 23, 1988: Omnibus Trade and Competitiveness Act of 1988 becomes law.

September 28, 1988: President Reagan signs U.S.-Canada Free Trade Act.

January-October 1988: During the first 10 months of 1988, farm product exports exceed imports by $12.6 billion, more than double 1987's $5.8 billion.

December 1988: Canadian Parliament ratifies U.S.-Canada Free Trade Act.

December 1988: The 1988 drought in the United States and Canada cuts world crop production more than 6 percent. Global feed grain output drops about 10 percent.

August 14, 1989: President Bush signs Disaster Assistance Act of 1989 to aid farmers who suffered losses from natural disasters in 1988 and 1989.

average was $16 billion compared with an average of $9.3 billion during calendar years 1983-86.

The Government has a long standing tradition of managing stocks to support commodity prices. Stocks of commodities are held by the CCC, established in 1948, and in the farmer-owned grain reserve (FOR), established in 1977. The 1981 Act continued the authorities for an FOR.

Farmers participating in the FOR can repay their loans and claim their stocks. However, if producers redeem their loans before market prices reach the trigger prices, they must pay storage and other penalties.

When the reserve loan program was in effect, the CCC could not sell its stocks of wheat or feed grains except for an emergency feed program or a disaster reserve. Grains remained under Government control as long as market prices were below a trigger level. The 1985 Act continues the tradition of Government stock policy and makes CCC stocks available to the market via generic certificates.

Farm Policy Innovations Under the 1985 Act

The 1985 Act offers some farm policy innovations in trade and conservation designed to solve two problems facing U.S. agriculture in the 1980's, sagging export market share and mounting Government stocks. Some of these innovations are marketing loans, generic certificates, 50/92 and 0/92 provisions, and provisions regarding conservation compliance, sodbusting, swampbusting, EEP, and Targeted Export Assistance (TEA).

The 1985 Act, as amended in 1986, 1987, 1988, and 1989, has four important characteristics that enhance the U.S. farm sector's ability to compete in world markets in the short and long run:

- It provides the flexibility for lower loan rates and makes CCC stocks or loan collateral available to the market via certificate redemption and marketing loans;

- It increases marketing options for producers through the use of generic certificates;

- It provides direct export subsidies through the EEP and other export programs; and

- It enhances long-term land conservation under the Conservation Reserve Program (CRP), sodbuster, swampbuster, and conservation compliance provisions.

Marketing Loans

Marketing loans for rice and Upland cotton, mandatory under the 1985 Act, have made these commodities competitive in world markets (8). Discretionary marketing loans are possible for wheat, feed grains, and soybeans. Under a marketing loan, program participants may repay nonrecourse loans at less than the loan rate if world prices are below the loan rate. Loan repayment rates differ for each commodity. For example, the rice loan repayment rate is the higher of world price of rice or a minimum percentage of the basic loan rate. If the world price for rice is less than 70 percent of the basic loan rate (less than $4.55 per hundredweight), producers would repay $4.55 and retain $1.95, a difference of the basic loan rate ($6.50) and the world price. The difference between the loan rate and the repayment rate plus additional receipts from selling a commodity in the market are an added incentive to participate in the loan program. The marketing loan program also closes the gap between U.S. and world prices for rice and Upland cotton. Both U.S. rice and cotton exports increased in 1986 as a result.

Generic Certificates

Generic certificates were implemented under the 1985 Act to help move stocks from the Government to the market place. Generic certificates have set a precedent for stock policy and for encouraging farmers to use marketing tools to better manage their grains. The volume of stocks available determines whether the program is effective. Generic certificates provide a mechanism for reducing surplus wheat and feed grain stocks. Generic commodity certificates may be exchanged for CCC-owned commodities or may be used to redeem loans. The generic certificate program augments producers' marketing options. The program removes the Government risk when farmers default on grain loans and provides program participants a chance to make profits of price differencing. Generic certificates also reduce CCC stocks and make commodities available for export (see Bailey and Langley, page 103; 6).

50/92 and 0/92 Provisions

Some of the current U.S. farm programs feature "decoupled aspects" (programs that remove incentives to produce). For example, the 0/92 program allows enrolled farm producers to receive 92 percent of payments on their permitted acreage under an Acreage Reduction Program (ARP) if they do not plant at all or if they plant less than permitted. Enrolled farm producers in the

50/92 program could receive 92 percent of payments on their permitted acreage if they plant at least 50 percent.

Program yields used to calculate the deficiency payments under the 1985 Act have been frozen. The deficiency payments or direct income support are independent from the current production level—an example of "decoupling" payments. Continuing such independence will be an issue in the coming farm legislation debate.

Conservation Provisions

The conservation provisions constitute a long-term resource management program intended to improve productivity and sustain natural resources in the farm sector. The program provides financial incentives to control soil erosion and improve land management. Conservation is inconsistent with shortrun competitiveness, but it preserves and protects the longrun value of resources and enhances our ability to compete. Conservation provisions of the act include the CRP, conservation compliance, and sodbuster and swampbuster provisions (5).

These conservation measures are intended to protect highly erodible land. The CRP is a 10-year program that takes highly erodible cropland out of production. The Soil Bank Program of the 1950's and 1960's and CRP of the 1980's have many similarities. Sodbuster and conservation compliance deny program benefits to farmers who produce crops on highly erodible fields without an approved conservation plan. Under the swampbuster provisions, farmers who convert wetlands to crop production will also be denied program benefits.

Both the ARP and the CRP may force commodity prices upward by reducing supplies, and they may have a dampening effect on trade (see Baum, Young, and Crutchfield, page 37; Young and Osborn, page 125; Green and Baumes, page 143).

Trade Provisions

The declining market share of U.S. farm products in world agricultural trade during the early 1980's stimulated legislation to make the United States more competitive in export markets. The 1985 Act defines U.S. agricultural trade policy goals as follows (5):

- To provide through all possible means agricultural commodities and products at competitive prices;

- To support the principle of free trade and the promotion of fairer trade;

- To cooperate fully in all efforts to negotiate reductions in barriers to trade;

- To aggressively counter unfair trade practices; and

- To provide for consideration of U.S. agricultural trade interests in the design of fiscal and monetary policy that may foster continued strength of the dollar.

USDA extends credit guarantees to U.S. agricultural exporters to promote exports. Under these export credit guarantee programs, U.S. exporters or their lenders receive payments if buyers fail to pay. The programs reduce the financial risk that exporters face. Export credit guarantee programs provide both short-term (6 months to 3 years) and medium-term (3-10 years) guarantees.

USDA announced the EEP, an inkind export subsidy targeted on markets lost to "unfair" competition, on May 15, 1985, before the 1985 Act became law. The program was designed to counter unfair trade practices by the European Community (EC), to reinforce negotiation on agricultural trade problems, and to regain markets.

The 1985 Act made EEP mandatory through fiscal year 1988 with $1-$1.5 billion financial support annually. In July 1987, Congress extended and raised the appropriation for the EEP. Four criteria must be used to select the commodities to which EEP is applied:

- The use of EEP funds must increase U.S. exports of the chosen commodity above the levels of no program;

- The program must target specific markets to challenge U.S. competitors;

- The choice of a commodity must be cost effective; and

- The choice of a commodity must not increase budgetary outlays.

The Government seeks new export markets through the TEA program. CCC commodities and funds were committed for each fiscal year through 1988 (see Smith and Ballenger, page 169).

Trade enhancement programs, improved demand, and a weaker dollar have helped improved the U.S. trade position. The 1987 total U.S. trade

deficit of $157.8 billion reflected an improvement of less than 2 percent from fiscal year 1986. The agricultural trade surplus, however, increased 33 percent. U.S. agricultural exports have improved significantly in 1989 (11).

The Setting for the 1990 Farm Legislation

Many issues will affect the 1990 debate on farm legislation:

- Agricultural trade liberalization under the General Agreement on Tariffs and Trade (GATT),
- U.S. budget and trade deficits,
- 1989-90 weather,
- Broad policy objectives and philosophies of the Bush administration,
- Membership of the 101st Congress, and
- National and global economic conditions.

On July 6, 1987, the United States proposed negotiating for liberalized agricultural trade in the GATT. Other countries have also made similar proposals. All of these proposals advocate some degree of agricultural policy reform, but differ in scope, negotiating process, aggregate measures (measures for government intervention such as producer subsidy equivalents (PSE's) and consumer subsidy equivalents (CSE's) and ways to implement that reform (see Chattin and Wise, page 61).

The U.S. proposal would eliminate all agricultural barriers affecting trade in all countries over 10 years. Policies that influence production ("coupled programs") would not be allowed. Some programs, such as foreign and domestic food aid, food security, and environmental programs, such as the CRP, would probably remain in place. Policies that do not affect production ("decoupled programs"), in the long run and short run, should cost less and improve efficiency of resource allocation in agriculture. The effects of these proposals have yet to be fully examined and evaluated.

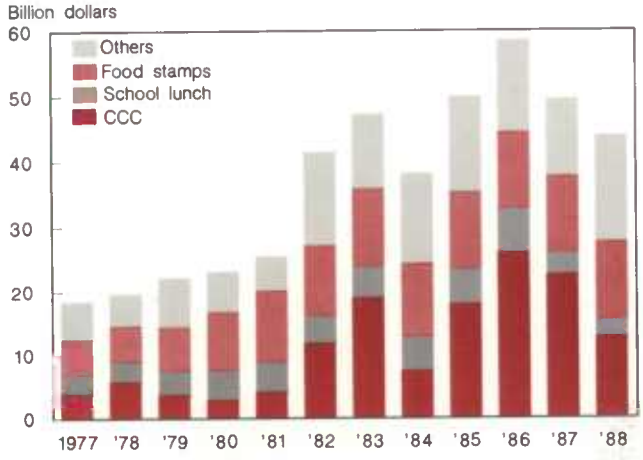
In November 1988, the United States proposed a framework for agricultural reform. The proposal was a plan to implement agreed-upon, long-term agricultural reforms. The U.S. proposal was meant to be a basis for the agriculture section of the GATT's Mid-Term Review in Montreal, Canada, in December 1988. The United States proposed that, at the Mid-Term Review,

ministers agree on the objectives and process of the reform. All measures directly or indirectly affecting agricultural trade would be brought under the proposed strengthened GATT rules and disciplines. The proposal also promised to develop schedules for implementing specific policy adjustments. The United States also proposed a freeze on levels of support and subsidies in 1989 and 1990 if the ministers would agree to implement the long-term reforms. The United States and EC could not come to an agreement at the Mid-Term Review. All members agreed to postpone the discussion to the GATT meeting in Geneva, April 1989.

The GATT agricultural negotiating group agreed in Geneva on both long-term and short-term measures for agriculture. They agreed to substantially, progressively reduce longrun agricultural support and protection and freeze shortrun support and protection.

The 1990 farm legislation debate could center on cutting the costs of supporting agriculture. CCC outlays accounted for much of the growth in the total USDA budget during the 1980's (fig. 2). Net CCC expenditures accounted for over 40 percent of the total agricultural budget in fiscal year 1987 compared with 16 percent in fiscal year 1981. Net CCC outlays in 1986 reached $25.8 billion. Net CCC outlays increased over 90 percent, while the total Federal budget increased 70 percent during fiscal years 1982-87.

Figure 2
Agricultural budget



Two other programs designed to cope with eroded U.S. export share and excess stocks are the EEP and generic certificates. With current higher global commodity prices and demand, the need to keep EEP would diminish. Because of low stock levels, continuing the EEP would probably increase Government outlays.

Generic certificates effectively deal with excess stocks. Yearend stock levels in 1988 and probably in 1989 will be lower because of the 1988 drought. Thus, generic certificates would no longer be necessary (see Bailey and Langley, page 103; and Smith and Ballenger, page 169).

The economic environment in the farm sector in the late 1980's will undoubtedly affect the debate of the 1990 farm legislation. The summer 1988 drought tightened global grain supplies and raised commodity prices. The drought spread rapidly when U.S. agriculture had begun to turn around. Corn production was only 4.7 billion bushels, a 34-percent drop from 1987. Wheat and soybean production dropped 14 and 21 percent. With such levels of grain and soybean production, ending stock levels will probably be at least 57-66 percent lower than what was previously expected. While global grain production is expected to be 6 percent lower, the world ending stocks are estimated to be 32 percent less.

The Disaster Assistance Act of 1988 (P.L. 100-387), enacted August 11, 1988, authorized assistance for livestock, grain, and other agricultural producers to partially offset their losses due to the drought. The tighter U.S. grain supply may significantly affect the 1990 debate on farm legislation and urgency of global trade reform. Lower ending stocks, for example, would mean fewer acreage reduction requirements as specified in the 1985 Act. Higher commodity prices because of tighter supplies will also lower direct supports from the Government.

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Chapter 3

Effects of Macroeconomic Policies on Agriculture

John Kitchen and Ralph Monaco*

Macroeconomic policies affect the general economy by changing income, prices, interest rates, and exchange rates, which in turn affect agriculture through changing commodity prices, exports, input costs, farm income, and farmland values. Existing macroeconomic policies and likely changes must be considered when attempting to form an effective agricultural policy. Over the next few years, macroeconomic policies will aim to reduce both the Federal budget and international trade deficits, suggesting that the macroeconomic environment will provide moderate support for the agricultural sector in the near term.

Developments in the overall U.S. economy can greatly affect agriculture. Changes in the international economy and links between U.S. and foreign macroeconomic policies similarly affect the U.S. economy. Interest rates, exchange rates, foreign and domestic incomes, and the policies designed to affect these variables all play important roles in determining agricultural prices, exports, and income.

This chapter discusses the channels through which developments in the general economy are transmitted to the agricultural sector, provides an overview of recent policy changes, and sketches the likely course of macroeconomic policies in the next few years.

Agriculture in the Macroeconomy

Agriculture directly represents only a small part of the U.S. economy. In the 1980's, farm businesses have accounted for slightly more than 2 percent of total output as measured by gross national product (GNP), and agricultural employment has been slightly less than 3 percent of total civilian employment.

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But, agriculture plays a larger direct role in international trade. Agricultural products have accounted for nearly 17 percent of the value of U.S. merchandise exports during this decade. Thus, agriculture is probably more sensitive to macroeconomic and international factors that affect international trade than are many other sectors in the economy.

The characteristics of agricultural production and markets increase agriculture's sensitivity to overall domestic and international developments. First, agricultural commodity prices react quickly to new information, unlike the prices of most other products in the economy that adjust slowly and are somewhat fixed over short periods. Most farm commodity prices are highly flexible, except to the extent that Government price support programs provide a floor below which they cannot fall. Second, agricultural production generally requires large initial expenditures on land and equipment, and production expenses occur before revenues are received. Many farmers take out long-term loans for land and capital purchases, and most obtain short-term loans to cover operating expenses that occur before harvest. Thus, agriculture tends to depend on the cost and availability of credit and on general financial market conditions.

On the supply side, macroeconomic factors affect agricultural production costs through interest rates and the prices of agricultural inputs. On the demand side, as U.S. economic growth and incomes increase, agricultural and food demands likewise increase. As incomes increase, consumers tend to purchase higher quality and more refined agricultural products. Finally, the incomes of foreign countries and the rate at which the U.S. dollar can be converted into foreign currencies (exchange rates) are particularly important in determining the level of agricultural exports. Agricultural exports tend to increase as foreign incomes rise and as the exchange value of the dollar falls.

Macroeconomic Policies

The Federal Government attempts to influence overall economic activity through macroeconomic policies. These policies aim to promote growth in income and production while keeping the general price level stable and unemployment low. Because these policies focus on the general economy, however, macroeconomic policies often have unintended and potentially harmful effects on specific sectors such as agriculture.

Macroeconomic policies are typically separated into two types: policies that involve spending, taxation, and other Federal budget issues (fiscal policies) and policies that directly affect interest rates, money, and credit flows in financial markets (monetary policies). The President and Congress, through the legislative process, are jointly responsible for the budget decisions that

become Federal fiscal policies. The Federal Reserve implements monetary policies by intervening in financial markets.

Fiscal Policies

The Government directly affects economic activity through its tax and spending activities. As Government expenditures increase, so do production and income. This relationship is represented by the Government's share of all spending in the U.S. economy. In the 1980's, purchases of goods and services by all governments have averaged about 20 percent of all final goods and services produced each year. Federal Government purchases have averaged 8-9 percent. (Government purchases of goods and services do not include transfer payments, which are a large part of total budget expenditures. Total Federal budget spending averaged about 24 percent of GNP in the 1980's.) Government can also target spending at specific industries or sectors such as agriculture.

Tax policies change economic behavior by changing spending and production levels and patterns. As income taxes increase, the income available for personal use declines, and consumer spending and output tend to decline. Further, growth of tax revenues slows when the growth of output and income slows. Taxes or tax benefits can also be directed at specific producers and sectors to either slow or enhance production. For example, agricultural production and investment have been promoted at times by accelerated depreciation schedules that reduce the tax burden for agricultural producers. These schedules allow a farm to deduct a greater portion of a machine's initial cost from its taxable income earlier in the machine's useful life.

Federal expenditures have increased much faster than tax revenues since 1982. The resulting deficits have forced the Federal Government to borrow from private sources through financial markets. While economists debate the net effect, the deficits were initially associated with strong real economic growth (GNP growth adjusted for inflation), rising imports, historically high interest rates, and a high exchange value of the dollar. The long-term effects of these deficits, however, will stem from a larger accumulated public debt. The increasing debt implies that a greater portion of Federal tax receipts must go to pay off the debt and interest, and either higher taxes or better control of Federal Government spending are needed to reduce the deficit.

Monetary Policies

The Federal Reserve periodically reviews the economy's performance, paying particular attention to interest rates, exchange rates, and money and credit flows. Based on the current and expected performance of the economy, the Federal Reserve adjusts growth in money and credit to promote high

employment and stable prices. If the policy is designed to lower interest rates, increase loans, and accelerate the growth of production, the Federal Reserve can purchase Federal Government securities in an open market operation. That purchase would increase the funds available for lending in the financial system. If the economy expands too rapidly and inflation threatens, the Federal Reserve would try to reduce money and credit available to the rest of the economy. To implement such a restrictive policy, the Federal Reserve could sell Federal Government securities, reducing funds available for lending in the system.

The Federal Reserve can also change the discount rate charged on loans made to banks. To reinforce a restrictive monetary policy, the Federal Reserve could raise the discount rate, making it more expensive for banks to borrow funds from the Federal Reserve. Conversely, the discount rate could be lowered to aid an expansionary policy.

Implementing monetary policy also depends partly on the responses of international economic relationships. World markets (particularly financial markets) have become increasingly integrated, and international trade and financial flows and exchange rates react to monetary policies. Having to consider international reactions, both private and governmental, to changing U.S. monetary policy has complicated economic policymaking.

The Federal Reserve has targeted different variables for monetary policy in recent years. In the late 1970's, the Federal Reserve set targets for interest rates. Inflationary pressures in late 1979 created difficulties for hitting the interest rate target, so the Federal Reserve shifted to targeting the money supply. For the next 3 years, the Federal Reserve restrained growth in money and credit, driving up interest rates and the exchange value of the dollar. Since late 1982, the Federal Reserve has adopted a more eclectic approach, using a combination of target variables, including exchange rates and broadly defined measures of the money supply.

An expansionary monetary policy can initially benefit the economy. As the level of funds in the banking system increases, interest rates fall and loans are easier to obtain. Consumption, investment spending, and the value of production increase. The potential problem with a sustained expansionary monetary policy is inflation. That is, higher expenditures can lead to price increases rather than increased production of actual goods. Further, as U.S. inflationary pressures increase in relation to foreign countries, the exchange value of the dollar falls, tending to lower the purchasing power of U.S. consumers.

A restrictive monetary policy can be used to combat inflationary pressures. However, if the policy is too restrictive, interest rates can rise substantially,

reducing consumption and investment expenditures and constraining production. Also, if U.S. monetary policy is more restrictive than foreign monetary policies, the exchange value of the dollar rises. An increase in the exchange value of the dollar tends to make U.S.-produced goods more expensive to foreign consumers, reducing the competitiveness of U.S. producers.

The combination of monetary and fiscal policies (the policy mix) is also important. For example, in the early 1980's, the policy mix combined a restrictive monetary policy with rising Federal budget deficits. This mix promoted upward pressures on interest rates and the exchange value of the dollar.

The International Monetary System

International trade is partially determined by consumer preferences, production relationships, and trade policies, but it also depends on international macroeconomic policies, financial flows across countries, and the international exchange system.

The present exchange system combines floating exchange rates among the industrialized countries of Europe, Japan, Canada, and the United States, with fixed exchange rates between many developing countries and the industrialized countries. The return to flexible exchange rates in the early 1970's brought hope that countries could independently conduct macroeconomic policies. However, the experience of the past decade has revealed that the macroeconomic policies of individual countries can greatly affect international trade, financial flows, and the economic performance of other countries. For example, U.S. Federal budget deficits and the Federal Reserve's restrictive monetary policy of the early 1980's contributed to increases in interest rates and the exchange value of the dollar. Foreign investment in the U.S. economy and the U.S. trade deficit both grew significantly, balanced by other countries' (West Germany and Japan, in particular) capital outflows and trade surpluses.

In response to the international economic volatility of the late 1970's and early 1980's, the major industrialized countries agreed in the mid-1980's to coordinate macroeconomic and trade policies more closely. The goals of such policy coordination are to reduce exchange rate variability and to promote stability and balance in international trade and financial flows.

Macroeconomic Policy Effects on Agriculture

The past decade has highlighted the importance of macroeconomic activity and policy in determining the performance of the rural economy in general and the

agricultural economy in particular (3).[1] This discussion concentrates on the effects on agriculture. However, much of this discussion also applies to other primary commodity producers and sectors (such as mining and forestry) of the rural economy to the extent that these industries share similar production and market characteristics.

Agriculture initially benefits from expansionary monetary policies. With expansionary monetary policy, real interest rates (those adjusted for inflation) and the exchange value of the dollar fall. Economic activity accelerates and agricultural product demand rises in both domestic and international markets. Higher demand and lower real interest rates tend to drive up commodity prices, and real revenues for commodity producers increase (2). The fall in real interest rates reduces credit costs. Higher revenues and lower costs together increase real farm income, and input use and returns on machinery and farmland increase.

Such a situation existed in the mid-to-late 1970's. Between 1973 and 1980, real prices received by farmers rose nearly 40 percent. Machinery use rose 10 percent, and fertilizer use rose nearly 30 percent. Farmland values averaged increases of 15 percent per year. At the same time, the real bank prime interest rate averaged just over 1 percent, and the exchange value of the dollar, though fairly stable between 1973 and 1976, fell about 17 percent between 1976 and 1980.

However, expansionary monetary policy and economic growth are usually associated with a rise in the general price level, which tends to drive up the costs of production items purchased outside the agricultural sector. Average production costs for agriculture nearly doubled between 1973 and 1980, even though much of that increase can be attributed to energy costs which more than tripled over the period. Further, while agriculture might initially benefit from expansionary monetary policies and the upward pressure on prices, experience suggests that agriculture is severely harmed by efforts to stop inflation.

Because macroeconomic policies are oriented toward the entire economy by design, the Federal Reserve sometimes implements a restrictive monetary policy to fight inflation, even though such a policy hurts agriculture and other primary commodity sectors. Under a restrictive monetary policy, real interest rates and the exchange value of the dollar rise, commodity prices fall, the domestic economy slows, and foreign and domestic demand slackens. Credit costs increase. Real farm income, returns to assets, input use, and farmland

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

values fall. These effects largely describe the situation that existed in the early 1980's.

Now consider what happens when monetary and fiscal policy are changed simultaneously (a changing macroeconomic policy mix). Expansionary fiscal policy together with expansionary monetary policy could initially benefit agriculture. Economic activity and income would expand, thus promoting agricultural demand. Monetary accommodation (in which the Federal Reserve provides the banking system with sufficient funds to meet increased demand for money) would hold down real interest rates and the exchange value of the dollar. A different mix of restrictive monetary policy and expansionary fiscal policy would raise real interest rates and the exchange value of the dollar and would tend to reduce commodity prices and increase interest costs. Such negative effects would offset and probably dominate any initial benefits the farm sector might receive from the increased economic activity associated with deficit spending (1).

The discussion thus far has centered on the shortrun effects of macroeconomic policy on agriculture. Effects of policies over longer periods are more uncertain. For example, expansionary monetary policy could have substantial shortrun benefits, as noted above. In the long run, however, an expansionary policy could ultimately reduce income and employment in the general economy and hurt agriculture if it results in higher inflation and stringent anti-inflation policies. Or, consider a policy mix example. Deficit spending with restrictive monetary policy initially drives up real interest rates and the exchange value of the dollar, tending to increase imports and reduce exports. In the long run, however, a large trade imbalance drives down the value of the dollar, helping to promote U.S. exports and restore the trade balance. Hence, one should be careful in attempting to measure the effects of macroeconomic policy on agriculture. Whether the sector appears to be better or worse off because of a particular macroeconomic policy or policy mix depends on how long the full effects of the policy take to reveal themselves and what time period is used in analyzing the costs and benefits.

The Outlook

The large trade and Federal budget deficits have dominated the macroeconomy in the 1980's. With the nominal value of the dollar rising nearly 50 percent between 1982 and early 1985, real net exports fell from $26 billion in 1982 to a deficit of $108 billion in 1985. (Real net exports are exports of goods and services less imports of goods and services measured in billions of 1982 dollars.) At the same time, the Federal budget deficit

rose from $128 billion in fiscal year 1982 to $221 billion in fiscal year 1986.

At international meetings in late 1985, the major developed economies offered to help bring down the high value of the dollar by altering their domestic monetary and fiscal policies. At the same time, the Gramm-Rudman-Hollings deficit reduction act in 1985 signaled a willingness on the part of U.S. policymakers to attempt to bring down the Federal deficit.

Both international and domestic fronts have improved since 1985. By the beginning of 1988, the value of the dollar had fallen nearly 50 percent, roughly back to the 1980 level, although it rallied about midway through the year. The real net export deficit began improving in mid-1986. From its record high of $152 billion in the third quarter of 1986, the real net export deficit fell to about $90 billion by the second quarter of 1988. The Federal budget deficit has also improved, falling to an estimated $155 billion for fiscal year 1988 from $221 billion in fiscal year 1986.

Since mid-1988, however, improvements in both the Federal and trade deficits seem to have stalled. The slide in the value of the dollar essentially stopped at the end of 1987, and the real net export deficit widened in the last two quarters of 1988. The Federal deficit for fiscal year 1989 was about $152 billion, slightly below fiscal year 1988. The fundamental forces driving the economy are aimed at correcting these large deficiencies, but progress is likely to slow. Thus, macroeconomic policies over the next several years will probably still be aimed at an orderly unwinding of both problems.

The orderly unwinding may ironically be complicated by the fact that the economy performed at near capacity and with low unemployment in 1987 and 1988. Higher inflation has been typically associated with higher production levels and lower unemployment rates. This situation hampers macroeconomic policymaking, because policymakers must more seriously consider the probable effects of their actions on inflation than they did when the economy was not so close to full capacity. For example, monetary policy actions taken in the second half of 1988 and early 1989 were aimed at heading off inflation (by increasing interest rates), but also probably helped drive up the value of the dollar, which may have contributed to slowing the improvement in the trade deficit.

We can sketch the effects of the macroeconomy on agriculture using our knowledge of the current situation of large trade and budget deficits and the likelihood that policies and the natural forces of economics will tend to work to reduce those large imbalances.

First, attempts to reduce the Federal budget deficit will cause effects which tend to offset each other. Declining Federal purchases will initially tend to slow the economy and disposable income growth. However, an improving Federal deficit should relieve upward pressure on real interest rates, allowing them to fall. Lower real interest rates could stimulate investment spending, offsetting some of the downward pressure from reduced Federal purchases. Lower real interest rates also should put upward pressure on commodity prices and downward pressure on the value of the dollar. From this perspective, the agricultural sector will probably benefit from an improving Federal deficit. Falling interest rates reduce costs, higher commodity prices increase returns, and the weaker dollar should improve agricultural competitiveness in world markets. Domestic demand could rise more slowly, but this effect is probably small relative to the beneficial effects.

Most of these effects depend on future monetary policy. If monetary policy must remain relatively tight to head off inflation as the Federal deficit falls, real interest rates may not fall, and the economy may not realize the benefits that would accompany falling real rates. Agriculture could then face slow growth in revenues and income without the benefit of lower interest costs, higher commodity prices, and enhanced international competitiveness.

A monetary policy that is too expansionary also poses dangers. Pushing real interest rates too low and allowing the value of the dollar to fall too quickly and too far could put substantial upward pressure on the general price level. Although agriculture might initially benefit from inflationary pressures, the early 1980's experience with stopping inflation suggests that agriculture lands harder than many other sectors in the longer run.

Despite the possibilities of overly restrictive or overly expansive policies, the experience of the last few years suggests that the Federal Reserve has had some success at running a middle course. Barring some unusual occurrence, such as another substantial oil price increase, the Federal Reserve will most likely maintain its middle course over the next few years. With the expected gradual decline in the Federal budget deficit and the middle course for monetary policy, agriculture and the rural economy should benefit from a more stable macroeconomic environment.

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Chapter 4

Resource, Conservation, and Environmental Policy

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Policymakers will confront resource, conservation, and environmental issues in the 1990's that spring from many other issues. If liberalized trade increases demand for U.S. agricultural products, how will we allocate limited natural resources to meet that demand? How will we control the myriad agricultural pests and protect endangered species? Will the rapidly advancing biotechnology industry's products be environmentally sound? This chapter examines these and other issues.

The U.S. farm sector enters the 1990's as a modern, efficient industry made up of larger, but fewer farms that use a mix of technology, machinery, land, and labor to produce food and fiber for both domestic and export markets. But, the sophistication of the sector has come at the expense of costly Federal budget outlays and potential, or real, environmental problems.

These circumstances have increased public concern over Federal farm programs and their relationship to input use, commodity production, and environmental quality (23).[1] These concerns raise some of the same questions that Miranowski and Reichelderfer raised in the mid-1980's (11):

> First, are Federal soil and water conservation programs really needed? Second, are current soil and water programs effective in accomplishing their objectives? Third, are programs designed to support commodity prices and farm incomes compatible with soil and water conservation objectives? Finally, are there other programs, more consistent and less costly, that could meet both farm commodity and conservation objectives?

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[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

Consistency among Federal programs affecting agricultural resource use and commodity production is an important public concern. Thus, debate over the evolution of integrated policies for soil and water conservation and commodity production will continue (18).

To assist in the debate over coming legislation, we provide an overview of U.S. soil and water resources, a national perspective on these farm program issues, and a discussion of issues for the 1990's.

U.S. Soil and Water Resources

The United States is fortunate to have an abundant, but finite, resource base of fertile soil, water, and land. The capacity of that resource base to produce the commodity surpluses of the 1970's and 1980's may be tenuous, as the 1988 drought illustrated (7). The environment has a limited capacity to absorb production byproducts, such as soil erosion and animal waste, and excess input application, such as fertilizers and pesticides, without reducing productivity or increasing environmental and human health concerns (5). Resource and commodity policies will play important roles in determining our ability to sustain productivity and conserve our natural resources to satisfy future domestic and foreign demand for U.S. agricultural products (3).

One can view the problems affecting soil and water use and availability through several perspectives. Each perspective will affect one's perception of the magnitude and extent of the problems and the proper policy responses.

Soil erosion provides an example of a conservation problem that is not adequately described by national, regional, or even State data. Recent research indicates that erosion significantly reduces productivity on only a small portion of cropland and that productivity loss is negligible on 80 percent of the 345 million acres of cropland. Setting a national erosion tolerance limit at an arbitrary level would have little scientific basis and would not account for such factors as soil depth, or alternative management techniques, among others (4, 17).

The 17 States of the Northern Plains, Southern Plains, Mountain States, and Pacific States have about 12 million irrigated acres that are highly erodible. About 13.4 million acres in those States are also located in areas where ground water levels are declining (6). Declining ground water levels are serious in some areas, such as the Ogallala region in the Southern Plains and California's Central Valley. The rate of decline varies greatly within and among States, but the rate of recharge is often inadequate to replace the water drawn from aquifers.

Environmental, Resource, and Conservation Policies and Programs

Interest in natural resource conservation and the environment intensified, ebbed, and shifted focus in much the same pattern as agricultural policies during the two centuries of U.S. history (18). Labor, not land, limited agricultural production in the 18th and 19th centuries. The supply of fertile land seemed inexhaustible during those years when the U.S. population was small and agricultural technologies were crude or nonexistent.

Until the passage of the Food Security Act of 1985, the goals of Federal commodity and resource conservation programs had been increasingly contradictory. For example, previous acreage diversion programs required only that acreage be protected from erosion by planting an appropriate cover crop. In the early 1970's, production restrictions to protect soil and water were abandoned as farmers were encouraged to plant as much as possible.

The Food and Agriculture Act of 1977 and the Agriculture and Food Act of 1981 restricted Government cost-sharing aid to owners of land on which resource problems had been identified. These provisions responded to criticism that the Soil Conservation Service was not efficiently reducing soil erosion. The Soil and Water Resources Conservation Act of 1977 increased public support for effective soil and water conservation programs by documenting resource problems, evaluating past programs, and making marginal program improvements. None of those acts addressed the offsite, long-term damages associated with soil erosion and surface and ground water contamination.

The Food Security Act of 1985 linked resource conservation and commodity price and production objectives in a comprehensive policy framework. Title XII includes the swampbuster, sodbuster, Conservation Reserve Program (CRP), and conservation compliance provisions and extends several provisions from previous farm legislation.

The swampbuster provision denies price support and deficiency payments, farm storage facility loans, crop insurance, disaster payments, and loans insured by the Farmers Home Administration to any person producing an agricultural commodity on wetland converted to agricultural production since December 23, 1985. This provision effectively reduces the incentive to convert wetlands to farmland for about 60 million acres of privately owned wetlands, although conversion of only 5-16 million acres might be economically justified (9).

The sodbuster provision denies assistance programs to farmers who plant commodities on highly erodible cropland converted after December 23, 1985,

unless an approved conservation plan is implemented. This provision potentially affects some 227 million acres, about 65 percent of which is pasture or rangeland. Farmers must reduce erosion on sodbusted land to a specified erosion level.

The conservation compliance provision requires farmers with highly erodible cropland to implement a conservation plan by 1990. The farm must complete the plan by 1995 to remain eligible for or receive Federal program benefits. This provision could affect the choice of commodity production and costs of production for up to 65 million acres, depending on the level of enrollment in the CRP, the level of treatment required, and incentives to participate in commodity programs.

Some analysts consider the CRP the conservation centerpiece of the 1985 Act (20 and Young and Osborn, page 125). The CRP pays producers annual rent and half of the cost of establishing permanent cover for retiring highly erodible cropland for 10 years for up to 45 million acres. Over 100 million acres are eligible for the CRP. The enrollment of 23 million acres (as of the end of 1987) had reduced annual soil erosion by about 366 million tons.

Amendments to the original legislation have expanded eligibility to include filter strips around lakes and streams to improve water quality and less erodible cropland if planted to trees. Congress has also considered further modifying the CRP eligibility rules or expanding CRP acreage to further target potential environmental problems, placing certain restrictions on specific types of production practices, providing permanent spending authority or a permanent conservation base, and further integrating the CRP with commodity-related legislation.

Unresolved Resource and Conservation Issues for the 1990's

New information and changes in public awareness suggest that many resource, conservation, and environmental issues are not yet resolved. Other related issues will also probably emerge over the next decade.

Soil Erosion and Water Quality

Agricultural activities generate a number of residual byproducts which can be carried into waterways by runoff or can potentially leach into ground water supplies. Such residuals include nutrients from chemical fertilizers and animal manure, pesticides, sediment, and dissolved minerals and salts. Water erosion effects are largely the result of sediment and agricultural water runoff, which may also carry agricultural chemicals and byproducts into streams and

waterways. Annual damages to off-farm water users are estimated at $2-$6 billion, compared with an estimated $1 billion per year in economic productivity losses from eroding soils (22). However, the type of offsite damage varies by region. Damages are greatest to recreation and fishing in the North and West and to navigation and flood plains in the South. The potential offsite benefits from conservation practices that reduce erosion are greatest in the Northeast, Lake, Delta, and Pacific regions.

Ground water can be contaminated by agricultural chemicals and their byproducts leaching into the underground aquifers that supply water to about 97 percent of rural residents and almost 50 percent of the U.S. population. Specific estimates of potential health damage from these pollutants are not available, but public concern for the safety of the potable U.S. water supply has grown. Potential nitrogen fertilizer contamination is greatest in the Corn Belt and Great Plains (16). Potential pesticide contamination of ground water is greatest in the Atlantic States, gulf coast, and the Corn Belt. We need more information to be able to examine the tradeoffs among conservation tillage (which may exacerbate this problem because less water runs off), herbicide use and cultivation, and soil percolation characteristics (5).

Farmland Protection In the 1990's

Farmland conservation, a State and local issue since the early 1960's, gained national interest in the 1970's. A joint Federal study of farmland conversion looked at farmland as a factor in food and fiber production because of the agricultural expansion in the 1970's (13). This study of rates of farmland conversion and the agricultural contraction of the 1980's revealed urbanization's role in cropland loss to be small, except in high growth areas.

The potential Federal role regarding farmland conversion is limited, but public concern over loss of farmland to urban uses will probably increase in the 1990's. Land use regulation resides with the States and is often delegated to local governments. The Federal Government indirectly influences land use through tax policy, flood insurance regulations, environmental impact statement requirements, and conservation policies (23). The Farmland Protection Policy Act of 1981 and subsequent amendments restrict Federal actions affecting farmland and constitute the only direct national policy effort in this area.

Agricultural Effects on Endangered Species

Wildlife is threatened by conversion of wetlands, forest, and native grassland to cropland or pasture and by environmental contamination due to agricultural pesticide byproducts. For example, environmental contamination by pesticides has been implicated in the deaths of wildlife and in reproductive failures of

species that prey on other species that have accumulated residues in their tissues.

Water pollution from agricultural runoff has harmed aquatic species. Agricultural demands for water resources in the West can reduce stream flows, reducing potential habitats for aquatic wildlife.

The Endangered Species Act has recently been reauthorized. Several proposals under consideration would require pesticide labeling which addresses the critical habitats of endangered species under the act.

Federally Supplied Irrigation Water and Commodity Programs

A potential conflict between USDA commodity programs and subsidies for irrigation water provided through the Bureau of Reclamation, U.S. Department of the Interior, is also an area of concern. The Bureau of Reclamation has subsidized development of rivers and streams in the West to supply agricultural irrigation water. Irrigated farms using this water supply continue to pay a price for water below the cost of Federal water resource development and supply (14). In 1985, much of this water was used to produce commodity program crops (corn, sorghum, barley, oats, wheat, rice, and cotton) on 9.6 million acres, primarily in California, Washington, and Idaho.

USDA administers a comprehensive framework of target prices, price support loans, and acreage restrictions to reduce production of certain program crops and to support farm income. Some of these policy objectives conflict.

Commodity programs offer incentives to producers to limit acreage and production of surplus crops, but the Federal water program, by subsidizing water use, encourages expansion of irrigated acreage and production. Fox, Moore, and Stults examined the apparent conflict of goals and concluded that, "reclamation programs emphasize, among other objectives, maintaining and expanding agricultural capacity over time...[while] commodity programs emphasize short-term price and income levels and stability" (8). One consequence is a double subsidy for farm operators who both receive subsidized irrigation water from the Bureau of Reclamation and participate in USDA commodity programs. Subsidized water encourages farmers to produce crops for which there is an insufficient market. These crops must then be further subsidized to maintain producer incomes.

Trade Liberalization and Agricultural Resources

Domestic and foreign trade policies of the United States and other countries have been among the primary reasons for the increased fluctuations in U.S.

grain exports. Policies designed to protect domestic markets from world market fluctuations tend to increase variability in world market demands (12).

Understanding the relationships, from national trade-distorting policies to export demand to the use and value of U.S. agricultural resources, is important because most demand growth for U.S. agricultural commodities will probably come from foreign, not domestic, markets. For example, between crop years 1970/71 and 1980/81, U.S. exports of wheat, corn, and soybeans rose 104 percent, 356 percent, and 67 percent, and nominal cropland values more than quadrupled. During 1972-82, cropland harvested for these crops expanded 46 percent, land use intensified through additional fertilizer and chemical application, and Great Plains farmers used 35 percent more irrigation water. Trade expansion in the 1970's also created growing concerns about use of our natural resources and possible degradation of our environment. Critics charged that our soil was "being exported," that water supplies were being polluted, and that environmentally sensitive wetlands and prairies were being irretrievably converted to agricultural production.

The United States has convinced other major trading nations to consider liberalizing global trade rules toward more of a free market system. Although we do not know what reform in trade policies will involve, reform that changes commodity flows between the United States and other nations will also affect the use and value of our land and water resources and the use of other inputs (25). Those effects would probably be greatest in the major export commodity regions such as the Northern and Southern Plains, Lake States, and Corn Belt.

The United States has acted to protect the environment by increasingly restricting private use of environmentally sensitive resources through the Food Security Act of 1985 and other laws. Passage of soil conservation legislation, for example, to remove cropland from production or restrict input use could increase costs of production and adversely affect U.S. terms of trade. Such policies to protect the environment may not be on the negotiating table, but they still may affect trade.

Agricultural Biotechnology

Agricultural biotechnology has been described both as the savior and bane of agricultural production (see Fleisher, page 333). Biotechnology could potentially change the production input mixes and cost structures. These changes, however, will depend on types and costs of the inputs developed and the changes these inputs make in physical production processes (21).

Many predictions about biotechnology's effects on the farm have started from the premise that biotechnologically derived inputs will reduce the farmer's costs, be widely adopted, and lead to major increases in total agricultural

output. However, a few large firms will probably dominate this new industry, affecting the products that will be developed and their prices. Even though biotechnology may increase agricultural output, prices for these new inputs will reflect their increased productivity and development costs. Thus, the costs of purchased inputs for producers may not significantly decline, and the 2- to 3-percent annual growth rate in output will probably increase only slightly.

Biotechnology will also probably change the proportion that producers spend for various agricultural inputs from chemicals, fertilizers, and pesticides to seeds. Producers may actually have less flexibility to change the proportions of various inputs in response to their production systems or to changes in the prices of different inputs.

Biotechnology has the potential to provide agriculture with inputs that have fewer byproducts to hurt the environment and human health. Regulating these inputs will play a major role in determining the types of biotechnologically derived products to be developed. The use of biotechnology to provide safer alternatives to existing agricultural inputs will depend on the Government's developing regulatory initiatives and making regulatory decisions based not only on minimum safety standards, but on the relative risks presented by existing, new, and potential technologies.

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Chapter 5

The Role of Federal Credit and Tax Policy in Agriculture

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Credit and tax policies fueled overinvestment in the farm sector during the 1970's, contributing to the farm debt crisis of the 1980's. The resulting caution of farmers and lenders toward debt-financed investment should reduce the influence of credit policies on agricultural production in the 1990's. However, recent legislative actions may have polarized the distinction between creditworthy borrowers and marginal farm operators, making affordable credit more difficult for the latter to obtain. Tax reform has greatly reduced the role of Federal taxes in investment decisions.

Federal tax policies and the cost and availability of credit have traditionally been important considerations to farmers making investment decisions. The easy lending policies of the 1970's and tax-induced overinvestment in agriculture contributed to the farm financial crisis of the early 1980's. As the prospects for farm sector profitability brighten, changes in Federal credit and tax policies are giving farmers significantly different signals. These new signals may help the farm sector avoid a replay of the 1980's, but recent credit and tax policy changes are not without problems.

Throughout the 1970's, Federal credit and income tax policies acted to increase investment and expand U.S. agricultural production. These policies frequently contradicted farm program policies aimed at resource conservation or supply control. The farm debt crisis of the 1980's has reduced reliance on debt-financed agricultural investments, and the Tax Reform Act of 1986 should greatly reduce tax-induced distortions in investment, production, and financing decisions. These developments will remove some of the inconsistencies between Federal credit, tax, and farm policies. However, new farmers and those with cash-flow problems may have more difficulty finding affordably

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priced credit because of recent credit market developments, and some farmers will face increased tax and recordkeeping costs as a result of tax reform.

Agricultural Credit

Credit is a major input to modern American agriculture. Credit allows farmers to react quickly to technological developments, changing market signals, and unexpected business opportunities. As an investment financing technique, debt financing allows farmers to alter or expand production while deferring payment until the investment earns revenues. For family farm operators with limited cash on hand, credit is often necessary to the production process and important in determining their farms' long-term success.

The demand for farm credit depends upon the cost of needed physical inputs into the production process—land, labor, fuel, fertilizer, feed—and the availability of alternative sources of financing, such as retained earnings, Government program payments, investor capital, and leased assets. The most advantageous financing arrangement varies with economic conditions, short- and long-term plans, and various commodity program, tax, and financial risk considerations. As a result, reliance on debt financing has fluctuated widely over the past two decades, increasing rapidly in the 1970's and dropping sharply during the 1980's. For example, only about 70 percent of all reported farmland sales involved debt financing in 1988, down from 90 percent in 1979 (7).[1] Nonetheless, 56 percent of farms continued to have debt outstanding at the end of 1987, and many more farmers rely on borrowed funds to finance a portion of their operation at some point during the year but repay their debts before year's end (9).

The Market for Farm Credit

The farm credit market is segmented according to the length of loans. Farmers use short-term credit to finance operating inputs, such as fuel and fertilizer, for use during the current production cycle. Farmers use medium- and long-term credit to purchase durable inputs, such as machinery and farmland, which contribute toward a flow of revenues over time. Commercial banks, production credit associations, the Farmers Home Administration (FmHA), merchants, dealers, and individuals provide short- and medium-term credit. Federal land banks, individual sellers, insurance companies, FmHA, and commercial banks provide long-term credit, chiefly for farm real estate mortgages (6).

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

American farmers dramatically increased their reliance on all types of debt during the 1970's. Over much of the decade, real interest rates (interest rates adjusted for inflation) were very low and sometimes negative. The value of farm assets (excluding operator households) increased by over 230 percent during the decade, encouraging farmers to borrow funds to purchase land and equipment which was expected to further appreciate in value (8). Furthermore, the increasing value of farm assets enabled farm operators to borrow additional funds, often in amounts above what could realistically be supported from the farm's cash-flow. This trend occurred because lenders based their loan decisions on the expected future value of the collateral that secures farm loans rather than the operator's ability to repay the loan.

The end of the agricultural boom was apparent by 1982, however. Rapidly rising interest rates and declining exports led to declines in farm incomes and asset values. After peaking in 1982, the average per acre value of farmland and buildings dropped by over one-third before stabilizing in 1987 (7). As collateral values began to fall, lenders tightened loan eligibility standards, paying particular attention to the loan applicant's cash-flow. Many overextended farmers ceased operations when they were unable to meet payments on existing loans or secure additional credit, leaving their lenders with billions of dollars in losses. During 1984-86, lenders wrote off about $11 billion in farm loans as 17 percent of the Nation's farmers were either in default or on the edge of defaulting on their loans (1). Post-Depression record numbers of agricultural banks failed as the 1980's progressed, and after the Farm Credit System (FCS) asked repeatedly for Federal assistance, Congress passed the Agricultural Credit Act of 1987.

Faced with growing farm loan losses, agricultural lenders raised the risk premium (the additional interest charge levied to cover higher anticipated losses) charged on farm loans, keeping interest rates for farmers relatively high. Farmers went from paying prime rates (or lower) on their commercial bank loans at the beginning of the 1980's to paying an additional 3 percentage points over prime in 1986 (6). In response, farmers drastically reduced their demand for credit. Demand for production credit fell as farm input expenses dropped and farmers found alternative sources of funds, chiefly Government commodity program payments and the Commodity Credit Corporation (CCC) loan program.

After peaking at nearly $88 billion in 1983, non-real-estate farm debt outstanding declined by $30 billion through the end of 1987 (6). The sharp drop in land values, with uncertainty over the long-term economic prospects of the farm sector, dampened all purchases of farmland and equipment, particularly those that were debt-financed, as farmers adopted a more conservative stance towards reliance on borrowed funds. Farm real estate debt

outstanding declined to $83 billion by the end of 1987 after peaking at $105 billion in 1983 (6).

Although painful for both farmers and lenders, these adjustments have left the sector on a much more solid footing. Since 1986, the quality of agricultural lender portfolios has improved, interest rates on farm loans have moderated somewhat, the farm financial crisis has eased, land values have stabilized, and farm incomes have reached record levels. The farm financial crisis has eased considerably primarily because of Federal farm income support programs and farmers' cost-containment measures. Between 1986 and 1987, the percentage of farms considered vulnerable to failure (those with negative net farm incomes and a high debt load) decreased from 10 percent to 4.9 percent (9). Aided by record farm incomes in 1987 and a 3-percent increase in the average value of farmland, farm lenders (except FmHA) have seen their farm loan delinquencies and loan losses fall dramatically (7, 5).

Demand for credit remains depressed, but if farm sector financial conditions continue to improve, the drop in outstanding farm debt should moderate and reverse over the next 2 years. However, as farmers approach the 1990's, not only do they have very different expectations about the farm sector's future, but they face credit market conditions very different from those of the late 1970's.

Credit Policy Developments

The Federal Government has taken numerous steps that directly or indirectly affect the cost and availability of farm credit. These actions were partly a response to the farm financial crisis, but also a general attempt to restructure financial markets. Banking legislation, the Food Security Act of 1985, changes in the bankruptcy code, and the Agricultural Credit Act of 1987 each profoundly affect the farm credit market.

Legislation deregulating the financial services industry during the 1980's tied the rural banking system much more closely to national financial markets. With deregulation, small rural banks were better able to compete for deposits. Because these small banks now have greater access to private funds and continued access to Federal Reserve funds through seasonal borrowing privileges, changes in financial market conditions should not affect the availability of loanable funds in rural areas as much as in the past. However, interest rates on farm loans will continue to be much more volatile than was generally true before banking deregulation because rural banks' own costs of funds rise and fall with national interest rates. The increased variability of interest rates and lenders' new-found concern over farmers' ability to repay loans may make credit more difficult to obtain for marginal farm borrowers in the future, even when banks have adequate loanable funds.

The 1985 Act directly affected the farm credit market through its changes in FmHA's programs. Through its loan and loan guarantee programs, FmHA provides credit to farmers unable to find affordably priced credit from private lenders. The act stipulated a gradual shift in funding from FmHA's direct lending programs to its guaranteed loan programs, effectively removing the Government from the loan origination business. The act also tightened eligibility standards for FmHA's emergency loan program and gradually reduced funding levels for its farmer programs. The net result has been more limited access to subsidized Government loans.

The 1985 Act also included "clear title" provisions, making the sale of agricultural products consistent with other sales covered by the Uniform Commercial Code. Before the 1985 Act, lenders could require the buyer of farm products pledged as loan collateral to repay the loan if the farmer defaulted. The act restricts the right of lenders to claim ownership of assets pledged as collateral on farm loans unless the buyer knew of the lien's existence before the sale (4). This change reduced the security value of crops and livestock pledged as collateral on farm loans and increased lender reporting requirements, making farm loans a little less desirable from the lenders' perspective. Other provisions of the act indirectly affected the farm credit market through their effect on farm operations and participation in Government commodity programs. For example, previous annual acreage reduction programs and the current Conservation Reserve Program reduced the amount of land in tillage, reducing the need for credit. Increasing advanced deficiency payments also have directly affected the demand for credit by giving farmers larger amounts of cash to pay for needed inputs at the beginning of the production cycle.

The Agricultural Credit Act of 1987 provided financial assistance to the ailing FCS and made several changes in the way farm credit is delivered and retired. The act's most profound long-term effect on the farm credit market may be the creation of the Federal Agricultural Mortgage Corporation (Farmer Mac) to develop a secondary market for farm real estate loans. A secondary market will allow lenders to make long-term farm loans that are resold as collateralized securities to investors. Several years and additional legislation may be necessary before Farmer Mac noticeably affects the cost and availability of farm credit. But if it becomes established, a strong secondary market for farm loans should increase competition among farm real estate lenders, standardize loan eligibility criteria, and lower borrowing costs for qualified borrowers.

The 1987 Act also mandated changes in FCS operations that will have a more immediate effect on farm borrowers. The FCS is a borrower-owned cooperative that, before the 1987 Act, was made up of 37 banks and approximately 370 associations specializing in making loans to farmers. The

act consolidated some FCS institutions and encouraged further reorganization with borrower approval. The FCS must finance an insurance fund to protect bond holders from future defaults, and borrowers will pay loan origination fees, with only modest borrower stock purchase requirements. The net result of these changes should be a more efficient lending organization that more closely resembles a banking concern than was true in the past.

Other congressional and regulatory actions in recent years have also affected the borrower-lender relationship. Chapter 12 of the U.S. Bankruptcy Code, introduced in 1986, simplified restructuring of farmers' debts under rules specifically designed for their circumstances, thereby increasing farm borrowers' negotiating power with lenders. Faced with the threat of a Chapter 12 filing, lenders are far more willing to restructure troubled loans rather than attempt a foreclosure.

Other legislation, including the Food Security Act of 1985 and the Agricultural Credit Act of 1987, significantly broadened the rights of FCS and FmHA borrowers. The 1987 Act also provided support for State mandatory mediation programs, which help financially stressed farm borrowers and their lenders renegotiate the terms of their loan agreements. Borrower-lender relationships have been further altered by recent court decisions holding lenders liable for heavy-handed loan collection techniques that were accepted practice only a few years ago.

These legislative and legal developments have significantly increased the rights of borrowers at the expense of lenders. Although borrowers' rights provisions allow distressed farmers time to reduce their debt burdens while retaining farm ownership, these provisions also increase the risk associated with farm loans, making lenders more cautious about extending new credit to any but the best qualified farm borrowers.

Emerging Credit Issues

The farm financial crisis of the 1980's, and policymakers' reaction to it, have altered the way credit markets serve the farm sector. Both farmers and their lenders will probably be much more cautious about debt in the 1990's than they were at the close of the 1970's. The agricultural sector would probably not benefit from a return to the liberal lending policies of the 1970's. However, changes in lender behavior, particularly in response to many of the policy prescriptions of the 1980's, may sharpen the distinction between qualified borrowers and those farmers with less-than-perfect credit credentials. The farm credit market of the 1990's may serve financially secure farmers very well but leave new farming operations, those that had trouble surviving the farm crisis, and other risky farm operations with a more limited ability to rely on debt-financed investments.

The realization that collateral values can fall dramatically within a short period of time may discourage asset-based lending to the farm sector, particularly until new farm legislation is passed and implemented. The farm sector's heavy reliance on Federal Government programs makes asset values very sensitive to changes in these programs. Because of continuing Federal budget pressures and the possibility that support levels could drop, the prospect of reduced asset values will probably keep loan eligibility standards high.

The effects of past policy initiatives may also restrict the flow of new credit to struggling farmers. Several policy initiatives may reinforce the distinction between qualified and unqualified farmers. If Farmer Mac successfully establishes a strong secondary market, it will divide the farm mortgage market into loans that meet Farmer Mac standards and loans that do not. By providing the lending industry with a standardized measure of loan quality, against which each lender can rate its own farm loan portfolio and the quality of new loan applications, Farmer Mac may institutionalize the split between high- and low-risk farm borrowers, reducing high-risk farmers' access to affordable credit.

The array of borrowers' rights granted over the last several years has also significantly raised the risks associated with lending to farmers who might experience cash-flow or collateral problems during the life of their loans. These added risks may lead lenders who enjoy alternative loan and investment opportunities to abandon the riskier segments of the farm credit market. Raising interest rates to cover the added anticipated costs may not be a viable lending strategy because higher interest rates increase the likelihood of borrower financial stress, triggering loan restructuring.

For the FCS and other local lenders with few lending options outside of agriculture, regulator behavior will determine the extent to which loans are made to higher risk borrowers. Recent policy actions have provided many financially stressed farm lenders with the "breathing room" they need to grow out of their farm loan problems, but these actions have not significantly reduced the costs of their past mistakes. For example, the 1987 Act provides the FCS with financial support but also requires the FCS banks and associations to increase their capital base, contribute to an insurance fund, and gradually repay the U.S. Treasury for any financial assistance provided. Likewise, the commercial bank capital forbearance programs administered by Federal regulators allow undercapitalized agricultural banks to remain open but require that capital bases be rebuilt within 3-7 years. Faced with continuing financial stress, some lenders may be willing to gamble that the farm sector's current prosperity will allow marginal farm borrowers to meet loan obligations, thereby avoiding the complications and added costs imposed by borrowers' rights provisions. But even if regulators allow these institutions to make higher risk loans, the institutions will also charge significantly higher

interest rates to meet their own financial needs—behavior markedly different from that of the 1970's.

The net result may be that higher risk farm borrowers will rely more heavily on Government credit programs. But that market has also changed. The shift in FmHA's support toward guaranteeing privately originated loans will probably reduce the availability of credit to high-risk farmers. Private lenders, even with an FmHA guarantee on 90 percent of qualified farm loans, will probably apply stricter loan eligibility standards than the FmHA applied on its direct loans in the past.

If a highly selective farm credit market emerges from the financial crisis of the 1980's, the farm finance system may be able to avoid the turmoil of another debt crisis, but at the price of significant structural adjustment. Higher farm loan eligibility standards will reduce the odds of another boom in farm debt, but could quicken the trend towards a farm sector having very large commercial-size farms and part-time farm operations, with fewer medium-size farms. Farm credit has historically been used to take advantage of investment opportunities during boom years and to weather the bust years. Although farmers as a group will probably remain cautious about using credit, those family farmers unable to secure affordable farm credit will tend to become less efficient over time and eventually join the ranks of part-time farmers, become tenant farmers, or leave the sector entirely.

Federal Tax Policies

Tax policy is one of the most powerful and frequently used policy tools for achieving various economic and social objectives. The savings and investment incentives enacted as part of the Economic Recovery Tax Act of 1981 and similar policies adopted both before and following the 1981 Act indicate that policymakers believe tax policy can effectively influence economic activity.

Federal tax policies affect agricultural investment and production decisions through their effect on both the relative prices of the various inputs used in farming and the level of taxation on various sources of farm income. Tax policies may change the level of output by altering either the input mix or the quantity of resources committed to farming. Tax policies also affect the organization of resources by favoring one form of business organization over other forms.

Analysts disagree considerably concerning the magnitude of tax policy effects on the sector and their importance in relation to commodity, credit, and other Government programs and policies. However, analysts now widely recognize

that tax policies have played a role in farm operations over the last two decades.

Background

The Federal income tax system throughout the 1970's and early 1980's had relatively high marginal tax rates and numerous exclusions, deductions, and credits. Both farmers and nonfarm investors exploited the income tax rules applicable to agricultural investments to shelter income from taxes. For farmers and nonfarm investors alike, tax management and tax planning frequently played a major role in decisions concerning investment, production, financing, marketing, and the organizational structure of farm operations.

Special income tax rules applicable to agriculture included (1) the use of cash accounting, (2) the immediate deductibility of capital costs, and (3) capital gains treatment for income from the sale of assets for which costs may have been currently deducted. The combination of these provisions frequently provided current tax benefits that greatly exceeded any associated future tax liabilities. These tax policies also encouraged additional investments in farming, resulting in increased production of most agricultural products, especially livestock and perennial crops, such as orchards and vineyards.

Investment incentives for depreciable capital promoted purchases of farm machinery and equipment and the construction of certain farm structures. Accelerated depreciation, combined with the investment tax credit, resulted in extremely low tax rates for investment in most types of depreciable farm capital. Nearly 20 percent of net investment in agricultural equipment over a 30-year period beginning in 1956 is attributed to these favorable tax policies (2).

Federal tax policies have also affected land ownership and values. Land received more favorable tax treatment than many other investments. Carrying costs, such as nominal interest expenses and property taxes, were immediately deductible. Yet, the appreciation in the value of land was not only taxed at a favorable capital gains rate, but that tax was deferred until the land was sold. In light of the optimistic expectations regarding future appreciation in land values during the 1970's, land investment was considered an excellent opportunity to shelter current income in exchange for appreciation taxed at very favorable rates. The incentives for land investments were greater for those in higher tax brackets, those who borrowed to buy land, and those who held their land for long periods before resale. The result was higher land values, greater concentration of land ownership, greater debt loads and risk for landowners, and a less active land market.

Federal income tax policies also affected resource use and conservation. Since 1954, farmers had claimed immediate tax deductions for certain types of soil and water conservation expenditures. Farmers' decisions regarding soil and water conservation and management were frequently based more on the tax savings associated with such expenditures than on the conservation benefits. Farmers were also allowed to claim immediate tax deductions for most expenditures on land clearing and land improvements. The immediate deductibility of land-clearing expenses, combined with the generally favorable tax treatment of land, encouraged the conversion of wetlands and other marginal land into cropland. Deductible expenditures on land improvements, such as drainage and preparations for irrigation, often encouraged more intensive farming practices that increased soil erosion.

Tax policies have also affected the organizational structure of the farm operation. The number of farm corporations increased by almost 200 percent between 1969 and 1982 (3). Many factors contributed to this increase, but Federal tax policies were undoubtedly a major consideration. Throughout the 1970's and early 1980's, corporate income tax rates were generally lower and less progressive than were individual income tax rates. Many fringe benefits were also deductible as business expenses by a corporation and frequently excluded from the owner-employee's income as well. Farms operated as sole proprietorships or partnerships generally could not deduct similar fringe benefits or deducted them in lesser amounts. Thus, Federal tax policies encouraged farmers to incorporate to reduce their tax liability. Furthermore, the tax savings from incorporating were frequently reinvested in the farm operation, resulting in increased growth and expanded production.

Together, the tax policies of the 1970's and early 1980's stimulated investment, contributing to higher input and lower product prices. Farmers and nonfarm investors best able to take advantage of these tax provisions frequently reaped substantial benefits. But, for those farmers unable to take full advantage of the tax provisions, the tax savings were more than offset by higher input and lower product prices.

Tax Reform Act of 1986

The Federal income tax system that existed before the Tax Reform Act of 1986 contained more than 100 provisions for economic incentives or tax relief to various groups of taxpayers. These preferential tax provisions steered resources toward investments with lower tax rates rather than those that made the greatest contribution to real output. These provisions of the tax code and the attempts to limit their application to targeted groups created an extremely complex and inequitable tax system. Taxpayers with similar economic incomes frequently faced very different tax burdens. Taxpayers used the

deductions, exclusions, and credits available under the prereform income tax system to greatly reduce, and in some cases eliminate, their tax liability.

By 1985, dissatisfaction with the Federal tax code led to a series of proposed overhauls to provide a more efficient, equitable, and simpler tax system. These proposals prompted a national debate on tax policy that eventually led to the enactment of the Tax Reform Act of 1986.

The 1986 Act was the most comprehensive overhaul of the Federal income tax system in over 30 years. The act substantially reduced marginal tax rates and broadened the income tax base by eliminating many of the exclusions, deductions, and credits introduced into the tax code over the years. Agriculture, like other sectors of the economy, was affected by several of these special provisions.

The act made a number of changes concerning these special provisions. These changes included limits on the ability to use cash accounting on prepaid expenses, repeal of the capital gains exclusion, and new requirements to capitalize development expenditures for plants and animals with a development period of more than 2 years. These changes will increase tax and compliance costs for many farmers, but they should also greatly reduce the incentive for tax-shelter investments in developing orchards and vineyards and various livestock operations.

The act reduced incentives for investment in depreciable capital. The investment tax credit was eliminated, and depreciation deductions were made less favorable by extending the recovery period for most assets. Compared with prior law, these changes should result in reduced investments in farm machinery, equipment, and some structures.

The act also reduced inconsistencies with various credit and conservation policies. Tax policies discouraged farmers from participating in debt restructuring programs. Farmers who previously had debts discharged either through a debt restructuring program or by reconveying property to their lenders were liable for taxes on the difference between the amount of the debt written off and their basis in the property. Under the new law, "qualifying farm debt" discharged or written down by an unrelated lender will not be treated as income. This change removed a major barrier for debt restructuring programs.

With respect to resource use and conservation, the act restricted or eliminated many special tax benefits that hindered conservation efforts. Soil and water conservation deductions were restricted to those consistent with a conservation plan approved by the U.S. Department of Agriculture or a comparable State agency. The deduction for land-clearing expenditures was completely

repealed. The act also discouraged the conversion of wetland and highly erodible land into cropland by treating any gain on the sale of such land as ordinary income and any loss as a long-term capital loss. These changes have made tax policies more neutral with regard to land use and conservation and should improve resource management.

The Tax Reform Act of 1986 represented a clear shift in the role of tax policy in agriculture. The substantial reductions in marginal tax rates and investment incentives and the new restrictions on the use of tax losses to offset other income have reduced the importance of taxes in investment, production, and financing decisions of both farmers and nonfarm investors. This shift should produce long-term benefits for the farm sector.

Emerging Federal Tax Issues

Despite increasing resistance to additional changes in our tax laws following the comprehensive overhaul of the tax code in 1986, Congress will probably enact new tax legislation over the next few years. However, unlike the 1986 Act, which focused on tax reform, tax changes over the near term will focus on raising additional revenue. Several options have been discussed in the past and will be reconsidered in light of the continuing need to reduce the budget deficit. These options include:

- Expanding the income tax base by eliminating more loopholes,
- Increasing marginal tax rates,
- Enacting an oil import fee,
- Increasing Federal excise taxes on alcohol, tobacco, gasoline, and similar items, and
- Enacting a value-added or national sales tax.

Of these options, further expanding the income tax base and increasing excise taxes are the most likely alternatives. The specifics of the particular tax package adopted will determine the implications for farmers. However, because the desire to raise revenue rather than reform the tax code will be the primary goal of tax legislation over the next few years, any change in the tax code in the near term will not have as dramatic an effect on agriculture as the changes of the early 1980's.

Relationship Between Credit, Tax, and Commodity Policies

Efforts to coordinate the various policies that affect the farm sector have been somewhat limited. For the most part, tax policies of general application are enacted based on how they will affect the entire economy, with only limited consideration for how they will affect the agricultural sector. This fact and the frequency of tax policy changes provide ample opportunities for conflicts to arise. Recent farm credit policies have aimed to ease the effect of the debt crisis on farm borrowers and to avoid disrupting financial markets generally, with little regard to their effect on production.

Throughout the 1970's and early 1980's, tax and credit policies expanded agricultural investment and increased farm production. These policies frequently contradicted other agricultural policies aimed at resource conservation and supply control. These contradictions have received increased attention in recent years, but efforts to coordinate all Government policies that affect the agricultural sector are still limited. Nevertheless, recent developments have reduced these contradictions.

Provisions of the Tax Reform Act of 1986 should reduce the conflicts between tax and other policies. The act specifically addressed inconsistencies between tax and conservation and credit policies. More general tax policy changes affecting marginal tax rates, investment incentives, and the use of losses to offset other income should reduce conflicts between tax and commodity policies. Thus, while contradictions and inconsistencies continue, Government policies are better coordinated today than previously.

Policymakers have focused far less attention on conflicts between resource conservation and commodity policies and the effects of farm credit programs and policies. But here, too, the overall effect of recent farm credit market developments on future farm investment and production decisions should be generally consistent with other program objectives. The likelihood of another easy-credit-induced expansion of the farm sector seems remote, both because of a change in the attitudes of farmers and lenders and because of farm credit policy developments.

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Chapter 6

Agricultural Trade Policy and GATT Negotiations

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The current "Uruguay Round" of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT) was launched in September 1986. Agriculture was included in the seven prior GATT rounds, but countries were unwilling to accept international discipline on their trade policies that support domestic farm programs. Agricultural negotiations now recognize for the first time that domestic agricultural policies affect international markets and therefore cause agricultural trade problems. This chapter provides background on the task facing agricultural negotiators and summarizes the progress achieved thus far.

The current "Uruguay Round" of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT) was launched with a declaration by trade ministers of member nations at Punta del Este, Uruguay, in September 1986. Agriculture was included in the seven prior GATT rounds, but countries were unwilling to accept international discipline on trade policies that support domestic farm programs. As a result, the current GATT rules for agriculture are more lenient than those negotiated for industrial products. Events in the 1980's have demonstrated the need to improve both these rules and GATT dispute settlement mechanisms. Governments have responded by giving agriculture a central place on the negotiating agenda for the Uruguay Round.

The Punta del Este declaration states, in part, that the objectives for agriculture are "to achieve greater trade liberalization and to bring all measures affecting import access and export competition under strengthened and more operationally effective GATT rules and disciplines" (7).[1] These goals would involve, among other things, improving market access through reducing import barriers; improving the competitive environment by increasing discipline on

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[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

the use of all direct and indirect subsidies and other measures directly or indirectly affecting agricultural trade; and minimizing the adverse affects of sanitary and phytosanitary (animal and plant health) regulations and barriers on trade in agriculture (7).

The declaration represents an historic attempt to change the treatment of agriculture within GATT. For the first time, agricultural negotiations recognize that domestic agricultural policies affect international markets and, therefore, contribute to agricultural trade problems. World leaders have supported the principles of the declaration by affirming the link between agricultural trade reform and reforms in national farm programs to reduce the effects of those programs on trade (14, 15).

This chapter provides background on the task facing agricultural trade negotiators and summarizes the progress achieved thus far in the Uruguay Round. We can best understand the challenge facing negotiators to accomplish this task if we examine the treatment of agriculture over time in the GATT and the role played by domestic policies in agricultural trade.

The GATT and Agricultural Trade

The GATT was one of the products designed to bring order to the international economy after World War II. The GATT's basic purpose was to establish "rules of conduct" to nurture trade between countries and promote the benefits of economic growth. GATT rules identify the ways governments may protect domestic markets and the rights and obligations of governments in trade (5).

The General Agreement calls for nondiscrimination in trade: a country must offer to all trading partners the same trade advantages as it provides to its most favored trading partner. This is the "most favored nation" provision. The GATT also aims to limit nontariff trade barriers (article XI) and export subsidies (article XVI and the Code on Subsidies and Countervailing Duties). The GATT attempts to limit protection to tariffs that are "bound" by setting maximum levels in negotiations. Once a tariff concession is made, it cannot be changed without consulting and, usually compensating, trading partners (that is, the tariff is "bound"). The General Agreement also provides for consultation, conciliation, and dispute settlement under its own auspices.

The "most favored nation" provisions and agreements on tariff concessions apply equally to agricultural and nonagricultural commodities. GATT rules for nontariff trade barriers and export subsidies, however, treat "primary products" more leniently than those negotiated for industrial products. Import barriers, export subsidies, and state trading practices form an integral part of national farm programs primarily designed to protect farm income.

Special treatment of such policies for agriculture has arisen because governments have been reluctant to accept international discipline on policies that underlie the operation of domestic farm programs. Because the rules governing agriculture are more lenient and less precise, the GATT has been ineffective in dealing with agricultural trade disputes. Agricultural trade reform will require new efforts to further tighten and clarify GATT rules relating to agriculture. Complete reform of agricultural trade will require placing agriculture under the same discipline that applies to nonagricultural commodities.

Quantitative Restrictions

Article XI contains a general prohibition on the use of quantitative import and export restrictions such as quotas but specifies three exceptions benefiting agriculture: (1) temporary export restrictions may be imposed to relieve food shortages; (2) restrictions may be used in applying classification, grading, and marketing standards; and (3) import restrictions may be applied on agricultural and fishery products where necessary for the enforcement of domestic programs aimed at limiting domestic production or marketings or for the removal of temporary surpluses.

In 1955, the United States applied for and received a waiver to articles XI and II. (Article II concerns the use of fees on imports.) The waiver was requested to allow the United States to fulfill its obligations under section 22 of the Agricultural Adjustment Act, as amended in 1951. The waiver allows the United States to apply fees and quantitative import restrictions on agricultural products whether or not U.S. domestic programs have production or marketing controls. During the 1980's, section 22 fees or quotas were in effect for several dairy products, peanuts, cotton of specified staple lengths, cotton waste, certain cotton products, sugar, and sugar-containing products.

Voluntary restraint agreements (VRA's) and variable levies are two forms of import protection not formally covered by current GATT rules. Under VRA's, an exporting country "voluntarily" agrees to limit exports to a specific importer. VRA's are more widely used in the manufacturing sector, but they are becoming more common in agricultural trade. For example, the European Community (EC) currently has such an agreement with Thailand to limit cassava exports. The United States has obtained periodic agreements with meat exporters when U.S. imports approach levels that could trigger quotas under the Meat Import Law.

A variable import levy is the difference between the world market price and an internal threshold price. Variable levies are employed to enforce minimum import prices and effectively isolate domestic producers from world price

movements. Variable levies are used by the EC on most temperate zone agricultural products except oilseeds, nongrain feeds, fruits, and vegetables. Japan employs variable levies on pork. Sweden, Norway, and Finland also use variable levies on many agricultural products. The status of variable levies under GATT rules has never been determined.

Export Subsidies

Another major agricultural exception is contained in article XVI which prohibits the use of export subsidies for nonprimary products. Article XVI permits export subsidies on primary products provided such subsidies do not result in a "more than equitable share of world export trade" being gained by the country using the subsidy. However, contracting parties should "seek to avoid" using such subsidies. Article XVI also requires contracting parties to report any domestic or export subsidy which has the effect of increasing exports or restricting imports.

Giving practical meaning to this approach has created continual problems. Most of the GATT subsidy disputes have concerned agricultural commodities. A total of 14 subsidy disputes were taken to the GATT between 1948 and 1985. All of the disputes involved complaints against one or more countries currently members of the EC. Eight of these disputes occurred between 1975 and 1985, and all eight involved agricultural commodities (10, page 106).

Much of the controversy over the special rules for agriculture concerns the definition of an equitable share of the world market. Representatives to the Tokyo Round (1973-79) tried to clarify these definitions by adding additional rules in the form of codes to the GATT. The Subsidies and Countervailing Duty Code is one example. However, disputes relating to the use of subsidies have continued despite the existence of the codes.

State Trading

State trading organizations (often known as marketing boards) are government-authorized agencies that control marketing channels for particular products. State trading operations are not unique to agriculture, but their importance in agricultural trade is often overlooked. Agricultural policies in most developing countries are implemented through marketing boards. Japan, South Korea, Canada, Australia, and New Zealand also authorize state trading agencies for many agricultural products. In the dairy sector, for example, butter imports into Canada, butter and skim milk powder imports into Japan, and dairy exports from New Zealand are channeled through state trading agencies. As much as 90 percent of world wheat trade and about 70 percent of feed grain trade pass through such agencies (10, p. 111).

GATT rules in article XVII basically require that state trading agencies act in a nondiscriminatory manner, governed only by commercial considerations. State trading agencies are intended to behave like private traders. In practice, these entities often effectively restrict imports or support exports without resorting to the particular tools proscribed by other GATT rules.

For example, a country using state trading may maintain high internal price levels by restricting imports of the products in question. Overt import quotas are not required in such circumstances. Japanese and South Korean programs for wheat, rice, and beef operate in this manner. Australian and Canadian wheat boards employ dual pricing schemes to sell wheat abroad at lower prices than their domestic consumers pay for wheat. Direct export subsidies are not required and, in most years, the wheat boards do not require government funds to cover their operations. Instead, domestic consumers, in effect, subsidize the wheat exports. Dual pricing programs also require restrictions on imports of the commodity.

Agricultural policy reform will be incomplete without addressing the trade-distorting practices of state trading agencies.

GATT Rules and Developing Countries

Since its beginning, the GATT has offered developing countries additional latitude to exempt themselves from certain GATT requirements. Developing countries may impose quantitative and other restrictions on imports to protect infant industries or to remedy balance of payment problems (article XVIII). These justifications have been interpreted so broadly that the GATT has little control over trade restrictions in developing countries (12, 19). Part IV of the General Agreement, added in 1965, relieved developing countries from the GATT requirement to provide reciprocal reductions in trade barriers in order to receive new reductions in other countries' barriers.

In 1971, GATT members authorized a 10-year waiver permitting a developed country to reduce barriers to developing country imports below the level applied to other developed countries. The waiver was made a permanent rule, known as the generalized system of preferences (GSP), in 1979. Each developed country importer may designate which countries it regards as "developing countries" and the products to be covered. Preferential imports are subject to quantitative limitations. GSP provisions currently are offered (unilaterally) by the United States, the EC, and 12 other GATT members (12).

These preferential arrangements for developing countries are generally referred to as special and differential treatment. GATT precedents suggest that developing countries will likely receive some form of special exemptions in the current negotiations. However, compared with their role in previous

rounds, more developing countries are now important traders in agricultural markets. Agricultural trade reform will be incomplete if the policies of developing countries are completely exempt from disciplines developed for other countries.

Setting the Stage: A Review of Previous Negotiations

GATT rules and disciplines for agriculture have been discussed in every trade round since the GATT was formed.[2] Agricultural tariffs have been reduced in all previous rounds, but negotiators have been unable, or unwilling, to fully "bring agriculture into the GATT."

The first three rounds—held in Geneva, Switzerland (1947); Annecy, France (1949); and Torquay, United Kingdom (1950-51)—primarily emphasized reducing tariffs on nonagricultural products. Agricultural surpluses rose in the 1950's, and the fourth round in Geneva (1955-56) took place during an era of growing agricultural trade tensions. Attempts to curb the use of subsidies backfired in the sense that article XVI was revised to include the current language allowing use of export subsidies on primary products (20). The United States obtained its waiver during the fourth round.

The Dillon Round (1960-62) was the first after the formation of the European Common Market (now the EC). Negotiations centered on securing new tariff bindings from the EC equivalent to the prior bindings made by individual member states. The negotiations took place under the certain prospect that the EC would include the establishment of a Common Agricultural Policy (CAP). Several important concessions, hardly noticed at the time, were granted by the EC. Duty-free bindings were granted on entry of soybeans, soybean meal, and corn gluten feed, and near duty-free bindings were granted on soybean oil cake, other oilseeds, and cotton. These commodities were not significant in trade between the United States and the EC then, but they are extremely important today.

Agricultural negotiations in the Kennedy Round (1963-67) focused on problems raised by nontariff barriers to trade. U.S. concerns centered on potential effects on grain exports arising from the basic mechanisms of the CAP—minimum import prices, variable import levies, and variable export subsidies. The EC did not consider the design of the CAP to be subject to negotiation within the GATT, particularly as the EC was still formulating the common price and commodity policy regimes required to implement the CAP. The U.S. negotiating approach reflected the view that agriculture could be

[2]See (2, 3, 4, 5, 6, 11, 19, 20, 21, and 22) for more detailed discussion of previous GATT rounds.

brought into a more market-oriented environment, but the EC pursued a more managed approach to agricultural policies. These philosophical differences between the EC and United States dominated the Kennedy Round discussions and continue up to the present negotiations.

The initial U.S. proposal was to bind and cut by half the protection due to border measures. For the EC, Japan, and the United Kingdom, the United States proposed establishing minimum access commitments equal to existing import levels. In response, the EC advanced the concept of binding margins of producer price support in relation to world reference prices (the "montant de soutien" or "margin of support"). At the same time the EC suggested that market sharing agreements could be made in those markets where competition remained. When this proved unacceptable to exporters, the EC offered to bind maximum self-sufficiency ratios at a level that would guarantee a 10-percent share of grain markets to exporters.

The United States and others rejected the EC approach. The "margin-of-support" concept offered no commitment on market access. The concept maintained variable levies and could have affected soybean trade, by then an important U.S. export to the EC, negating the benefits of the previously granted duty-free binding (19, p. 14). The self-sufficiency norms suggested by the EC were too limited to be acceptable to exporters' domestic legislatures. The offer to bind self-sufficiency would have applied for only 3 years and then only on the condition of global surplus (20).

The Kennedy Round negotiations on agriculture stalemated, and GATT rules for agriculture were not changed. Negotiators agreed on the essentials of a world grains arrangement, but the document detailing the International Grains Agreement was not completed until after the Kennedy Round concluded. The grains arrangement lasted only a year. The Food Aid Convention to provide grain to developing countries was more successful and was renewed and expanded in 1971 and 1980.

Even as the Kennedy Round ended, GATT members established the foundation for a new trade round. Events of the early 1970's within and outside agriculture raised concerns that the world was retrenching into an era of restriction and contraction of the international economic system. The Tokyo Round (1973-79) offered a means to affirm the importance of multilateral cooperation in stabilizing the world economy. The negotiations on agriculture were identified as a separate agenda item which was a significant departure from previous rounds.

Once again, differences between the United States and the EC dominated the agricultural negotiations. The United States again pushed for more market-oriented policies, and the EC resisted any multilateral constraints on

the principles and mechanisms of the CAP. The EC pushed for international commodity agreements that would include maximum and minimum prices and storage arrangements to regulate market supplies. After protracted discussions, GATT members negotiated commodity arrangements emphasizing information exchange and consultation over bovine meat and dairy products. The International Dairy Arrangement also had minimum import price provisions. The only improvements in access for agricultural products resulted from traditional "request and offer" negotiations on tariff reductions and import quota enlargements.

The Tokyo Round did produce agreement on a subsidies code and on several new procedures for settling disputes. The Subsidies and Countervailing Duties Code addressed agriculture by attempting to define the conditions under which export subsidies could be used for primary products. The code now gives countries a right to take complaints about domestic subsidies of other countries to the GATT. However, the code also contains a list of acceptable reasons for using domestic subsidies. The code also attempted to add more precision to the concept of a "more than equitable share" of world markets by defining equitable share as the average share in three recent, representative years.

The subsidies code has not appreciably limited the use of trade-distorting agricultural subsidies in practice and the new definitions have not reduced problems in resolving agricultural disputes. Many observers have concluded that unless the GATT rules are more completely and precisely applied to agriculture, the GATT cannot be expected to adjudicate world agricultural trade (10, 13, 20). A GATT dispute settlement procedure that remains mostly irrelevant to agriculture will undermine the strength of the GATT as a regulator of world trade.

Domestic Farm Programs and Agricultural Trade Policy

Governments design farm programs to meet national policy objectives such as providing a "fair" price to producers, stabilizing prices, protecting rural incomes, or ensuring food security. In pursuing these objectives, most countries use a mixture of policies to manipulate the prices or production costs, or both, that their farmers face. The protection or support (and the nature of that support) that governments provide to their agricultural sectors is the cause of agricultural trade problems.

Many countries support agricultural product prices above world trading prices, stimulating production and generally discouraging domestic consumption.

Import barriers become necessary to keep out lower priced products. Other countries use deficiency payments or other income schemes linked to production to support producers. Such income supports allow domestic consumers to pay world prices for agricultural products but stimulate agricultural output. Subsidies are often required to export excess production. Export subsidies and other surplus disposal programs lower world prices, thereby affecting producer incomes in other countries.

Many (but not all) developing countries, on the other hand, control access to markets and employ policies that depress farm prices below world prices, providing low food prices to urban consumers but discouraging agricultural output. Some developing countries use a combination of import protection and domestic or export taxes on primary products (such as soybeans) to encourage or finance exports of processed products (such as soybean meal).

Most governments also assist farmers in reducing production costs through transportation subsidies, credit programs, subsidies for fertilizer or other inputs, and marketing subsidies. Governments also generally promote rural well-being through infrastructure development and support research to develop new agricultural technologies. Input and marketing subsidies and, over time, infrastructure programs lower production costs and, hence, lower the prices that domestic farmers can charge in the international market.

The complete package of agricultural support—import access barriers, export subsidies, and trade-distorting domestic farm subsidies—must be considered in trade negotiations. Domestic policies are an integral part of the "trade" problem either directly through their effects on production or because of the border measures used to support domestic program tools. Discipline on trade policies will require discipline on internal policy instruments. For example, reductions in nontariff import barriers would increase product supplies in domestic markets. Governments would be faced with two options: reduce production and increase consumption by lowering price and income supports or purchase the increased supplies to maintain high internal prices. Internal budget constraints and new GATT disciplines on the use of export subsidies would probably limit government purchases. Over time, agricultural policy reform would require changes in government programs that stimulate production.

Negotiators must deal with two interrelated aspects of national agricultural programs to achieve meaningful agricultural reform in the GATT: the high levels of support or protection many governments provide to their farm sectors and the nature of the support packages. That is, countries generally employ internal policy tools that, in turn, require border measures (import access barriers or export subsidies, or both) to operate effectively.

The Punta del Este Declaration gives agricultural negotiators the task of developing GATT rules and disciplines to curb the adverse effects of domestic and border policies on agricultural markets. This task will require countries to reduce support to farmers currently provided by trade-distorting policies. Governments will be unwilling to accept new GATT rules without a plan for reducing trade-distorting intervention in agricultural markets. Agreement on the way to reduce such protection is important because each country will want to ensure that the discipline it accepts is part of equivalent reforms in other countries. Agricultural negotiators must identify which national policies will be subject to increased discipline and develop guidelines for imposing discipline on those policies. Negotiators will also face issues such as the role of supply controls, the way to meet food security objectives without distorting markets, and the design of farm programs that do not distort production.

The Uruguay Round

The Uruguay Round was launched in September 1986 and is scheduled to conclude by the end of 1990. An innovative feature of the Uruguay Round is that ministers agreed to meet in December 1988 to review the progress made during the first half of the negotiations. Nine negotiating proposals for agriculture were submitted before that meeting.

The United States was the first to submit its proposal on agriculture in July 1987. Eight other proposals followed (table 1). All the proposals essentially seek to harmonize sanitary and phytosanitary regulations worldwide and to eliminate the use of such regulations as disguised trade barriers. All proposals recognize the need to achieve agricultural trade reform, but some important differences in the means suggested to achieve the Punta del Este objectives exist. Many proposals raise the possibility of a more comprehensive approach to the negotiations, rather than the more traditional "request and offer" (or product-by-product) procedure used in previous negotiations on agriculture. Finally, all proposals call for binding commitments in the GATT and modifying or strengthening GATT rules to reflect the framework developed for agriculture. On other issues, the proposals differ fundamentally.

The proposals contain very different ideas concerning objectives and timetables for agricultural policy reform. The United States, the Cairns group, and Canada (a Cairns group member) call for eliminating all trade-distorting policies by all countries and for all commodities. The U.S. proposal would allow direct income or other payments not linked to production and bona fide food aid programs. The Cairns group adds noncommodity-specific infrastructure programs, trade-neutral consumer programs, and structural adjustment programs to the list of policies permitted in the U.S. proposal. The

Table 1—Proposals for agriculture submitted to the Uruguay Round of GATT negotiations

Item	United States	European Community[1]
Scope and objectives	Eliminate over 10 years all trade-distorting policies affecting all commodities in all countries.	Reduce supply imbalance effects of major countries' policies for major commodities. Achieve balance through sharing schemes.
Negotiating process	Agree on a measure of support and a schedule to reduce support. Then negotiate national plans to implement agreed-to reductions in support levels, including access barriers.	Agree to short-term disciplines on cereals, nongrain feeds, dairy, sugar, and beef and reductions in support for major commodities. Then, continue to reduce support coupled with a rebalancing of external protection. Bind aggregate measure and retain request-and-offer approach.
Subsidies	Eliminate over 10 years. Only income support and food aid unrelated to production allowed.	Reduce internal levels of support over long term, and improve rules specifying types and circumstances for the use of subsidies.
Market access	Eliminate all import barriers to trade over 10 years.	Readjust measures used to achieve market stability goals. Would involve reducing some barriers and raising others. Common Agricultural Policy's two-price system nonnegotiable.
GATT rules	Develop interim rules for transition period and new, stronger rules for long term to reflect elimination of subsidies and access barriers.	Improve and supplement existing rules to fit new conditions, accomodate state trading and allow for tight surveillance.
Special and differential treatment for developing countries	Not specified.	Allowed according to each individual country's need.

See footnotes at end of table.

Continued—

Table 1—Proposals for agriculture submitted to the Uruguay Round of GATT negotiations—Continued

Item	Cairns group[2]	Canada
Scope and objectives	Eliminate trade-distorting policies for all commodities in all countries in 10 years or less.	Basically supports Cairns group. Major reduction in subsidies and access barriers in 5 years.
Negotiating process	Freeze trade-distorting policies, then reduce subsidy levels as a "downpayment." Agree to interim reforms to move countries over time to separately negotiated long-term framework.	Agree on comprehensive approach using index of trade distortion. Submit country plans and implement reform.
Subsidies	Freeze production and export subsidies, and phase out within 10 years. Income support, infrastructure, and non-distorting consumer transfers not related to production allowed.	Reduce trade-distorting subsidies in 5 years and eliminate in a period to be negotiated. Policy coverage determined by index of trade distortion.
Market access	Freeze current levels of access and increase over time. Ban new forms, exceptions, and barriers not covered by GATT rules in long term.	Bring all measures under GATT rules and discipline.
GATT rules	Develop transitional rules to be replaced by long-term rules prohibiting measures not now covered under GATT and current exceptions.	Bring all measures under GATT rules and discipline.
Special and differential treatment for developing countries	Applies to domestic social development and economic policies by allowing longer time-frames for adjustment.	Consider at the appropriate times as provided for in the Punta del Este declaration.

See footnotes at end of table.

Continued—

Table 1—Proposals for agriculture submitted to the Uruguay Round of GATT negotiations—Continued

Item	Nordic countries [3]	Japan
Scope and objectives	Reduce trade-distorting policies for all commodities in all countries. Maintain import barriers under stricter rules.	Reduce trade distortions on particular commodities in certain countries, recognizing food security and social needs.
Negotiating process	Negotiate immediate measures to correct market imbalances. Target long-term reductions in subsidy levels using index of trade distortion. Bind specific commitments for each product.	Traditional request-and-offer approach on tariffs, freeze and agree on phase-out of export subsidies. Write tighter rules for use of other subsidies and import restrictions.
Subsidies	Immediately reduce subsidized exports. Long-term binding of reduced or eliminated direct and indirect subsidies.	Freeze and phase out export subsidies. Agree on rules to minimize trade-distorting effects of other subsidies, including those for infrastructure and self-sufficiency.
Market access	Reduce tariffs and import levies and bring under improved rules. Clarify conditions for imposing quantitative restrictions.	Reduce tariffs and bring exceptions and measures not now covered under new rules to ensure transparency and minimum access commitments.
GATT rules	Clarify present market-access rules, including conditions for use of variable levies. Develop rules to bind and reduce effects of trade subsidies.	Strengthen present rules, review some of the market-access exceptions. Prohibit export subsidies.
Special and differential treatment for developing countries	Not specified.	Appropriate consideration should be given to developing countries' needs when implementing agreements.

See footnotes at end of table.

Continued–

Table 1—Proposals for agriculture submitted to the Uruguay Round of GATT negotiations—Continued

Item	Developing countries *	Republic of Korea
Scope and objectives	Cover all trade measures for all countries and all commodities, allowing for special and differential provisions.	Bring trade policies under strengthened rules allowing for the "specific nature" of agriculture. Improve access but maintain minimum self-sufficiency for basic foodstuffs.
Negotiating process	Identify short-term measures needed, rules requiring action, measures to improve dairy and bovine agreement and means to monitor benefits to developing countries. Then, negotiate rules.	Short-term actions on export subsidies. Write tighter rules for import restrictions and embargoes.
Subsidies	Strengthen rules taking into account special interests of developing countries. Compensate developing countries for price rises due to reduced subsidies by developing countries.	Phase out export and trade-distorting production subsidies.
Market access	Reduce developed countries' tariffs to zero or low levels and expand generalized system. Remove voluntary restraint agreements for developing countries on priority basis. All other trade-restricting measures to be eliminated or subject to strengthened rules.	Improve rules on import restrictions taking into account the "specific nature" of agriculture. Maintain minimum self-sufficiency on basic foodstuffs.
GATT rules	No separate agreements for agricultural trade. Improve dispute settlement, especially for perishable products, bovine meat, and dairy products.	Bring all measures affecting import access and export competition under strengthened rules, recognizing the "specific nature" of agriculture.
Special and differential treatment for developing countries	Strengthen and expand.	Allow longer time, more flexibility, and production subsidies for basic foods during transition period. Improve access for developing countries' products on priority basis.

See footnotes at end of table.

Continued—

Table 1—Proposals for agriculture submitted to the Uruguay Round of GATT negotiations—Continued

Item	India
Scope and objectives	Ensure scaling down, eliminating distortions and restrictions originating in industrial countries within a specified time frame.
Negotiating process	Not specified.
Subsidies	Eliminate all subsidies of industrial countries affecting trade. Base negotiations on the presumption that subsidies in developing countries do not affect trade. Developing countries should be willing to examine obligations on export subsidies, consistent with their development and competitive needs.
Market access	For industrial countries, prohibit use of nontariff measures not specifically provided for in GATT, bind all agricultural tariffs at low levels, and eliminate all provisions for exceptional treatment of agriculture. For developing countries, tariff reductions remain voluntary, maintain all exceptions on access allowed in current GATT articles, and add provisions to allow for quantitative restrictions to ensure adequate supplies of basic wage goods.
GATT rules	Develop rules consistent with other elements of the proposal.
Special and differential treatment for developing countries.	Basically exempt developing countries from revised GATT rules. Maintain all current provisions and expand market access conditions for developing countries.

[1] Belgium, Denmark, France, Federal Republic of Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Spain, Portugal, and the United Kingdom.
[2] Argentina, Australia, Brazil, Canada, Chile, Colombia, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand, and Uruguay.
[3] Finland, Iceland, Norway, and Sweden.
[4] Egypt, Jamaica, Mexico, and Peru; supported by Morocco and Nigeria.

United States and the Cairns group initially proposed eliminating trade-distorting subsidies and access barriers within 10 years, and Canada wanted significant reductions in 5 years. Proposals by the United States and the Cairns group for the Mid-term Review indicate more flexibility on the timetable for eliminating trade-distorting subsidies and market access barriers (1, 18). Other negotiating proposals do not include a specific timetable for policy reform.

The Nordic countries propose reducing or eliminating direct and indirect agricultural subsidies (including export subsidies), measures to improve market access, and more explicit GATT rules concerning the use of import barriers, particularly variable levies.

The EC proposal would gradually reduce incentives that lead to overproduction for major commodities and readjust external protection (which would presumably include increased import protection on soybeans and other feed ingredients if support for grains is lowered). The EC wants to achieve "market balance" through managed reductions in supplies and market-sharing arrangements. For the negotiations on reducing support levels, the EC emphasizes improving the applicability of enforceable GATT rules, implying a stricter definition of the conditions under which export subsidies and access restrictions can legitimately be applied. As in previous GATT rounds, the EC wants to maintain its dual pricing system and related trade policies, including the variable levy and export refunds, as currently operate under the Common Agricultural Policy (CAP).

Proposals from Japan, Korea, a group of developing countries, and India support reduced export and other subsidies and strengthened GATT rules regarding import barriers. Those proposals view agricultural trade reform as primarily an issue for developed country exporters. Japan and Korea cite food security concerns and the "special" character of agriculture to justify continued use of import barriers on basic foodstuffs. The group of developing countries wants strengthened rules for trade-distorting subsidies with special and differential treatment for developing countries. These developing countries also call for reducing or eliminating barriers to imports of developing countries. India, citing the special character of agriculture in developing countries, calls for trade reform in industrial countries but limited actions by developing countries.

Agricultural negotiators also must agree on a method to translate such policy commitments into enforceable obligations under the GATT (that is, to "bind" commitments, such as occurs with tariff schedules). In previous GATT rounds, concessions on agricultural products were negotiated using a "request-and-offer" or product-by-product, concession-by-concession approach. Japan, Korea, and the EC, to an extent, want to continue the request-and-offer method as a basis for the Uruguay Round negotiations. Thus, each trade-distorting policy for each commodity in each country would have to be negotiated separately. Many countries, however, suggest a more comprehensive or aggregate approach.

The EC wants to bind reductions in a quantitative index or aggregate measure of support provided by governments to agricultural producers of major commodities. (Other commodities presumably would be negotiated using the

request-and-offer procedure.) The measure proposed by the EC includes adjustments for world price variability and current fluctuations. For example, a measure could be calculated as the difference between the domestic price received by agricultural producers in a year and the lowest external reference price observed over 1979-87. By fixing the external reference price at its lowest level, the aggregate measure of support is highest at the base year chosen to begin the calculations.

The EC method effectively binds internal producer prices but does not directly bind variable levies or export refunds. Indirect subsidies, such as for inputs, could be included in the EC approach. Binding this aggregate measure of support would allow countries maximum flexibility in deciding the type of adjustments required to meet the Uruguay Round commitments, but trading partners would not necessarily gain increased import access or reduced export subsidies.

The United States and the Cairns group want to bind national plans or schedules containing specific commitments on individual policies for all commodities. The U.S. proposal for country plans calls for countries to first convert all nontariff measures to tariffs and then agree on a schedule to eliminate these bound tariff rates and all direct and indirect trade-distorting subsidies (18). The Cairns group proposal does not explicitly require the conversion of import barriers to tariffs. Both proposals mention an aggregate measure of support but not as the basis for binding commitments. Rather, a form of aggregate measure of support could be used as a yardstick or as a unit of account to set targets for reductions or to help monitor progress in reducing all trade-distorting policies.

All negotiating proposals except the one initially submitted by the United States include short-term actions as part of agricultural policy reform. Those proposals consider short-term measures undertaken during the final years of the negotiations as a form of "downpayment" on longer term reform. Many proposals include some form of a freeze on at least some of the policies that distort agricultural trade. The Cairns group wanted an immediate freeze to be followed by a commitment to reduce output-based support to highly subsidized commodities by 10 percent in both 1989 and 1990. Commitments included disciplines on stock disposal and supply controls and specific measures to increase market access and to reduce administered prices and export subsidies (1).

The United States opposed giving emphasis to short-term measures, particularly in the EC proposal, and argued that the Uruguay Round should focus on the long-term commitment to agricultural trade reform. In November 1988, the United States proposed a freeze on support, subsidies, and protection in 1989 and 1990 if the December 1988 Mid-term Review yielded

long-term commitments to reform agriculture based on free-trade principles (18).

Trade ministers were unable to agree on the long-term objective, timetable, and plan for implementing agricultural reform at the Mid-term Review held in Montreal, Canada. As in previous GATT rounds, the differences between the United States and the EC dominated the Montreal discussions. The United States refused to back away from its objective of a liberalized agricultural trading system, including seeking a commitment to eliminate all trade-distorting support. The EC would not agree to eliminate trade-distorting subsidies or to long-term reform of the mechanisms of the CAP. This stalemate in agriculture and problems in 3 other negotiating areas (trade-related intellectual property, textiles, and safeguards) resulted in Ministers agreeing to put all results achieved in the other 11 negotiating areas on hold until April 1989 (8).

At the meeting held April 5-7, 1989, in Geneva, Switzerland, senior negotiating officials completed the portions of the Mid-term Review process left unfinished at the conclusion of the Ministerial discussions. Negotiators resolved outstanding differences in the 4 areas and agreed to approve the 11 other framework agreements.

The agreement for agriculture established a framework providing the general direction and procedures to be followed in the final phases of the Uruguay Round negotiations. The framework for agriculture included short- and long-term reform elements and arrangements on sanitary and phytosanitary regulations (9).

Short-term measures include commitments to ensure that domestic and export support and protection levels in the agricultural sector are not exceeded and intentions to reduce support and protection levels for 1990. Specific commitments apply to import access barriers and support prices to producers. The short-term elements are in effect from April 1989 until the formal completion of the negotiations in December 1990 and operate within the scope of existing national legislation and existing GATT rights and obligations.

The long-term objective of the agricultural negotiations will be to provide for substantial and progressive reductions in agricultural support and protection sustained over an agreed period of time, resulting in correcting and preventing restrictions and distortions in world agricultural markets.

Reductions in support and protection are to be achieved either by negotiations on specific policies and measures, through commitments on an aggregate measure of support, or by a combination of the two approaches. Credit will be

given for measures taken since the opening of the Uruguay Round that have contributed positively to the reform process.

Negotiations on long-term reform will encompass all measures directly or indirectly affecting import access and export competition, including quantitative and other nontariff restrictions, tariffs including bindings, internal support measures which directly or indirectly affect trade, direct budgetary assistance to exports, other payments on products exported, other forms of export assistance, and export prohibitions and restrictions. Negotiations on import access will encompass restrictions maintained under waivers, protocols of accession or other exceptions, measures not explicitly provided for in the General Agreement (for example, variable levies), and the matter of converting import access restrictions into tariffs.

The agreement also states that special and differential treatment to developing countries is an integral element of the negotiations and that concerns regarding noneconomic factors, such as food security, will be taken into account in negotiating long-term reform of agricultural trade.

Participants are to advance detailed proposals for achieving long-term reform by December 1989. The proposals may include the terms and use of an aggregate measure of support, strengthened GATT rules and disciplines, special and differential treatment for developing countries, sanitary and phytosanitary regulations, tariffication, decoupled income supports, other ways to adapt support and protection, and ways to address possible negative effects of the reform process on net-food importing developing countries.

Not later than the end of 1990, GATT members will agree on the long-term reform program and the timetable for its implementation. Implementation of the first phase of agreed commitments on the long-term reform program will take place in 1991.

Agricultural negotiators are facing major decisions as the Uruguay Round enters its the final phase. The timetable and exact plan for implementing the long-term objectives established in the framework agreement must be negotiated. Resolving these issues will determine the new GATT rules and the future trading environment for agriculture.

Conclusion

The Punta del Este declaration states that objectives for agriculture in the Uruguay Round include bringing all import barriers and measures affecting export competition under more operationally effective GATT rules and disciplines. For the first time, agricultural negotiations appear to recognize

that discipline on trade policies will require discipline on domestic farm policies. Domestic policies are an integral part of the trade problem because of their effects on production or because of the trade measures used to support domestic programs.

The Uruguay Round represents an historic attempt to change the treatment of agriculture within the GATT. Agricultural negotiators face a difficult task because countries have fundamentally different perspectives concerning the way farm programs could operate to achieve greater trade liberalization. The task of the negotiators is to find the will and the way to resolve these differences.

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Current Policies and Programs

Chapter 7

Income and Price Support Programs

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Income and price support programs have changed considerably since the 1973 introduction of the concept of target prices. Most of the changes have arisen from perceived shortcomings in the methods for establishing and adjusting income and price supports. These changes often have followed reversals in agricultural economic conditions. Examining changes in the programs over time, including recent amendments to the Food Security Act of 1985, suggests that several issues remain to be resolved. Debate on replacing or modifying the 1985 Act may focus on provisions that most directly affect program costs, namely support levels and program acreage base inflexibilities.

Evolution of Income and Price Support Programs

By 1973, demand for American farm products was high because of generally favorable worldwide economic growth, crop shortages, changes in import policies of other countries, and devaluation of the dollar. Stocks that had been at surplus levels for two decades were greatly reduced. Thus, Congress debated the Agriculture and Consumer Protection Act of 1973 in an economic setting that differed from those preceding previous farm legislation debates. The economic situation had changed from one of chronic surpluses and low income requiring a high Government presence to one where many thought the Government could finally minimize its role in providing price and income support. Since passage of the 1973 Act, Congress has substantially modified the income and price support programs for grains and cotton. An analysis of those changes and why they were made helps to identify program issues and probable future changes.[1]

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[1]Additional information on legislation pertaining to agriculture may be found in (1, 2, 3, 4, 5, and 12). For details about specific commodities, consult (9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, and 21). Underscored numbers in parentheses identify literature cited in the References at the end of the chapter.

Agriculture and Consumer Protection Act of 1973

The major feature of the 1973 Act was the target price program. Under the target price concept, direct payments to support income would only be made if market prices fell below specified target price levels. The deficiency payment rate would vary by the actual difference between the average farm price and the target price during a specified period of the marketing year. The payment rate could not exceed the difference between the target price and the price support loan rate for the commodity. Farmers would receive no payment if the average farm price exceeded the target price.

The 1973 Act specified target prices for the 1974 and 1975 crops of corn, wheat, and Upland cotton. Target prices for sorghum and barley were to be set at the discretion of the Secretary of Agriculture and were to be based on the target price for corn. Target prices are currently established for corn, sorghum, oats, barley, wheat, rice, Upland cotton, and extra long staple (ELS) cotton (table 1).

Since the inception of the target price program, policymakers have struggled with three problems: establishing target price levels, specifying a formula or method to adjust target prices over time, and determining the amount of production which is to be eligible for target price protection.

Target price levels for 1974 and 1975 were set in relation to costs of production for corn, wheat, and Upland cotton. Adjustments in 1976 and 1977 were based on approximate changes in costs of production as reflected by changes in yields for the specific crop and movements in an aggregate index of production input costs. Target prices covered normal production from national base acreage allotments, which were based on historical plantings. Feed grain and wheat producers could collect deficiency payments on their allotment acres regardless of whether any or all of the allotment acres were planted. Cotton growers were required to plant at least 90 percent of their allotment acres to collect the full deficiency payment. Although the 1973 Act authorized acreage set-asides to limit production of program crops, set-asides were not required during 1974-77. Target price coverage was limited to a total of $20,000 per person on deficiency payments from the wheat, feed grain, and cotton programs combined.

Another new concept in the 1973 Act was disaster payments. Participating producers in the wheat, feed grain, and cotton programs who were prevented from planting any portion of allotments or who suffered yield losses from natural disaster received a payment based on a percentage of the target price. The disaster payment program recognized that crop farmers' revenues depend

on both market prices and crop yields. The disaster payment program was slated to be replaced by Federal crop insurance in the late 1980's, but the concept was renewed for at least 1 year in response to 1988's extreme drought.

The target price concept introduced in the 1973 Act remains the cornerstone of U.S. income support programs some 16 years and three farm laws later. The 1973 Act redefined direct payment programs in two profound ways. First, the amount of direct payments varied inversely with market prices so the Government assumed the risks of making deficiency payments at an unknown rate, but up to a known maximum. Earlier direct payment programs had payment rates fixed in advance. Second, the basis of income support shifted from the parity price concept toward a cost of production concept with rules

Table 1—Target prices for selected crops

Legislation/ crop year	Wheat	Corn	Upland cotton	Rice
	——Dollars per bushel——		Cents per pound	Dollars per hundredweight
1973 Act:				
1974	2.05	1.38	38.00	[1]
1975	2.05	1.38	38.00	[1]
1976	2.29	1.57	43.20	8.25
1977	2.90	2.00	47.80	8.25
1977 Act:				
1978	3.40	2.10	52.00	8.53
1979	3.40	2.20	57.70	9.05
1980	3.63	2.35	58.40	9.49
1981	3.81	2.40	70.87	10.68
1981 Act:				
1982	4.05	2.70	71.00	10.85
1983	4.30	2.86	76.00	11.40
1984	4.38	3.03	81.00	11.90
1985	4.38	3.03	81.00	11.90
1985 Act:				
1986	4.38	3.03	81.00	11.90
1987	4.38	3.03	79.40	11.66
1988[2]	4.23	2.93	75.90	11.15
1989[2]	4.10	2.84	73.40	10.80
1990[3]	4.00	2.75	72.90	10.71

[1] The Rice Production Act of 1975 established target prices for rice.
[2] Budget Reconciliation Act of 1987 reduced 1988 and 1989 target prices by 1.4 percent from levels in the 1985 Act.
[3] Minimums under 1985 Act.

being established to adjust annual target prices in relation to changes in average production costs.

Because of favorable market conditions, the 1973 Act made only minor changes to previous price support programs. The Commodity Credit Corporation (CCC) supports prices by acquiring stocks from the market at specified prices, either through direct purchases or through nonrecourse loan programs. In either case, the loan rate or purchase price establishes a minimum guaranteed price to eligible producers. The CCC also stabilizes market prices by selling Government-owned stocks at certain specified price levels above CCC acquisition prices.

Price support programs are available to producers for corn, sorghum, oats, barley, wheat, rice, Upland cotton, ELS cotton, rye, soybeans, sugar, tobacco, peanuts, honey, and dairy products (table 2). The precise methods used for establishing the support prices for these commodities varied under the 1973 Act. Wheat and feed grain support prices could be set at any level by the Secretary of Agriculture within certain bounds prescribed by the legislation. Dairy support prices were also discretionary, but the minimum and maximum levels allowable under law were tied directly to the parity concept. Cotton support prices were based entirely on a formula involving a moving average of past market prices.

This diversity of methods used to establish support prices for the different commodities illustrates the difficulty policymakers have had in finding an appropriate means of supporting commodity prices. The problem is to find a method of stabilizing commodity prices, while limiting budgetary costs through the income support programs, avoiding unacceptable levels of Government stock accumulation, and avoiding loss of export markets by artificially raising domestic prices above world levels.

Food and Agriculture Act of 1977

Farm income had begun to fall when Congress considered legislation to modify or extend the 1973 Act. Although stocks remained below the levels of the 1960's, commodity prices had not kept pace with production costs, resulting in a cost-price squeeze. Farm income fell in 1975 and 1976 without triggering any large-scale income support. Congress's response to these conditions as embodied in the Food and Agriculture Act of 1977 was to set target prices on the basis of commodity-specific costs of production, extend target price coverage to current plantings of a commodity, and raise the per person limit on deficiency payments. The 1977 Act covered crops produced during 1978-81.

Under the 1977 Act, estimates of national average costs of production, including a return to land, for individual commodities were used in establishing target price levels. Annual adjustments in target prices were based on changes in variable costs, machinery ownership costs, and general farm overhead costs per unit. Costs of land ownership were excluded from the adjustment formula because of the potential for building into target price levels a land value-cost of production spiral.

Table 2—Support prices for selected crops, 1974-88

Crop year	Wheat		Corn		Upland cotton		Rice	
	Basic loan rate	Findley[1] loan rate	Basic loan rate	Findley[1] loan rate	Basic loan rate	Loan repayment rate	Basic loan rate	World market price
	Dollars per bushel				Cents per pound		Dollars per hundredweight	
1973 Act:								
1974	1.37	NA	1.10	NA	27.06	NA	7.54	NA
1975	1.37	NA	1.10	NA	36.12	NA	8.52	NA
1976	2.25	NA	1.50	NA	38.92	NA	6.19	NA
1977	2.25	NA	2.00	NA	44.63	NA	6.19	NA
1977 Act:								
1978	2.35	NA	2.00	NA	48.00	NA	6.40	NA
1979	2.50	NA	2.10	NA	50.23	NA	6.79	NA
1980	3.00	NA	2.25	NA	48.00	NA	7.12	NA
1981	3.20	NA	2.40	NA	52.46	NA	8.01	NA
1981 Act:								
1982	3.55	NA	2.55	NA	57.08	NA	8.14	NA
1983	3.65	NA	2.65	NA	55.00	NA	8.14	NA
1984	3.30	NA	2.55	NA	55.00	NA	8.00	NA
1985	3.30	NA	2.55	NA	57.30	NA	8.00	NA
1985 Act:								
1985	NA	NA	NA	NA	NA	NA	8.00	3.16
1986	3.00	2.40	2.40	1.92	55.00	44.00	7.20	3.82
1987	2.85	2.28	2.28	1.82	52.25	NA	6.84	5.77
1988	2.76	2.21	2.21	1.77	51.80	NA	6.63	6.30

NA = Not applicable.
[1] See the Glossary, p. 383, for a discussion of the Findley loan rate.
Source: (7, 8).

Target prices rose for all commodities under the 1977 Act. By 1981/82, the target price was about 30 percent greater than in 1977/78 for wheat, 20 percent for corn, 50 percent for cotton, and 30 percent for rice.

A significant and far-reaching change in the 1977 Act was to extend target price coverage to current plantings of a crop. Under the 1973 Act, grain producers received deficiency payments based on their acreage allotments, regardless of how many acres of wheat or feed grains they actually planted. In many cases, allotments based on past planting patterns were out of line with current planting patterns. The 1977 Act attempted to correct this distortion, but in doing so made the target price more important in producer planting decisions.

Set-aside acreage programs were not crop-specific. Thus, basing deficiency payments on current plantings increased the potential for excess production of target price commodities and larger program costs. To contain program costs when a set-aside was not in effect, the act provided an "allocation factor" that would be applied to the deficiency payment rate whenever harvested acres of a program crop were too large in relation to estimated needs (the minimum factor for grains was 0.8). The allocation factor did not affect producer planting decisions because no single farmer could influence the value of the factor and the factor was not known at planting time.

The 1977 Act made important changes to price support policies as a result of economic conditions. During the 1973 Act, agricultural prices had been volatile because of changes in the export markets for U.S. grains. As a result, the 1977 Act established the farmer-owned reserve (FOR). This program encouraged farmers to place grain in the reserve for an extended period of time (3-5 years) by offering price support loans and storage subsidy payments to participating farmers. By encouraging farmers to hold more buffer stocks, policymakers hoped to reduce future price variability.

Despite the FOR, the 1977 Act did little to change the methods used to establish price supports. The FOR loan rates were identical to the loan rates offered under the regular CCC nonrecourse loan program. However, the FOR did affect the prices at which grain in Government storage programs could enter the market. The FOR program included provisions for a release price. Once grain prices exceeded the release price, FOR storage subsidy payments were discontinued, encouraging farmers to remove their grain from the FOR and sell it on the market. The release price for wheat was 140-150 percent of the loan rate over the course of the 1977 Act, and the release price for corn was 125 percent of the loan rate for the same period. The CCC resale price could be set at no less than 150 percent of the loan rate when the FOR was in effect. Before the 1977 Act, the minimum CCC resale price for grains was 115 percent of the loan rate. Thus, although the FOR program encouraged

additional buffer stocks, these stocks could only enter the market at relatively high prices.

The Agriculture and Food Act of 1981

Farm income was also falling when Congress debated the Agriculture and Food Act of 1981. The debate focused on price and income supports and methods for annually adjusting their levels. The target price adjustment formula specified by the 1977 Act had been applied during a period of rapid inflation, and adjustments lagged actual cost conditions. The Agricultural Adjustment Act of 1980 discarded the adjustment formula, fixed 1980 target prices for wheat and corn, and required 1981 target prices to be no less than 1980 levels.

Congress abandoned the cost-of-production formula for adjusting target prices with the 1981 Act. Instead, the act set minimum target prices for the 1982-85 crops. These minimum levels increased about 6 percent annually, reflecting anticipated inflation rates. The Secretary had discretion to set target prices above the legislated minimums if warranted by changes in per acre production costs, but there was no explicit formula as in the 1977 Act. After the passage of the 1981 Act, decreased annual inflation rates and increased deficiency payments brought about efforts to reduce target prices below levels set by the 1981 Act. The Agricultural Programs Adjustment Act of 1984 set the wheat target price at $4.38 for 1984 and 1985 and maintained target prices for the other crops at their 1984 levels through 1985.

The 1977 Act replaced historical acreage allotments that traced back to the 1950's and 1960's by adopting current plantings as a payment base. The 1981 Act reestablished acreage bases for individual crops, reflecting recent plantings of those crops. The acreage base for a particular crop was used to operate acreage reduction programs and to determine the amount of production eligible for deficiency payments. These crop-specific acreage bases were expected to result in more effective acreage reduction programs and permit USDA to be more selective in limiting production of program crops. In the mid-1980's when participation rates in acreage reduction programs reached the 85- to 90-percent level, the acreage base concept would lock in production patterns in much the same way as the earlier acreage allotments had.

Because CCC's net purchases of dairy products during the 1980-81 marketing year had reached record levels, the 1981 Act made important changes to the methods used to determine dairy support prices. For the first time, dairy support prices were no longer tied automatically to parity, and adjustments to the support prices over time were directly linked to changes in market conditions.

The 1981 Act made few significant changes to methods used for determining price supports for the major crops. However, in the wake of the 1980 embargo of grain sales to the Soviet Union, there were political pressures to make these programs more attractive. The 1981 Act raised the minimum allowable loan rates for crops, and provided the Secretary with the authority to establish FOR loan rates above regular CCC loan rate levels by offering reserve premiums. FOR release prices became totally discretionary. The Secretary subsequently used that authority to offer reserve premiums and to maintain FOR release prices at high levels. These decisions were to have serious consequences later during the course of the 1981 Act when the economic environment changed.

Because of a worldwide recession and a strong dollar, U.S. exports declined in 1982. Thus, FOR and CCC crop inventories increased dramatically through the price support operations. With FOR release prices exceeding target prices, and only a narrow opportunity for reducing loan rates within the limits of the law, the outlook for disposing of these stocks in the near future was not favorable. The Secretary consequently announced a payment-in-kind (PIK) program in 1983 as a short-term measure to reduce inventories. This program removed more acreage from production than any previous supply control program. As a further measure to reduce stocks, reserve premiums were not authorized for the 1983 marketing year, and the Secretary has not offered reserve premiums since.

CCC inventories of manufactured dairy products also continued to grow to unacceptable levels during the course of the 1981 Act. In response to this situation, Congress enacted legislation in 1982 and 1983 that reduced dairy price supports and authorized further reductions if CCC net purchases exceeded certain trigger levels. The 1983 Act also authorized a short-term voluntary diversion program for dairy producers to reduce CCC stocks.

The Food Security Act of 1985

The farm debate of 1985 took place under economic conditions of serious financial stress for many farmers. During 1982-85, U.S. agriculture's significant loss of export markets had accompanied growing surplus stocks and escalating Government costs. Generally favorable weather conditions, record crop yields, and a strong dollar exacerbated the problems facing U.S. agriculture. The rigid structure of the 1981 price support programs prevented these programs from adequately adjusting to these new market conditions. Consequently, special short-term programs were necessary to reduce domestic production and surplus stocks.

The Food Security Act of 1985 established farm policy for 5 crop years, 1986-90. The 1985 Act aimed to make U.S. agriculture more competitive in

foreign markets by reducing price support loan rates for grains, oilseeds, and cotton. However, farm income support was maintained by freezing target prices at 1985 levels for 1986-87 and allowing for slowly declining target prices thereafter.

How To Calculate Deficiency Payments Under the Food Security Act of 1985

The following example illustrates the deficiency payment calculation for 100 acres of corn base. Target prices and loan rates for the 1986/87 crop are used, but the assumed farm prices do not represent 1986/87 conditions. In 1986/87, the actual national average farm price of corn for the first 5 months (September-January) of the marketing year was less than the basic loan rate, and the season average price was less than the reduced (announced) loan rate. Therefore, eligible corn growers received the maximum deficiency payment of $1.11 per bushel ($3.03 minus $1.92).

Item	Computation	Quantity or value
A. Base acres	Given	100 acres
B. Acreage reduction	Given, 20 percent	0.20
C. Permitted acres	Ax(1-B)	80 acres
D. Payment yield	Given	100 bushels
E. Program production	CxD	8,000 bushels
F. Target price	Given	$3.03
G. Basic loan rate	Given	$2.40
H. Reduced loan rate	Given	$1.92
National average farm price:		
I. September-January average	Given	$1.90
J. Season average	Given	$2.05
Deficiency payments:		
K. Arising from F-G[1]	Ex(F-G)	$5,040
L. Arising from G-H[2]	Ex(G-J)	$2,800
M. Total payment	K+L	$7,840

[1]The payment rate is the difference between the target price and the higher of the national average farm price during September-January or the basic loan rate. In this example, the payment rate is $3.03-$2.40, or $0.63 a bushel.

[2]The payment rate is the difference between the basic loan rate and the higher of the season average farm price (September-August) or the reduced loan rate. In this example, the payment rate is $2.40-$2.05, or $0.35 a bushel.

The 1985 Act ties basic loan rates to an average of past market prices and gives the Secretary discretion (under the so-called "Findley" option, see Glossary, page 383) to reduce loan rates even further if such action is needed for the United States to remain price competitive. The loan rates dropped dramatically from 1985/86 to 1986/87: corn from $2.55 to $1.92 a bushel; wheat from $3.30 to $2.40 a bushel; cotton from 57.3 cents a pound to a loan repayment rate of 44 cents under a marketing loan program; and rice from $8 a hundredweight (cwt) to an average loan repayment rate (based on the world market price) of $3.82 under its marketing loan program. The 1985 Act also decreased dairy price supports and required future adjustments to price supports based on market conditions.

The 1985 Act allows the Secretary to make further reductions in wheat and feed grain loan rates up to 5 percent a year from the 1986 levels. By 1990/91, the corn loan rate could be as low as $1.57 a bushel and the wheat loan rate as low as $1.95. Potential target price reductions are much smaller. For example, minimum target prices for corn and wheat in 1990/91 are specified as $2.75 and $4. The gap between target prices and loan rates will stay wide over the life of the 1985 Act. Thus, the Government accepted a large increase in potential deficiency payments to make U.S. agricultural commodities competitive.

To limit program crop production and reduce program costs, the act mandates acreage reduction programs (ARP's) under certain stock conditions, and large-scale ARP's were employed in the first 3 years of the 1985 Act. Because total and per farm deficiency payments were expected to be much larger under the 1985 Act, the $50,000 per person limit, if not increased, would have discouraged participation in ARP's and resulted in lower farm income. Under the 1985 Act, combined payments from all programs are limited to $50,000 on payments arising from the difference between the target price and the basic loan rate. In 1986/87, for example, the wheat target price was $4.38 a bushel and the basic loan rate was $3; the corn target price was $3.03 and the basic loan rate was $2.40. (See "How To Calculate Deficiency Payments Under the Food Security Act of 1985," page 93.)

The Secretary of Agriculture used discretionary authority to reduce basic loan rates by the full 20 percent in 1986/87, announcing a corn loan rate of $1.92 a bushel and a wheat loan rate of $2.40. In 1986/87, payments arising from differences between basic loan rates and announced loan rates were not limited. For 1987-90 crops, the limit on these payments is $200,000 per person. The limit on total payments is, therefore, $250,000 per person.

The short-term effect of the target price/loan rate provisions of the 1985 Act is to make farm programs more important to farm income and crop production decisions. ARP participation has risen to record rates as loan levels and market prices have fallen sharply in relation to target prices. However, the act also has provisions aimed at gradually reducing the influence of farm programs. Target prices will fall about 10 percent from 1986 to 1990. If new farm legislation adopted for 1991 and subsequent crops follows the scheduled target price reductions under the 1985 Act, deficiency payments for most crops could be virtually eliminated by the mid-to-late 1990's. The 1985 Act also freezes program payment yields, and acreage bases, particularly for wheat, are dropping as farmers enroll land in the long-term Conservation Reserve Program (CRP). The net effect of these changes will be to reduce deficiency payment rates and the amount of production eligible for payment.

The Budget Reconciliation Act of 1987 amended some provisions of the 1985 Act. To maintain farm income in the face of severe drought in 1988, Congress passed the Disaster Assistance Act of 1988. The many changes in income and price support programs over the years and amendments to the 1985 Act during the first half of its lifetime suggest many income support issues remain to be resolved.

Income and Price Support Issues

Issues relating to income and price support programs arise from conflicting objectives of U.S. farm policy, such as maintenance of farm income, competitive export prices, minimum Government costs, and minimal Government interference in the marketplace. At the heart of these issues are those concerning how target price levels are established and adjusted over time, the quantity of production protected by target prices, farm program influence on crop production decisions, program costs, and the distribution of program benefits.

These issues are basically interdependent. Thus, isolating any one as the most important is difficult. Nevertheless, the starting point for any debate will probably be target price levels and coverage. These program variables most directly affect program costs and producer planting decisions.

Target Price Levels

The clear intent of the 1973 Act was to set target prices in relation to costs of production and to adjust levels over time according to changes in costs. The

1981 Act discarded the costs of production concept following the cost-price squeeze brought about by rapid inflation in the late 1970's. Target prices were set in advance for the 1982-85 crops based on the expected inflation rate for the period. As it turned out, inflation was much below anticipations and the legislated target prices (and loan rates) were set too high. This experience set the stage for the legislated target price reductions under the 1985 Act.

Even after 16 years of experience, policymakers still have not found a definitive method to establish target price levels. Target prices are now well above total economic costs of production, including a return to land. From 1982 (the first year of the 1981 Act) to 1986, total economic costs declined by more than 10 percent for wheat, corn, and cotton and by slightly less than 10 percent for rice. Meanwhile, target prices increased by 10 percent or more during the same period. Thus, farmers have had an incentive to grow program crops, such as grains and cotton, and reduce production of nonprogram crops, such as soybeans.

Eligible Production

The big expansion in the amount of production eligible for target price coverage resulted from the current plantings concept written into the 1977 Act. The wheat allotment eligible for target price protection in 1977 was about 62 million acres. By 1981, the last crop produced under the 1977 Act, wheat plantings had risen to 88 million acres, with all of this acreage potentially eligible for deficiency payments. The expansion in acreage of wheat and other crops in the late 1970's was built into program crop acreage bases established under the 1981 Act and continued under the 1985 Act.

The production potential on program crop acreage bases exceeds domestic and export needs. Enrollment of land in the CRP has reduced bases, but the primary way of matching program crop production with total use continues to be use of acreage reduction programs.

Cross-Commodity Effects

The clearest example of how target prices influence crop production decisions is given by recent trends in soybean acreage. In 1982, farmers planted soybeans on 71 million acres. By 1988, farmers were planting soybeans on fewer than 60 million acres. Because soybeans do not have a target price, farmers may choose to plant crops with target prices, such as corn and cotton. The 1985 Act provisions have encouraged record rates of participation in acreage reduction programs because of the large deficiency payments. Thus, the substantial acreage bases for corn and cotton have not been available for soybean production. The result has been high soybean market prices

compared with prices for grains and cotton. Recent production decisions by U.S. farmers have not been based on relative market prices, but such decisions abroad have been. Soybean production has expanded in South America, and Argentina and Brazil are increasing their shares of the world market as the U.S. share has dropped (6).

The Disaster Assistance Act of 1988 provides one response to the soybean acreage dilemma. The act allows soybeans and sunflowers to be planted on no less than 10 percent nor more than 25 percent of the acreage permitted for program crops in 1989 and gives the Secretary of Agriculture discretionary authority to implement a similar program in 1990. Farmers who plant soybeans on their acreage base for program crops will not lose base under this program.

Program Costs

Program costs have risen sharply under the 1985 Act as an inevitable consequence of maintaining target price levels and reducing price support loan rates at a time of surplus program crop commodities. Because target prices were initially frozen at 1985/86 levels, the maximum potential deficiency payment rate more than doubled for many crops. Deficiency payments to feed grain and wheat producers on their 1986 and 1987 crops totaled about $20 billion, exceeding total deficiency payments made to all program crop producers during 1974-85.

The continuing potential for large deficiency payment rates under the 1985 Act means that acreage reduction programs must be considered each year, regardless of the stock situation. Because target prices are reduced only gradually, farmers will continue to have an incentive to plant as much of their program acreage base as possible.

Distribution of Program Benefits

Deficiency payments are targeted to a crop sector, such as wheat or Upland cotton, based on the target price and national average farm price for the particular crop. For example, all eligible wheat growers receive the same deficiency payment per bushel of program production, regardless of the class of wheat grown and regardless of individual production costs, price received, or financial needs. The winter wheat grower with normal yields in 1988 would receive the same payment rate as the spring wheat grower whose yield dropped 50 percent or more.

In recent years as program costs have escalated, there has been a growing concern over whether deficiency payments are going to farmers most in need.

Because each grower of a particular program crop receives the same payment rate, the larger farms receive the bulk of deficiency payments. Thus, some proposed changes to the programs would lower the payment limit, base the payments on farm size (smaller farms would get higher payment rates), or reduce payment rates as production volume increases. Somewhat related to these proposals are suggestions to base payments on personal financial conditions or a means test.

No method for targeting benefits based on individual circumstances has been worked out. The Disaster Assistance Act of 1988 showed that targeting income support is practical, at least on a limited basis. Payments, based on a percentage of the target price, were made to farmers suffering yield losses on a case-by-case basis. Farmers with the greatest yield losses received the largest payment per unit of lost production.

Price Volatility

Economic events since the passage of the 1985 Act have helped reveal what issues may be important in the upcoming debate on farm legislation in relation to price supports. The 1985 Act gave the Secretary great latitude for reducing loan rates when past market prices were low and established specific rules for maintaining FOR release prices at relatively high levels. The 1985 Act specifies the release price must be the higher of 140 percent of the announced loan rate or the target price level. Thus, market prices have considerable room to adjust. The 1988 drought, which severely reduced production of many of the major crops, caused price adjustments that concerned many policymakers. The situation raised the issue of whether price support policies established under the 1985 Act have adequately stabilized prices.

Price volatility may be reduced by adjusting the CCC loan rates or by adjusting the FOR release and CCC resale prices. The 1985 Act established maximum loan rates for the major crops based on formulas involving past market prices. The Secretary may reduce loan rates below the maximum if market conditions warrant this action. In contrast, earlier legislation established minimum loan rates for crops. That system was too inflexible when market prices fell rapidly. During the 1980's, these policies stabilized prices by artificially supporting domestic prices above world market-clearing levels. Thus, U.S. exports decreased and CCC inventories soared to unacceptable levels. The only advantage to this system for setting price supports had been that it limited the amount Government income support payments could expand. However, these savings in income support payments were partially offset by the costs of reducing CCC inventories through special short-term programs.

The 1985 Act's methods for setting loan rates are an improvement over the previous methods. Loan rates for the major crops respond directly to long-term changes in market prices, avoiding unwarranted increases in Government stocks. This system does not rely on the ability of policy-makers to foresee changes in market conditions that may occur during the course of farm legislation that covers 4 years. Altering the loan levels because of short-term political considerations is also more difficult. In the past, such actions have not always had desirable long-term consequences.

The main drawback to the current system for setting loan rates is the potential for costly income support programs. However, because of the advantages associated with the current method for establishing loan rates compared with previous methods, the issue of price volatility will probably focus more on methods for setting FOR release prices.

Budgetary outlays were a main consideration when FOR release prices were established under the 1985 Act. If FOR release prices are below target prices, farmers are encouraged to market their FOR grain at prices below target, effectively limiting market prices to the release price until all of the FOR stock is exhausted. Under these circumstances, the price support policy would increase potential income support payments.

However, maintaining FOR release prices too high in relation to market conditions can also be costly. The CCC incurs costs in encouraging farmers to maintain buffer stocks that can be used in periods of short supply. If FOR release prices are too high, this buffer stock will not be available when it is needed, and the CCC will continue to pay for maintaining these inventories.

During the 1988/89 marketing year, the FOR release prices for wheat and corn were set at 191 and 165 percent of their respective loan rates. Those prices did not protect livestock producers from increasing feed costs caused by the 1988 drought. Thus, several provisions of the Disaster Assistance Act of 1988 were designed to provide emergency relief to livestock (including dairy) producers. If FOR release prices had been lower, the costs associated with these emergency programs for livestock producers could have been reduced at the expense of incurring higher costs in deficiency payments to grain producers.

These tradeoffs are obviously difficult to assess. However, unless some action is taken to bring FOR release prices more in line with movements in loan rates, the FOR will continue to have a small role in reducing price variability.

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Chapter 8

The Role of Generic Certificates in U.S. Commodity Programs

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Generic certificates have been an effective tool for reducing Government-owned stocks. The profit potential of certificate exchanges for both producers and agribusinesses has earned widespread public support. Certificates have increased total outlays by the Commodity Credit Corporation compared with cash payments, but they have also increased available free stocks and contributed to more competitive prices for U.S. commodities in international markets. Certificates may play a lesser role in U.S. agricultural policy programs during periods when supply and demand are more balanced.

The Generic Certificate Program, authorized by the Food Security Act of 1985, has proven to be a useful agricultural policy tool. These certificates ensure price support benefits for farmers and keep commodities competitive; they prevent accumulation of surplus commodities, reducing the demand for storage; and they may be issued or stopped at the discretion of the Secretary of Agriculture. The flexibility they provide allows USDA to adjust to changing market conditions.

This chapter discusses:

- How generic certificates have helped accomplish the goals and objectives of the Food Security Act of 1985;
- The interaction of generic certificates across commodity lines;
- What generic certificates mean for producers, processors, consumers, taxpayers, and program administrators; and
- The future of generic certificates.

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Background

Generic certificates are negotiable instruments issued by USDA in fixed dollar denominations for program payments. Certificates are "generic" in that they may be exchanged for stocks of any eligible commodity. As negotiable instruments, certificates may be bought, sold, or exchanged for commodities in a variety of ways before expiring 8 months after they are issued.

The Food Security Act of 1985 authorized USDA to make 17 program payments on a noncash (certificate) basis: advanced deficiency, deficiency, land diversion, inventory reduction, prevented plantings, loan deficiency, marketing loan repayments for the 1985-90 rice crops, loan deficiency payments for the 1985 rice crop to producers who did not have rice loans, marketing certificates, interest payment certificates, reopening of signup payments, advance announcement of programs, Conservation Reserve Program, program yield certificates, wheat export certificates, feed grain export certificates, and dairy export incentive program payments. (See Glossary, page 383, for a discussion of these programs.) Although all of the authorized payments could be commodity-specific, all certificate payments have been generic except for a limited number of cotton payments.

Subsequent legislation authorized additional generic certificate payments for ethanol production and disaster relief. Payments for the Export Enhancement Program (EEP), Targeted Export Assistance (TEA) Program, Emergency Feed Program, Conservation Reserve Program, and the Conservation Reserve Corn Bonus Program have all been made with generic certificates. The first generic certificates authorized under the 1985 Act were issued in May 1986. As of January 31, 1989, USDA had issued $22.6 billion in certificates for all authorized programs (app. table 1).

Although certificates have been issued to nonfarm organizations through such USDA programs as TEA, EEP, and ethanol production, this chapter focuses on generic certificates issued directly to producers, constituting over 85 percent of total certificates issued.

Definition and Regulations

The 1985 Act authorizes program payments on a noncash basis. USDA makes these payments of dollar-denominated generic certificates directly to the producer, often referred to as the initial holder. The initial holder may choose one of the following courses of action:

- Sell or transfer the certificate,
- Use the certificate to redeem regular commodity, reserve, or special producer storage loans,
- Exchange the certificate for cash at the issuing county office of the Agricultural Stabilization and Conservation Service (ASCS) no sooner than 5 months following issuance.

Cooperative members may designate an approved cooperative to market their certificates. Exporters earning certificates under the EEP or TEA program may sell or transfer the certificates or exchange them for inventory owned by the Commodity Credit Corporation (CCC).

All initial certificate holders, except for exporters receiving EEP or TEA payments, may exchange their certificates for cash (the "cash-out option"). However, the initial holder must wait 5 months following the issuance month before cash-out is allowed. The 5-month waiting period was intended to encourage holders to exchange certificates for commodities instead of cash. Producers may use certificates to redeem outstanding CCC loans or, with a simple endorsement, transfer the certificate to subsequent holders anytime before the expiration date.

A subsequent holder is a person who receives a certificate in any manner other than directly from USDA. Subsequent holders of commodity certificates may choose one of the following courses of action:

- Sell or transfer the certificate,
- Use the certificate to redeem CCC loans, or
- Exchange the certificate for commodities from CCC inventory.

Subsequent holders may not exchange their certificates for cash.

Both initial and subsequent holders have until the expiration date shown on the certificate to sell or transfer their certificates. Certificates expire 8 months after the month of issue. For example, a certificate issued in November expires the end of July of the following year.

Certificates are dollar-denominated. When certificates are redeemed for commodities, the face value of the certificate is converted to a bushel equivalent based on terminal market prices adjusted for location. Certificate

redemption values, often called posted county prices (PCP's), are used to determine the value at which certificates can be exchanged. PCP's are adjusted daily by subtracting location differentials from two relevant terminal markets from among the 19 terminal markets used as base pricing points. The CCC uses the higher of the two resulting values for the PCP in a county or elevator on a given day. Holders of generic certificates may obtain title to CCC-owned inventory by exchanging the certificates at the "market value" (PCP) of the commodity at the warehouse where it is stored. All CCC-owned grain is eligible for exchange, regardless of whether it is included in a catalog published by CCC or not. However, only the storing warehouse is eligible to obtain noncataloged CCC-owned grain with certificates.

Changes in the generic certificate program began within 2 weeks after USDA issued the first certificate. USDA originally limited the certificates to farm program participants who were due program payments and who did not have outstanding price support or reserve loans that could be redeemed as payment. USDA changed this regulation May 15, 1986, to allow all producers to receive generic certificates. Making all producers eligible increased the demand for certificates, leading to trading of certificates at a premium to face value.

Certificates and the Goals of the 1985 Act

Congress debated the 1985 Act in a period of falling exports, rising stocks, and increasing Government costs. U.S. exports fell 13 percent from $43.8 billion in fiscal year 1981 to $38 billion in fiscal year 1984. Falling exports and record yields resulted in large supplies and farm prices that approached nonrecourse loan levels. These loan levels were above world market prices. As a result, forfeitures of nonrecourse loans to the CCC increased. Ending CCC stocks of wheat rose from 190 million bushels in 1981 to 602 million bushels in 1985. Ending CCC stocks of corn rose from 280 million bushels in 1981 to 546 million bushels in 1985. There were prospects for even higher forfeitures in later years. Total CCC expenditures for storage and handling rose from $200.2 million in fiscal year 1981 to $398 million in fiscal year 1984 (see Langley and Baumes, page 7).

The 1985 Act included provisions designed to bring U.S. commodity prices more in line with lower world prices (by reducing nonrecourse loan rates) and for more commodities to be available on the market (by freeing up stocks isolated in Government storage and by reducing the potential for future forfeitures to the CCC). CCC can only sell its stocks if market prices rise to CCC sale price levels. For 1985, the average CCC sale price for wheat was $5.45 per bushel, compared with the season average farm price of $3.08 per bushel. The 1985 average CCC sale price for corn was $3.90 per bushel,

compared with the season average farm price of $2.23 per bushel. The use of certificates to liquidate loan, reserve, and CCC inventory at market prices rather than at statutory minimums has supplied domestic and export markets with increased free stocks previously isolated from the market.

Policy Objectives of Generic Certificates

The use of certificates has helped domestic commodity-related industries ensure that a continuous flow of free commodity stocks are, or can be, available at market prices. This feature allows domestic commodity prices to react to world market prices. Even though certificates permit commodity prices to move below loan levels, producers can still obtain income protection from existing programs.

Certificates may result in additional loan activity, but their use in allowing farmers to redeem commodities pledged as loan collateral has resulted in savings in storage, handling, and transportation costs. For example, in the summer and fall of 1986, certificates gave producers and warehouse owners the opportunity to solve their own storage and grain marketing problems by removing an estimated 800 million bushels of grain from storage demand. Grain moved into normal marketing channels at the decision of producers rather than as determined by CCC.

Hence, certificates have allowed grain to be competitively priced without harming producer income, alleviated storage tightness, reduced budget outlays associated with storage and handling, and made inventories available to the market.

Why Generic?

Certificates were made generic for two reasons. First, the 1985 Act limited commodity-specific payments to 5 percent of total deficiency payments. Second, experience with the 1983 payment-in-kind (PIK) program showed that linking payments to specific commodities is expensive and disruptive to the market. The 1983 PIK experience was confirmed by similar problems with 1986 cotton-specific certificates. CCC stocks of cotton fell to where there was no collateral backing for cotton-specific certificates. The market value of those certificates fell to 60-80 percent of face value.

Interaction of Generic Certificates with Other Commodity Program Provisions

Generic certificates play an integral part in the operation of commodity programs. Certificates have been an effective tool for reducing Government-

owned stocks. However, the effectiveness of certificates depends on the relationships between loan rates, market prices, and stock levels.

Relationship Between Certificates, Loan Rates, Market Prices, and Stock Management Programs

Certificates are issued as a specific dollar amount. To translate that dollar amount into bushels for redemption requires CCC to establish daily market prices on all commodities and to disseminate the pricing information to about 10,000 U.S. locations. CCC implemented a differential pricing system for determining market prices in about 3,000 counties and 7,000 warehouse locations. That system is based on the average difference between "posted" prices furnished to CCC by grain elevators on selected dates from January 1985 to January 1986 and "market prices" on those dates at major grain terminals where the elevators would normally transact business.

In 1985, ASCS county offices contacted all Uniform Grain Storage Agreement (UGSA) warehouses and obtained information on those elevators' posted prices on January 31, 1985, April 1, 1985, July 1, 1985, September 30, 1985, and January 1, 1986. ASCS used these dates to develop a historical relationship between the individual UGSA warehouse and the terminal price in the warehouse area. The difference between each terminal market and the elevator price formed the basis for determining the differential. As the terminal price changed, the local county redemption value changed by a fixed differential.

These initial differentials have undergone a number of changes since they were originally established. For instance, ASCS altered the differentials in 30 high-corn-producing counties in Illinois while the Illinois River was closed for repairs to its locks in 1987.

As terminal prices change, certificate redemption values change. Redemption values are designed to reflect market conditions as closely as possible, but are not prices. Local market prices occasionally differ from redemption values, but the marketplace usually corrects such differences quickly.

Generic Certificates and Marketing Loans

The generic certificate program is similar to the marketing loan program in that producers can redeem loans at a value below the original face amount of the loan. However, several key differences make the certificate program a more effective and efficient approach to permit repayment of commodity loans at the prevailing market price.

With the certificate program, Government outlays are controlled by the dollar volume of certificates issued. There is no similar limitation on outlays for the marketing loan. The difference between the loan rate and the loan repayment price is absorbed on all eligible commodities, not just the marketing loan commodities. In a situation of surplus production, marketing loans may reduce prices and increase CCC outlays more than certificates.

Certificates provide ready access to CCC-owned stocks in cases where such stocks are better positioned or available in the volume and quality needed to meet market needs. A marketing loan program cannot provide such access to CCC inventory. The certificate program also provides considerable liquidity to the market, which lessens demand for storage. The marketing loan does not ease storage problems other than through increasing marketings. The marketing loan may, in fact, exacerbate tight storage by forcing all commodities to be handled through the loan program.

A final major advantage of certificates over marketing loans is that producers, livestock and poultry feeders, and commodity firms have considerably more flexibility to effectively and profitably market grains. Certificates offer numerous opportunities to enhance income, as evidenced by the premium on certificates (2).[1]

Certificate Premiums

Certificate premiums have varied considerably since certificates were first issued in May 1986. Premiums have ranged from 30 percent above face value to 1-3 percent below (5). This variation in premiums can be attributed to one or more of the following:

- Differences between redemption values and the actual market price,
- Elimination of carrying charges (interest and storage charges), or
- Access to CCC inventory.

Differences Between Redemption Values and Actual Prices

If the redemption value (PCP) is less than the local cash price, which may happen because the PCP changes daily while actual prices change constantly, a producer may capture this difference with certificates. For example, if the PCP for wheat was $2.50 and the actual market price was $2.60, a holder of a

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

certificate with a face value of $5,000 could exchange it for 2,000 bushels ($5,000/$2.50). Selling these bushels at $2.60 per bushel would net the holder $200 over the original value of the certificate. A producer would be willing to pay up to a 4-percent premium over the face value to obtain additional certificates ($200/$5,000). The more the local cash price exceeds the PCP, the greater the value of the certificate. While these arbitrage opportunities exist, the far greater incentive to the producer is to redeem crops under loan to capture carrying charges (4).

Elimination of Carrying Charges (PIK and Roll)

Certificates allow producers to receive the benefit of the loan rate without storing their crop for 9 months. Without certificates, producers must hold their crops for the full life of the loan before they may forfeit the commodity. The producer must incur storage costs associated with carrying the grain for 9 months (if the loan is forfeited) plus interest on the loan principal for 9 months (if the loan is repaid).

Certificates give the loan holder an additional way to repay the loan prior to maturity. For example, a wheat farmer places 5,000 bushels of wheat under loan for $2.45 per bushel, or $12,250. The producer may use the loan principal however he or she chooses, but the collateral must still be stored for 9 months before forfeiting the grain. At a storage cost of $0.20 per bushel for 9 months, these storage costs would be $1,000. The producer would net $11,250. Certificates allow producers to repay their loan immediately after loan disbursement and save the storage costs. Thus, a $5,000 certificate used to exchange a loan results in $408 in storage savings (2,040 bushels at $0.20 per bushel). This makes the certificate worth $5,408, or provides an 8-percent premium over face value ($408/$5,000).

Access to CCC Inventory

Grain either owned by CCC or in the farmer-owned reserve (FOR) can be released or sold only when prices reach certain mandated levels. For instance, for the 1988 marketing year, wheat could not be sold from CCC inventory at less than 238 percent of the county loan rate where stored. However, wheat could be exchanged for certificates at the "market" value at the warehouse where stored. All CCC-owned grain is eligible for exchange, as is all FOR grain, whether stored on or off the farm. Hence, certificates are a market-sensitive safety valve that allows grain to flow to the market to cushion artificial price appreciation due to institutional constraints. As of January 31, 1989, certificates worth $15 billion, or 70 percent of the total $21.3 billion exchanged, were exchanged for commodity loans. The remaining $6.3 billion were redeemed against CCC inventory.

Certificates offer additional opportunities for CCC-owned stocks to enter market channels. Faced with growing concern whether sufficient free stocks of wheat were available to meet expanding export markets, USDA announced an alternative certificate exchange procedure on October 30, 1987. Under this procedure, CCC would accept bids each week for up to an announced quantity of wheat stocks. Successful bidders could exchange certificates for the price and quantity of stocks bid. As of January 31, 1989, over 388 million bushels of wheat were exchanged with certificates through the CCC procedure. Bid prices and quantities varied by week. The average bid price was around $2.65 per bushel. Without generic certificates, these stocks could not have been released to the market at prices less than the CCC sales price of $5.26 a bushel.

Other Factors

The quantity of outstanding certificate supplies and the amount of time left before the certificate expires affects premiums. As the crop year progresses, storage-generated premiums will decline because storage savings for commodities under loan decline. In general, the smaller the supplies of certificates, the greater the potential premiums. Also, the shorter the time before expiration, the lower the premiums because of reduced time to seek profitable transactions.

Factors Influencing Redemption Patterns for Commodities

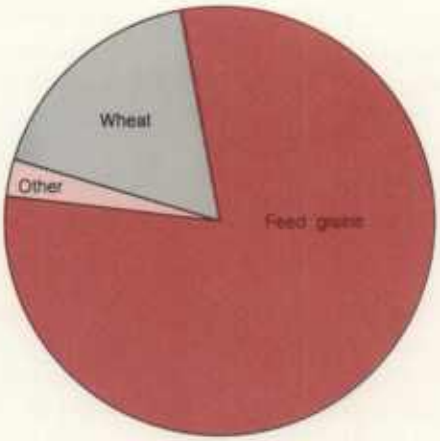
The price of the commodity exchanged is the principal factor affecting which commodities are exchanged for certificates. Although certificates are generic in that they can be redeemed against a number of commodities, returns are greatest for the commodities priced lowest in relation to their loan rates. Consequently, the relatively lower priced commodities result in a greater number of bushels redeemed. Corn prices have fallen below nonrecourse loan rates more often than other commodities in the major producing areas. Thus, 80 percent of all certificate exchanges have been against feed grains, even though only 48 percent of certificates were issued for program payments to feed grain producers (fig. 1). If market prices for all eligible commodities move above their respective loan rates, there is no advantage in exchanging one commodity for another if local PCP's reflect current market prices.

Implications of Generic Certificates for Producers, Processors, and Government Program Administrators

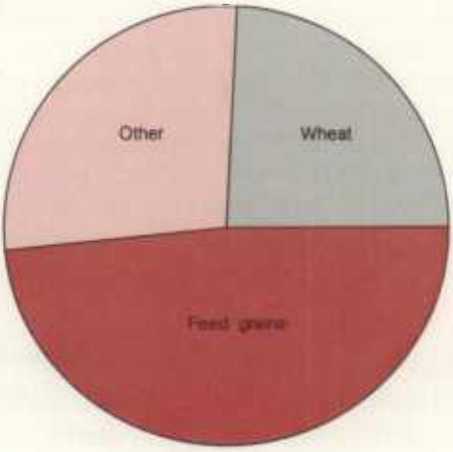
Generic certificates have become an effective and popular agricultural policy tool. Certificates have had a wide range of implications for producers,

Figure 1

Certificates redeemed for commodities through fiscal year 1988



Certificates issued for commodities through fiscal year 1988



processors, and Government program administrators. The following discussion summarizes some of the major implications.

Implications for Producers

Generic certificates' most significant implications pertain to producers. With certificates, producers are not as adversely affected by lower prices as before. The profitability of certificate exchange increases as prices decline below the loan rate, limited by storage savings. The fact that producers can profit from lower prices allows greater latitude for farm programs to be managed in a fashion to ensure U.S. grain is competitively priced.

Certificates provide additional income support that is not subject to payment limitations. The examples provided in the previous discussion of certificate premiums show how producers can sell their certificates above face value and capture storage and interest charges before loan maturity. Any profits generated through PCP-cash price differences are exempt from payment limitations. Budget cuts made in 1986 because of Gramm-Rudman-Hollings did not apply to certificate exchanges for commodities (but did apply to certificates returned to CCC for cash), further enhancing farmer income.

Another implication of certificates for producers has been the need for increased flexibility in marketing a commodity, even if it is under loan. This means producers must be aware of not only whether it pays to redeem a loan, but the size of certificate premiums, the PCP-cash price spread, and the spread between PCP's and the loan rate. Producers have had to increase their attention to marketing.

Implications for the Market

Certificates have made processors and other segments of agribusiness even more involved in commodity programs. Cash program payments went to producers. Now, however, certificates can affect a wider clientele because of the active market for certificates. Hence, the agribusiness community can benefit from commodity programs from both arbitrage transactions for certificates and lower commodity prices brought about by increased free stocks. For example, lower commodity prices benefit livestock feeders who purchase feed grains.

Market implications of certificates have increased now that CCC inventory and FOR stocks are no longer isolated from the market. When combined with nonrecourse loan rates that are less of a price floor, certificates have made grain controlled either directly or indirectly by USDA accessible to the market regardless of price. In preventing forfeitures, certificates alleviate a buildup in CCC inventory.

Lower commodity prices from both lower nonrecourse loan rates and certificate exchanges contribute to increased U.S. export competitiveness. Signals are sent to foreign competitors that the United States will be less likely to support world grain prices by storing most of the world's grain stocks.

Another market implication is the reemergence of carrying charges. Carrying charges relate to the cost of holding grain in terms of interest payments and storage costs. Frequently, the job of the futures market in the past was not so much to carry inventories, but to form the basis of cash transactions. Today, however, as loans are redeemed with certificates, or as grain in CCC inventory is redeemed, the grain is no longer isolated from the market. Storage of the grain not sold must be paid for by private traders, which enhances carrying charges.

Generic certificates and other provisions of the 1985 Act have affected the seasonal pattern of cash and futures prices. Figure 2 illustrates the daily basis for corn at Chicago beginning with the 1984 marketing year. We define basis to be the cash price at Chicago for #2 Yellow corn minus the near-term closing price for #2 Yellow corn on the Chicago Board of Trade futures market. Before the 1985 Act (which took effect with the 1986 crop), the daily basis for corn was generally positive; that is, cash prices exceeded futures prices. The basis was typically lower at the beginning of the crop year, and rose toward the end as available supplies tightened. Beginning in 1986, lower loan rates allowed cash prices to fall below near-term futures prices, causing the basis to be negative. Because free stocks are now more readily available to the market throughout the year because of certificate exchanges, the basis for corn tends to fluctuate around zero. That is, cash and futures prices tend to remain closer together.

Implications for Government Program Costs and Administration

Debate continues over the potential cost of certificates compared with cash payments. Accurate accounting of certificate program costs is complicated by the significant indirect cost involved in such items as net lending activity and deficiency payment rates. Whether certificates cost more, less, or the same as cash payments depends on various other market and program factors.

Reduced Storage Costs

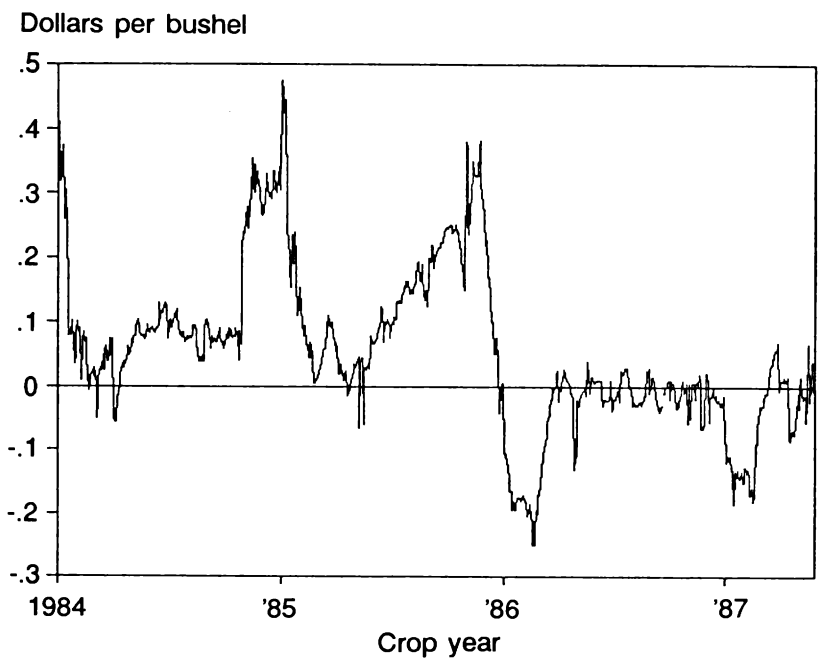
Reduced CCC stocks directly result in reduced CCC storage costs. CCC stocks are not only directly reduced by certificate exchanges for CCC-owned stocks, but the potential buildup in CCC stocks may be ameliorated because of lower loan forfeitures. For example, over 400 million bushels of onfarm 1985 crop loans were scheduled to mature during the summer of 1986. With cash

prices running below loan redemption levels, most of the 400 million bushels might have been forfeited to CCC during July-October 1986. Once forfeited, CCC would have had to take possession of the grain and move it to approved storage facilities. With certificates, however, over 500 million bushels of onfarm and off-farm grain were moved into commercial channels, freeing up storage space. If forfeited, the 500 million bushels would have cost CCC between $300-$500 million in fiscal years 1986 and 1987 for storage and transportation. A General Accounting Office (GAO) report estimated that total CCC storage savings since 1986 have been $169-$253 million (7).

Indirect Costs of Certificates

The intuitive appeal of generic certificates is that they substitute something the Government has too much of (commodities) for something it has too little of (cash) as a way to pay producers. There is no direct budget effect from

Figure 2
Corn daily basis



Chicago cash price for No. 2 Yellow corn minus Chicago Board of Trade's near-term price for No. 2 Yellow corn futures.
Source: Chicago Board of Trade.

certificate exchanges compared with cash because the Government has already purchased the crops or lent money against them.

However, as Kennedy and others argue, indirect costs, such as increased loan activity or potentially higher deficiency payments, make generic certificates at least as expensive as cash payments (1, 3, 5, 6, 8). The profitability of certificate exchanges encourages producers to put eligible commodities under loan solely for the purpose of redeeming the loan with certificates. Because producers can repay their loan at what for some commodities have been relatively lower PCP's, the cost of CCC lending activity increases. In other words, the Government tends to buy high (at the loan rate) and sell low (at the PCP).

Other indirect budget costs relate to the effect of certificates on market prices. By increasing free stock availability, certificates allow market prices to be lower than if those stocks were isolated in CCC-owned storage. If market prices remained above loan rates without certificates, every penny that certificates cause market prices to fall results in a penny increase in the deficiency payment rate. If market prices were below loan rates without certificates, the use of certificates would not increase deficiency payments but would increase loan activity expenses. If market prices were at or near loan rates, exchange of certificates could reduce CCC outlays because deficiency payments and loan outlays are similar to what they would be without certificates, but savings are derived from reduced CCC storage and handling charges (3). Hence, cost estimates for the certificate program greatly depend on market conditions.

Glauber estimates that the net CCC costs of the certificate program over cash payments for fiscal year 1987 were $368 million for corn and -$26 million for wheat (5). The combined net cost of $342 million amounts to about 5 percent more than if payments had been made in cash. These cost estimates were derived from historical data on certificate issuances and redemptions, along with assumptions on market prices, the responsiveness of demand, and on public and private stockholding behavior with and without certificates. Glauber found that certificates are more costly (about 11 percent more than cash) if demand is less responsive to changes in market price caused by certificate exchanges and if most CCC stocks exchanged for certificates are consumed instead of placed in private storage for later use.

Glauber's estimates are consistent with other reports. According to GAO, net CCC outlays (loan outlays minus storage and handling savings) have increased less than $400 million because of certificates (7). USDA estimates that the certificate program may cost up to 10 percent more than using cash to pay producers (8).

Prospects for Certificates

Generic certificates are most effective during periods of surplus stocks. Hence, prospects for certificates are inversely related to their success in reducing stocks. Ending CCC stocks of wheat, which rose to 602 million bushels in 1985/86, were at 250 million bushels at the close of the 1987 crop year and were expected to be 84 million bushels at the end of 1988/89. Ending CCC stocks of corn increased from 546 million bushels in 1985/86 to 835 million bushels in 1987/88, and were expected to be 460 million bushels at the close of 1988/89. Certificates have allowed wheat and corn stocks to decline.

Additional issues related to future certificate issuances are the collateral backing for certificates, the composition of that collateral backing, certificate premiums, and the relationship between loan rates and market prices. Because certificates are negotiable instruments with fixed dollar denominations, they must have collateral backing. Issuing certificates without sufficient collateral backing is tantamount to issuing a form of currency, which only the U.S. Department of Treasury is allowed to do. The collateral backing for certificates must be uncommitted stocks of commodities owned and controlled by CCC. Hence, loan stocks and FOR stock, which form the basis for 82 percent of all certificate exchanges, cannot be considered collateral. Also, the 147 million bushels of wheat committed to the Food Security Reserve and the quantity of corn committed to emergency feed programs are exempt from consideration as collateral.

The success of certificates in reducing CCC stocks has resulted in falling collateral backing for certificates. On August 1, 1988, CCC-owned inventory of fibers, grains, and oilseeds, valued at current prices, indicated an eligible CCC-owned inventory value of $4.4 billion. The balance of certificates in circulation on that date was $2.9 billion. Hence, collateral backing for certificates in circulation was sufficient, but new certificate issuances should be closely watched.

Authorizing legislation prohibits deficiency payments to be more than 5 percent in kind. Even though certificates are generic, with 93 percent of CCC collateral backing in the form of feed grains, future certificate issuances for feed grain deficiency programs could be a de facto commodity-specific payment. Certificate payments for other commodity programs or for other program payments (for example, Conservation Reserve Program rental payments) to feed grain producers do not violate the 5-percent rule.

Until recently, certificates have traded at premiums to their face value. However, recent market developments have caused market prices and PCP's to rise above their respective nonrecourse loan rates for most major commodities.

Such a situation reduces the profitability for producers to place their new crop under loan and use certificates for exchange. Reduced loan activity is associated with reduced demand for certificates. As a result, certificates have traded at 1-3 percent below face value in some areas. The widespread support for certificates will probably diminish if certificates continue to trade near or slightly below face value.

Conclusion

Generic certificates have proven effective in dealing with the supply/demand imbalance of the mid-1980's. CCC-owned stocks would have continued to be isolated from the market if not for certificate exchanges. Certificates will probably play a less important role when supply and demand are more balanced. However, as long as U.S. agriculture tends to overproduce, certificates may continue to be a significant policy tool.

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Appendix table 1—Issuances of generic certificates

Fiscal year/ crop year	Type of payment	Date issued	Wheat	Cotton	Rice	Corn	Barley	Sorghum	Oats
			Million dollars						
Fiscal year 1986 (actual):									
1986	First advanced deficiency	May 1986	333	0	0	588	34	50	4
1986	Advanced diversion	May 1986	199	0	0	124	6	12	1
1986	Second advanced deficiency	Aug.-Sept. 1986	261	115	42	98	28	58	2
	Other	Aug.-Sept. 1986	0	0	0	0	0	0	0
	Total		793	115	42	1,210	68	120	7
Fiscal year 1987 (actual):									
1986	Second advanced deficiency	Oct. 1986	65	31	12	91	9	14	1
1986	Final deficiency	Dec. 1986	1,075	0	0	0	46	0	6
1986	Final deficiency	Mar. 1987	0	13	2	355	0	35	0
1986	Final deficiency	July 1987	0	0	0	0	61	0	2
1986	Final diversion	July 1987	15	0	0	0	0	1	1
1987	Advanced deficiency	Jan.-Mar. 1987	791	226	86	1,331	91	115	10
1987	Advanced diversion	Jan.-Mar. 1987	0	0	0	360	8	30	2
1987	Corn CRP bonus [1]	Apr. 1987	0	0	0	0	0	0	0
1987	Final diversion	June-July 1987	0	0	0	711	15	55	3
	Other		0	0	0	0	0	0	0
	Total		1,946	270	100	2,848	230	250	25

See footnotes at the end of table.

Continued—

Appendix table 1—Issuances of generic certificates—Continued

Fiscal year/ crop year	Type of payment	Date issued	Wheat	Cotton	Rice	Corn	Barley	Sorghum	Oats
			Million dollars						
Fiscal year 1988:									
1986	Final deficiency	Oct. 1987	248	2	5	1,466	0	128	0
1987	5-month deficiency	Dec. 1987	1,229	0	0	0	116	0	0
1987	Final deficiency	Feb. 1988	349	510	379	0	0	0	0
1987	5-month deficiency	Mar. 1988	0	0	0	1,401	0	127	0
1987	Loan deficiency	Mar. 3, 1988	0	0	0	0	0	0	0
1987	Final deficiency	July 1988	105	0	0	0	6	0	0
1988	First advanced deficiency	May 16, 1988	513	190	44	1,255	53	120	12
1988	Advanced diversion	May 16, 1988	0	0	0	566	20	39	0
1988	Final diversion		0	0	0	0	0	0	0
	Other			0	0	0	0	0	0
	Total [2]		2,444	702	428	4,688	195	414	12

See footnotes at the end of table.

Continued—

Appendix table 1—Issuances of generic certificates—Continued

Fiscal year/ crop year	Type of payment	Date issued	CRP[2]	Ethanol	TEA[3]	EEP[4]	Feed	Disaster	Total
			Million dollars						
Fiscal year 1986 (actual):									
1986	First advanced deficiency	May 1986	0	0	0	0	0	0	1,009
1986	Advanced diversion	May 1986	0	0	0	0	0	0	342
1986	Second advanced deficiency	Aug.-Sept. 1986	0	0	0	0	0	0	1,004
	Other	Aug.-Sept.	0	25	16	10	1	0	52
	Total		0	25	16	10	1	0	2,407
Fiscal year 1987 (actual):									
1986	Second advanced deficiency	Oct. 1986	0	0	0	0	0	0	223
1986	Final deficiency	Dec. 1986	0	0	0	0	0	0	1,127
1986	Final deficiency	Mar. 1987	0	0	0	0	0	0	405
1986	Final deficiency	July 1987	0	0	0	0	0	0	63
1986	Final diversion	July 1987	0	0	0	0	0	0	17
1987	Advanced deficiency	Jan.-Mar. 1987	0	0	0	0	0	0	2,650
1987	Advanced diversion	Jan.-Mar. 1987	0	0	0	0	0	0	400
1987	Corn CRP bonus [1]	Apr. 1987	327	0	0	0	0	0	327
1987	Final diversion	June-July 1987	0	0	0	0	0	0	784
	Other		83	29	67	643	85	556	1,463
	Total		410	29	67	643	85	556	7,459

See footnotes at the end of table.

Continued—

Appendix table 1—Issuances of generic certificates—Continued

Fiscal year/ crop year	Type of payment	Date issued	CRP[2]	Ethanol	TEA[3]	EEP[4]	Feed	Disaster	Total
					Million dollars				
Fiscal year 1988:									
1986	Final deficiency	Oct. 1987	0	0	0	0	0	0	1,849
1987	5-month deficiency	Dec. 1987	0	0	0	0	0	0	1,345
1987	Final deficiency	Feb. 1988	0	0	0	0	0	0	1,238
1987	5-month deficiency	Mar. 1988	0	0	0	0	0	0	1,528
1987	Loan deficiency	Mar. 3, 1988	0	0	0	0	0	0	0
1987	Final deficiency	July 1988	0	0	0	0	0	0	111
1988	First advanced deficiency	May 16, 1988	0	0	0	0	0	0	2,187
1988	Advanced diversion	May 16, 1988	0	0	0	0	0	0	625
1988	Final diversion		0	0	0	0	0	0	0
	Other		757	0	110	1,200	39	12	2,118
	Total[2]		757	0	110	1,200	39	12	11,001

[1] CRP = Conservation Reserve Program.
[2] As of August 1, 1988.
[3] TEA = Targeted Export Assistance program.
[4] EEP = Export Enhancement Program.
Source: Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture.

Chapter 9

An Economic Evaluation of the Conservation Reserve Program

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The Conservation Reserve Program (CRP), a conservation-oriented cropland retirement program administered by USDA, will have a sizable effect on the agricultural sector, related sectors of the economy, and the environment. The authors' comparison of the voluntary retirement of 45 million CRP acres with a situation with no CRP indicates that commodity prices will rise, timber production will increase, consumer food costs will increase, environmental quality will improve, and Commodity Credit Corporation (CCC) costs will decline. The authors estimated the net economic benefits to be in the range of $3.4-$11 billion. However, some important economic effects could not be included due to unavailable data. Any estimate of the net Government expense of the CRP depends greatly on projected commodity market conditions and assumed levels of the acreage reduction program (ARP). The authors estimated in late 1987 that the net Government expense would be small. A more recent estimate made after the 1988 drought and with higher assumed ARP levels in the absence of the CRP resulted in a significantly higher net Government expense.

Title XII of the Food Security Act of 1985 authorized the Conservation Reserve Program (CRP), a voluntary long-term cropland retirement program administered by USDA. In exchange for retiring highly erodible

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cropland for 10 years, USDA pays CRP participants (farm owners or operators) an annual per acre rent and half the cost of establishing a permanent land cover (usually grass or trees). The CRP is the largest conservation-oriented cropland retirement program in U.S. history. Its primary goal is to reduce soil erosion on highly erodible cropland by enrolling 40-45 million acres by the end of 1990. Secondary objectives include protecting the Nation's longrun ability to produce food and fiber, reducing sedimentation, improving water quality, fostering wildlife habitat, curbing the production of surplus commodities, and providing income support for farmers.

After the eighth CRP signup in February 1989, about 30.6 million acres had been enrolled. This chapter presents estimates of the probable economic effects resulting from retiring 45 million CRP cropland acres by the end of 1990 and evaluates the program's effects on national income, Government expenditures, and regional economies.[1]

Conservation Reserve Program Operation

Applying experience gained from the Soil Bank program of 1956-62 and recent supply control efforts, including the 1983 payment-in-kind (PIK) program, Congress authorized the CRP to address the joint problems of environmental quality and surplus crop production. Like the Soil Bank program, the CRP encourages farmers to voluntarily retire acreage for an extended period (10 years). The CRP also requires this land to be placed in a permanent vegetative cover that may not be used for commercial purposes, such as haying or grazing, except under declared emergency conditions. Finally, similar to the Soil Bank, the CRP pays participating farmers an annual rent for their enrolled acreage and half of the cost of establishing the vegetative cover.

In contrast to the Soil Bank, however, only cropland classified as highly erodible could be initially enrolled in the CRP. To be considered highly erodible, cropland must meet specific conditions relating to land/soil classification and the current or potential rate of erosion. This requirement limits CRP-eligible cropland to about 101 million acres. Thus, CRP funds are specifically targeted to areas where soil erosion, or the potential for soil erosion, can be significantly reduced. For acreage from a particular field to be

[1]The Food Security Act of 1985 calls for the enrollment of no less than 40 million nor more than 45 million acres of cropland in the CRP by the end of the 1990 crop year. CRP enrollment will probably not reach the 40-45-million-acre goal, based upon existing enrollment, current expectations, and the higher commodity prices caused by the 1988 drought. This report estimates the economic effects of a 45-million-acre CRP because this level of enrollment was believed attainable at the time of analysis.

enrolled, at least two-thirds of the field must meet the highly erodible requirement, and it must have been used for crop production in at least 2 of the previous 5 years. CRP eligibility was subsequently expanded to include filter strips, cropped wetlands, and cropland subject to scour erosion.

CRP participation may not exceed 25 percent of the cropland in any county unless a waiver is requested by county officials and the Secretary of Agriculture determines that exceeding this limit will not seriously depress the county's farm supply and service sector. This limitation effectively reduces CRP-eligible cropland to 70 million acres (fig. 1). Land on which ownership changed in the 3-year period preceding the first year of CRP retirement is ineligible for enrollment unless the land was acquired by will or succession, the land was acquired before January 1, 1985, or the Secretary of Agriculture determines that the land was not acquired for the purpose of being placed in the CRP. This limitation was established to minimize the potential for land speculation which had occurred in some locations during the Soil Bank program.

To enroll cropland in the CRP, farmers apply at their county Agricultural Stabilization and Conservation Service (ASCS) office during a designated signup period. Farmers indicate the fields they propose to enroll, the annual rental payment that they would require (rental bid), and the Commodity Credit Corporation (CCC) crop base (the amount of the farm's land that can be enrolled in CCC programs) that would be reduced during the life of the CRP contract. Crop base is reduced by the proportion of the farm's CRP acreage to its total cropland acreage.

Figure 1
Cropland eligible for the Conservation Reserve Program by farm production region

Once all applications for a particular signup period are received, the Secretary of Agriculture determines maximum acceptable rental rates (MARR's) for multicounty areas referred to as "bid pools." County committees verify that eligibility conditions have been met and review each application. An application is accepted (contracted) if the rental bid does not exceed the established MARR and is consistent with market rents for comparable cropland.

CRP Enrollment and Projections

Total CRP enrollment was 30.59 million acres, representing nearly 300,000 contracts after the eighth signup held in February 1989. Average annual erosion on all land enrolled in the first eight signups was reduced by an estimated 20 tons per acre (4).[2] USDA rents paid to farmers averaged nearly $49 per acre per year, and one-time cost shares for establishing cover averaged $37 per acre. Not reflected in the USDA rental rates and cost shares are an increasing number of State programs which supplement CRP payments made to farmers.

Average CRP rental rates increased from $42 per acre for the first signup to $51 per acre for the eighth signup. This overall increase may be explained by two factors. First, with subsequent signups, the geographic distribution of enrolled acres shifted to areas where agricultural land is more productive with correspondingly higher market rents and more valuable USDA program crop bases. Because MARR's reflect geographic differences in market rents and the value of lost commodity base, average rental rates have increased. Second, as some farmers have become aware of the MARR's for their areas, they have tried to maximize economic returns from CRP participation by submitting bids near the MARR even if lower annual rental payments would be acceptable.

The Northern Plains showed the greatest regional CRP enrollment in the first eight signups where farmers retired nearly 8 million acres, or 60 percent of the region's available land. The Southern Plains and Mountain regions also showed high participation, and the Northeast had the lowest rate. Although about 78 percent of all U.S. counties contain some CRP enrollment, over 80 percent of all enrolled acreage is contained in only 18 percent of U.S. counties. Most of these counties are in the Mountain, Northern Plains, and Southern Plains regions, although a few high enrollment areas exist elsewhere (fig. 2).

[2]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

We based our projections of enrollment culminating in a 45-million-acre CRP on actual enrollment through the sixth signup and remaining eligible cropland (6). Our analysis indicates that geographic differences in the amount of eligible cropland and the ratio of annual CRP rental payments to market rents for cropland have strongly influenced the current distribution of CRP enrollment. Thus, our projections assumed a continuation of pre-1988 rules and regulations affecting eligibility and economic benefits from participation. Changes in CRP rental payments or changes in eligibility in future signup periods could alter the existing pattern of enrollment.

We based our projections of cumulative enrollment for 1988 on acreage actually enrolled through the sixth signup period and an assumption that an additional 1.5 million acres would be enrolled for 1988. We allocated this additional acreage across regions using the distribution of acreage retired through 1987. We based our 1989 projections on a midpoint between the projected 1988 and 1990 enrollment levels. Enrollment of the maximum 45-million-acre goal will require a shift from existing enrollment trends as the participation level in any region approaches its acreage ceiling. Thus, we based our final 1990 projections on the enrollment trend of the first six signups modified to account for the distribution of remaining available cropland. This method projects greater CRP enrollment in the Corn Belt and other low participation regions than simple extrapolation of existing enrollment patterns would indicate.

From 1991 through 1995, we assumed that CRP enrollment would remain constant at final 1990 levels. Starting in 1996, however, land that was initially

Figure 2
Conservation Reserve Program enrollment by farm production region, through Feb. 1989

1 dot equals 1,000 acres.

30.59 million acres enrollment through February 1989.

retired under the CRP will no longer be eligible for CRP rental payments and will progressively be available to return to crop production. Much of this land will be subject to the conservation compliance provisions of the Food Security Act of 1985. If farmers return this land to crop production, they must adopt soil conservation practices approved in a conservation plan or forgo participation in USDA commodity programs. Because technological advances in soil conservation practices and changes in commodity programs and prices are difficult to project, we assumed that CRP land planted to trees would remain in retirement and land not planted to trees would return to crop production. This relatively conservative assumption has little effect on the estimated effects of the CRP.

Gross Economic Effects of the CRP

Estimates of the gross economic effects of the CRP presented in this section summarize the results of coordinated studies of specific program effects (2, 4, 5).[3] Because interest should focus on effects resulting exclusively from implementing the program, we uniformly compared CRP effects with a baseline situation without the CRP. Estimates of the CRP's economic effects depend critically upon the assumptions of the baseline, particularly with respect to assumed levels of other supply control programs such as acreage reduction programs (ARP's) or paid land diversions (PLD's). Because agricultural programs and policies that would have occurred without the CRP are unknown, there is no single correct baseline scenario.

For this analysis, we assumed that the baseline would include ARP and PLD requirements identical to maximum levels allowed by current legislation. We adopted this assumption because no consensus existed on the level of supply control that would have occurred in the absence of the CRP or on the mix of other programs (loan rates, target prices, and annual PLD payment rates) needed to achieve a similar level of supply control. An equally valid but different baseline would expand ARP and PLD levels in the absence of the CRP to achieve supply control identical to that provided by the CRP. However, identifying and estimating the economic effects of this expanded ARP/PLD situation would be difficult and would have necessitated numerous arbitrary assumptions. Had we adopted this alternative baseline, the resulting estimates of the CRP's economic effects would probably have been different from those we present in this chapter.

[3]All estimates of gross economic effects are reported as the present value of the effect discounted over the life of the program using a 4-percent interest rate.

Diverting 45 million acres from crop production will create various economic effects. The major effects are lower crop production accompanied by increased commodity prices, less damage to the environment and to soil productivity because of reduced erosion, lower Government outlays for commodity programs, and negative effects on localized rural economies where enrollment is heavy.

Agricultural Sector Effects

CRP diverts land from active cultivation. If the land enrolled in the CRP would have been in crop production without the CRP, less land is available to produce crops, total production declines, and the stock of commodities stored for future use drops. Decreased production of commodities results in higher commodity prices and fewer purchases of manufactured agricultural inputs.

Several factors determine the extent of production and price adjustments. First, farmers electing to retire land by means of the CRP will tend to enroll their least productive highly erodible cropland. Therefore, on a percentage basis, the reduction in the total production of commodities will be less than the reduction in acres. Second, because farmers must also retire a portion of their crop base as a condition of CRP participation, some of the land that is enrolled would otherwise have been idle under ARP and PLD. Third, as total production declines, the prices of agricultural commodities will rise. Price increases will be greatest for those commodities whose demand is minimally affected by changes in price. As commodity prices rise, farmers will generally tend to expand production within the limits of existing commodity programs. To the extent that production or supply expands, the net increases in commodity prices are moderated.

The net returns to agricultural production change as total production declines, prices rise, and farmers receive CRP rental payments and incur CRP establishment costs. Because demand for agricultural commodities is minimally affected by price rises, constraining production can increase total revenue as prices rise. Total production costs fall because less land is used for agricultural production. Thus, the CRP would probably increase agricultural net returns. CRP rental payments to farmers will also increase net farm income, which will be partially offset by the farmer's share of vegetative cover establishment costs. If land enrolled in the CRP is planted to trees, the net future harvest value of the trees increases the landowner's net wealth.

The value of net farm income over the 15-year life of the CRP (present value) using these assumptions, excluding direct rental payments and establishment-cost shares paid to farmers, will probably increase by $20.3 billion because of the CRP. About 85 percent of this increase occurs after 1992 when projected commodity prices will rise sharply. After 1995, as some

of the land initially enrolled in the CRP comes back into production, net farm income begins to decline because of declining crop prices. Under a more conservative assumption that market prices do not increase over projected 1992 levels, the present value of net farm income increases by only $9.2 billion.

Farm programs that are tied to production also affect land values. Farm programs that increase net farm income tend to increase the value of cropland. To the extent that land values rise due to CRP-induced net farm income increases, landowners may gain from the program. However, in a competitive land market, increases in the value of land caused by the CRP would equal the present value of CRP increases in farm returns. Because this chapter estimates the increase in net farm income separately, to include the increase in land values when evaluating the overall performance of the CRP would double-count the effects of the CRP on farm income (6).

Timber Production

Cropland planted to trees under the CRP provides a potential increase in income to landowners when those trees are harvested. For this analysis, we assumed that 2.7-3.5 million acres of land enrolled in the CRP would be planted to trees with the majority in the Southeast and Delta regions.

Over a 45-year period, an average acre enrolled in the CRP that is planted to trees could produce 7,400 cubic feet of commercial wood (6). Thus, 2.7-3.5 million acres planted to trees could produce 20-25.9 billion cubic feet of wood over the same time span. We estimated the present value of an acre of trees to be over $2,040 at a 4-percent interest rate, and the present value of maintenance and harvesting costs to be $210 per acre. Information from the first six CRP signups suggests that the farmer's share of tree establishment costs averaged about $37 per acre. If we assume that 85 percent of the 2.7-3.5 million acres of CRP trees will be maintained until mature harvest, the net present value of CRP trees would be $4.1-$5.4 billion. This figure is an upper-bound estimate because we assumed that all tree acres would be carried through a 45-year production period and that owners would thin and harvest only during scheduled years.

Consumer Costs

The CRP increases consumer food costs by restricting agricultural production, thus raising prices of agricultural commodities. However, a 1-cent increase in crop prices does not result in a 1-cent increase in consumer food costs because farm prices are less than 30 percent of the average retail price of food. We estimated that consumer food costs will increase by less than 1 percent in any

year as a result of a 45-million-acre CRP. We estimated the present value of CRP-related increases in consumer costs, which will peak around 1995, to be $25.2 billion over the program's life. If USDA policymakers act to prevent large CRP-induced commodity price increases projected to begin around 1992 by changing ARP's, the rise in consumer food costs would be less. Under this assumption, we estimated the net present value of the increase in food expenditures to be $12.7 billion.

Natural Resource Effects

Five of the seven goals of the CRP aim at protecting natural resources and environmental quality. The primary goal is the reduction of wind and water erosion. Estimates of natural resource effects vary regionally and depend on estimates of the regional distribution of cropland retired and reductions in erosion levels.

Effect on Erosion

The 1985 Act establishing the CRP emphasized removing the most erodible cultivated cropland from production. The longrun average annual rate of erosion reduction for all land enrolled in the first seven signups was about 20 tons per acre, compared with a national average cropland erosion rate of 7 tons per acre. Land that enters crop production, resulting from CRP-induced increases in commodity prices, produces little new erosion because of the sodbuster provision of the 1985 Act. That provision denies commodity program benefits to farmers who produce an agricultural commodity on highly erodible land not in production in 1981-85 unless they first adopt a soil conservation plan approved by the local soil conservation district.

As more acres are enrolled in the CRP, the average erosion reduction rate will lessen because the additional land will be less erosive. Erosion on land enrolled in the first two signups was reduced by an average of 26-27 tons per acre per year. That average declined to 17-18 tons of reduced erosion for land enrolled in the sixth and seventh signups. The entire 45-million-acre CRP will probably reduce erosion by about 17 tons per acre per year, or about 800 million tons (6).

Effect on Soil Productivity

Because the CRP is targeted to highly erodible soils, retiring these lands preserves their future productive capacity. Over time, excessive erosion reduces crop yields by diminishing water-holding capacity and water infiltration rates and by increasing nutrient losses. Increasing fertilizer application rates may mitigate nutrient losses but will not restore potentially

permanent yield loss associated with diminished water-holding capacity. Conserving soil reduces longrun yield loss and fertilizer cost increases. Our estimates show that soil productivity benefits to society for the 45-million-acre CRP would be $0.8-$2.4 billion, with $1.6 billion as most likely. Higher soil productivity in the Corn Belt and the Lake States gives these regions greater productivity benefits under projected enrollment than the Mountain and Northern Plains regions, which have more acres enrolled.

Effect on Water Quality

Agricultural activities generate a number of residuals that can be carried into waterways by runoff. Once there, these residuals can have detrimental effects on water uses. Major residuals include nutrients from chemical fertilizers and animal manure (primarily nitrogen and phosphorus), pesticides, and sediment. Sediment washing off cropland and into waterways can fill reservoirs, block navigation channels, interfere with water conveyance systems, affect aquatic plant life, and degrade recreational resources. Excessive amounts of nutrients in surface waters can accelerate the growth of aquatic vegetation, reducing fish populations and degrading recreational resources. Nutrients that leach into ground water can contaminate drinking water supplies. Pesticides in sufficient quantities can be harmful if consumed by humans or aquatic organisms.

The CRP will influence both surface and ground water quality. Offsite surface water quality benefits from reduced erosion and nutrient use on cropland due to the CRP amount to an estimated $1.9-$5.3 billion. Per acre benefits varied widely among regions, ranging from $30 per acre for the Northern Plains to $250 per acre for the Delta region. Per acre benefits depend on per acre erosion reductions on land enrolled, on the amount of sediment deposited in bodies of water, and on the demand for water services indicated by the damages per ton of erosion.

CRP eligibility was expanded, beginning with the February 1988 signup, to include filter strips adjacent (within about 100 feet) to streams, lakes, and estuaries and other permanent bodies of water. Trees or grass planted on these areas filter sediment and nutrients from runoff water, thus substantially contributing to improved water quality. Of the 3.4 million acres enrolled during the sixth signup, over 16,000 acres were in filter strips. Assuming that the proportion of land in filter strips remains constant for the remainder of the signups, about 100,000 acres of filter strips would be established in the CRP. Converting 100,000 acres to filter strips would add less than $300 million of surface water quality benefits, with $200 million estimated as most likely. Over 50 percent of these benefits occur in the Pacific, Corn Belt, and Mountain regions.

Retiring cropland through the CRP may also lead to improved ground water quality. Because the land is taken out of crop production, applications of agrichemicals to the soil are restricted, thereby lessening the amount that leaches into ground water. The economic benefits will probably be small. Highly erodible cropland has high runoff of water and soil particles which carry away many of the excess agrichemicals that degrade ground water quality. When water runs off the surface, it does not leach pollutants to ground water (2). We were unable to measure the economic benefits of ground water improvement attributable to the CRP because there is no methodology available for use in assigning a value to changes in ground water quality.

Effect on Wildlife

Acres enrolled in the CRP can provide high-quality habitat for wildlife associated with agricultural land. Species often use grassy areas close to cropland for nesting cover, food, winter cover, and corridors for movement. The new grassland habitat created by the CRP should increase farmland wildlife populations. People who engage in wildlife-related recreational activities, such as hunting, benefit most from these population increases. The net present value to small game hunters produced by the CRP is estimated at $3-$4.7 billion.

Effect on Wind Erosion

Many areas of the Western United States have little rainfall, frequent drought, and relatively high wind velocities. These conditions, combined with fine soils, sparse vegetative cover, and agricultural activity, make some areas susceptible to wind erosion. Wind erosion contributes significantly to particulate air pollution in some regions of the arid Southwest and Great Plains. In rural areas, wind erosion can also produce short-term particulate loads that exceed urban levels, increasing maintenance and cleaning costs for households and businesses, damaging nonfarm machinery, and creating harmful health effects. Wind erosion benefits, based on a full 45-million-acre CRP, were estimated at $0.4-$1.1 billion. However, reliable estimates of the economic benefits from reduced wind erosion are difficult to develop from available information. Estimates of wind erosion are generally regarded as less reliable than estimates of water erosion.

Government Budgetary Effects

Implementing a program such as the CRP affects the USDA budget in two ways. There are direct costs to the Federal Treasury associated with operating the program, and there are cost savings that accrue to the CCC. Direct CRP program costs include:

- Payment of rents for 10 years to participating farmers,
- A share of the one-time cover establishment costs,
- Technical assistance costs associated with verifying field eligibility and with designing conservation practices, and
- Program administration costs.

Direct program costs will be about $21.5-$22.8 billion over the 15-year life of the CRP, with rental costs being the largest component at about $19.5 billion. Rental costs will be greatest between 1990-95 when the full 45 million acres of cropland are retired.

Assuming that CRP land having base acreage (except for ARP's and PLD's) would have been in production in the absence of the CRP, cost savings accrue to the CCC when program cropland is removed from use. We estimated the direct deficiency payment savings from retired cropland to be $10.2-$12.2 billion. We also estimated that the CCC will indirectly save $6-$7.3 billion on remaining program acreage from rises in market prices of program crops because of the CRP. Thus, the CCC may realize direct and indirect cost savings of $16.2-$19.5 billion from retiring program crop base in the CRP. There would be reduced CCC commodity program cost savings under a baseline scenario in which ARP and PLD levels were expanded in the absence of the CRP to achieve alternative supply control. However, the CCC would incur costs to attain this expanded supply control. To reach the supply control objective, farmers must be compensated as an inducement to participate in the program. This inducement could be a PLD, or target payments could be increased to improve the attractiveness of participating in the commodity program with higher ARP's.

Net Economic Effects of the CRP

To evaluate the net economic effects of the CRP, one must distinguish among the program's various gross effects. Some effects, such as decreased crop production and reduced soil erosion damages, represent changes in the quantity or quality of goods and services that make up total national income. Others, including reduced costs for Government commodity programs, do not represent changes to real goods or services but rather are adjustments in transfer payments between sectors of the economy. This distinction determined the way we combined the economic effects of the CRP under three different evaluation perspectives.

The first evaluation perspective focused on the net effect that the CRP will have on total national income in the present and near future. This perspective, sometimes referred to as economic efficiency or benefit-cost analysis, included only program effects which change the quantity or quality of real goods and services. Results of this perspective indicate whether the social benefits of the program warrant the social costs.

The second evaluation perspective focused on the net Government financial effect of the CRP. To evaluate the program from this perspective, we considered Government expense savings and new expenses specifically attributable to the CRP. Whether there was a real effect on goods, services, or resources was unimportant so long as there was an effect on the Federal treasury. This perspective has become important because of general concerns over the macroeconomic effects of continuing Government budget deficits.

Finally, the third perspective presents a qualitative view of regional economic effects. This approach is important because CRP enrollment is uneven across regions and influences agricultural sectors differently within a region.

Net Effect on Total National Income

To estimate the full net national income effects of the CRP, one must weigh the estimated values for all real resource benefits and costs associated with the program against those that would occur if no program were in force. Real resource benefits would include:

- Increased farm income,
- Increased future supplies of timber,
- All improved environmental services, and
- Decreased costs of surplus commodity storage.

Real resource costs would include:

- Increased consumer food costs,
- Higher production costs from restructured production of crops,
- Administrative program costs such as cost-sharing for establishing vegetative cover and outlays for technical assistance,
- The farmer's share of vegetative cover establishment costs, and

- Unemployment or underemployment of immobile production and marketing resources caused by reduced crop production.

We were unable to estimate values for all of these benefits and costs. However, we did estimate the primary effects including changes in farm income, timber production, consumer costs, soil productivity, surface water quality (including filter strips), wildlife habitat, wind erosion, administrative costs, costs for establishing vegetative cover, and technical assistance costs. Using these estimates, we estimated that the present value of net benefits for a 45-million-acre CRP would be $3.4-$11 billion.

This estimate of CRP net economic benefit should only be regarded as an approximation of the true net benefit of the program for several reasons. First, because of the methods used for analysis, the estimated effects on farm income and consumer costs do not exclusively reflect changes in economic welfare. Second, we could not estimate all economic effects of the CRP. For example, potential economic effects resulting from changes in ground water quality, surplus crop costs, and unemployment or underemployment of production resources are not included. Third, the effects we did estimate depend to varying degrees on the assumptions of the no-CRP baseline situation. Our baseline assumed that in the absence of the CRP, ARP and PLD levels would remain at the legislated maximums that were in effect at the time of the analysis. Under alternative baseline assumptions, the magnitude of the estimated effects on net farm income and consumer food costs would change the most, while the size of the other effects would probably be altered to a lesser degree. However, because net farm income and consumer food cost effects are largely offsetting, different baseline assumptions would probably not significantly change the CRP's estimated net economic benefit.

Net Effect on Government Expenses

A complete accounting of the CRP's effect on Government expenses should compare Government expense savings and new expenses attributable to the CRP with Government expenses incurred if there were no CRP. CRP-generated cost savings to the Government include:

- Reduced commodity price support payments because some land (base acreage) is taken out of production,
- Reduced commodity price support payments due to market price rises, thereby decreasing Government support payments on remaining production,
- Fewer outlays to transport, store, and subsidize exports of surplus commodities, and

- Lowered administrative expenses for commodity programs and non-CRP conservation programs when land is enrolled in the CRP.

New Government expenses associated with the CRP include:

- Annual rent payments to CRP participants,
- The Government's share of vegetative cover establishment costs, and
- Administrative resources required to implement and enforce CRP.

These changes in Government expenditures mainly represent adjustments in the flow of payments between taxpayers and Government or between different Government programs. Except for transportation, storage, export subsidy costs, cost sharing for vegetative cover establishment, administrative costs, and technical assistance, they do not overlap with the national income framework. We estimate that net Government expenses may increase by $2-$6.6 billion as a result of a 45-million-acre CRP.

Our estimate of the net Government expense of the CRP is only one approximation of the true net Government expense of the program. As with the net economic benefit estimate, we could not estimate all potential Government cost effects of the CRP. Estimates of Government cost effects are greatly influenced by ARP levels that we assumed in the no-CRP baseline situation. Different assumptions about the level of ARP's in the absence of the CRP will result in different estimates of net Government expense.

For example, Barbarika and Langley estimated after the 1988 drought that the present value of the CRP's net Government expense would be about $9.7 billion (1). They used a similar set of models, but they used different assumptions concerning expected supply-demand-price and CCC program conditions than we did. They assumed lower commodity stock levels, higher market prices, lower ARP/PLD levels, and lower CCC program expenditures resulting from the 1988 drought. The most important factor, however, is that Barbarika and Langley assumed that ARP/PLD levels would have been higher in the absence of the CRP. These assumptions reduce the CCC cost savings attributable to the CRP and, thus, cause their estimate of net Government expense to be higher than ours.

Regional Economic Effects

The net effect of the CRP on regional economic activity is difficult to predict. Economic activity in industries linked either directly or indirectly with agricultural production will decline because of CRP reductions in cropped acreage and subsequent lower crop production. As the level of economic

activity associated with agricultural production declines, income in industries associated with agricultural production (such as farm input and food processing) will fall, leading to declining personal income and, therefore, household consumption. These effects will be concentrated in counties where agriculture is a dominant economic activity and where enrollment in the CRP is greatest. Conversely, local economic activity will benefit from the increased farm income associated with CRP rental payments and higher net farm income. To the extent that this increased farm income is spent locally, regional economic activity will benefit. A portion of this increase, however, will be spent outside the local economy, tempering local benefits.

The greatest regional economic effects of the CRP will probably occur in the agricultural production and inputs sectors where total income was estimated to fall by 3 percent and 2 percent (3).

The CRP most affects the economies of regions where farm-dependent counties and high rates of enrollment predominate. High enrollment rates will probably influence the economies of the Northern Plains, Southern Plains, and Mountain States. Even though enrollment rates will be lower in the Lake States and the Corn Belt, the retirement of more highly productive land in these regions will also affect their economies. The CRP will influence even more the economic activity of smaller, more agriculturally dependent areas.

Summary

Retirement of 45 million acres of cropland from production under the CRP will influence the Nation's rural economy. As land is removed from cultivation, total crop production will decline, commodity prices will increase, and soil erosion will decrease. These changes will increase net farm income, land values, future farmer income from sale of forest products, and consumer food costs, will improve water quality and wildlife values, and will lower wind erosion damages. The Federal Government's CRP rental costs, share of the cost of establishing cover, and technical assistance costs will be partially offset by decreased CCC outlays for surplus commodities. As purchases of inputs for agricultural production and sales of agricultural products decline, income in related sectors of rural economies will also decline.

The current value of net benefits of a 45-million-acre CRP could be $3.4-$11 billion, based on the estimates of CRP effects presented. This range indicates uncertainty over the exact magnitude of the social benefits of the program. However, the estimated economic effects of the CRP suggest that the benefits of the CRP probably justify its costs. The CRP may increase Government expenses by $2-$6.6 billion over the life of the program. Finally, economic activity in industries linked either directly or indirectly with agricultural

production will decline as a result of acreage reductions and subsequent declines in production resulting from the CRP. These effects will tend to be concentrated in counties where agriculture is a dominant economic activity and where enrollment in the CRP is greatest, although farm income from CRP rental payments and increased farm income and land values may moderate the declines.

Our estimates of the net economic benefit and net Government expense of the CRP should be interpreted as approximations of the true effects of the program. These estimates include the primary effects of the program, but we could not estimate all potential effects. Also, the choice of assumptions in the no-CRP baseline situation influences estimates of the net economic benefit and net Government expense of the CRP. All CRP effects are measured with respect to this baseline. Different assumptions about the level of ARP's in the absence of the CRP, in particular, will lead to different estimates. We believe that the net economic benefits of the CRP will vary less than net Government expenses in response to changing baseline assumptions.

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Chapter 10

Supply Control Programs for Agriculture

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Supply control programs are among those the Federal Government uses to balance supply and demand for certain commodities and to support prices and farm income. These programs are both short run and long run and are usually combined with other domestic commodity programs that provide incentives to overproduce and depress prices. Restricting production controls supplies and supports prices. Mandatory controls, still used for tobacco and peanuts, have been discontinued for other crops. Acreage diversion, acreage set-aside, and acreage limitation programs have been used to reduce surpluses of program crops. Long-term conservation programs that remove fragile land from production to reduce erosion may also address the underlying problem of excess capacity. Voluntary dairy supply control programs are relatively new, and their effects apparently are very short run.

U.S. farm policy is a complex and highly integrated complement of programs designed to achieve certain primary objectives, such as maintaining commodity prices and incomes, ensuring the continued economic health of the farm sector, and maintaining adequate food supplies at stable prices. The primary objectives for Government intervention into the agricultural sector have not changed radically over time. However, the agriculture sector itself and the economic and technological environment in which agricultural programs are made and implemented have changed dramatically.

Supply control has been a component of agricultural policy since the 1930's. Supply control programs can be either short run or long run. Longrun adjustment programs focus on removing cropland from production for substantial periods of time for conservation or economic reasons. Shortrun programs annually attempt to correct for current supply/demand imbalances.

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Federal supply control programs tend to shift emphasis between shortrun and longrun policies, often in response to a changing economy.

The approach to supply control has also varied over time between emphasis on two at times conflicting goals: keep agricultural production in line with anticipated needs and give producers more opportunity to decide what and how much to produce on their farms. At times, the Government has tried to balance domestic production with anticipated needs by imposing highly restrictive, mandatory programs. At other times, producers' interest in added flexibility in decisionmaking has led to legislation that authorized less restrictive voluntary programs.

Like the larger complement of agricultural policies, supply control programs and policies have evolved in response to the changing nature of agriculture and to the broader economic environment. This chapter focuses on supply control policies in U.S. agriculture, their evolution, current use, and the issues that surround such policies.

Setting the Scene for Supply Control

Before World War I, most U.S. agricultural policies encouraged investments in the farm sector so that it could produce more food and fiber. Landmark laws included the Homestead Act, which pushed the farm sector westward; the Morrill Act, which established the land-grant research institutions; and the Hatch Act, which established experiment stations. Those laws all advocated improved efficiency and productivity of U.S. agriculture (14, 15).[1] The outbreak of World War I created greater demands for U.S. food and fiber, and farm prices and incomes rose in response. The stage was set for further expansion in U.S. agriculture.

After World War I, the export market weakened as European countries promoted their domestic farm sectors. As prices weakened, farm income dropped. During the 1920's, the U.S. farm sector weakened, but production expanded despite declining prices and incomes (37).

Attempts to control marketings through cooperatives to obtain higher prices gained momentum in the 1920's. The Capper-Volstead Act of 1922 exempted farmers' cooperatives from antitrust laws (14). Cooperatives proliferated, but they could not keep prices up as farmers continued to increase production. Hybrid varieties and mechanized power, the fruits of earlier Government

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

investment, increased productivity and further aggravated the oversupply situation. Producers, cooperatives, and other farm groups were unable to solve the "farm problem" and, consequently, they appealed to the Government for assistance.

The Agricultural Marketing Act of 1929 established the Federal Marketing Board (11, 32). The act was an early effort to restrict supplies to the market and boost farm prices. Congress gave the board $500 million to purchase excess supplies to strengthen prices for cotton and wheat. The board's requests for farmers to voluntarily limit plantings proved ineffective. The inability to control production and the Great Depression essentially bankrupted the Board by June 1932. Thus, policymakers recognized very early that supply control without a system to regulate acreages or quantities or without consistent price and stock management objectives was costly and ineffective.

Evolution of Supply Control Programs

The Agricultural Adjustment Act of 1933 was the forerunner of current supply management programs (11, 30, 32). Its major thrust was to reverse the decline of commodity prices and farm incomes by controlling supplies. The act was intended to support prices, restrict production, and fund the program from revenues earned by a tax imposed on processors of agricultural commodities. The act authorized voluntary reductions in acreage in basic crops through agreements with producers and direct payments for participation in acreage control programs and regulated marketing through voluntary agreements with processors, producer associations, and other handlers of agricultural commodities.

The basic commodities designated in the act were wheat, cotton, field corn, rice, tobacco, hogs, and milk and its products. Amendments passed in 1934 and 1935 expanded the list to include rye, flax, barley, grain sorghum, peanuts, cattle, sugar cane, sugar beets, and potatoes.

Commodity-specific acreage reduction programs were implemented for wheat, corn, peanuts, rice, tobacco, cotton, and sugar crops through 1935. Production control programs were supplemented by marketing agreement programs for tobacco and rice and for peanuts before being designated a basic commodity in 1934. The act, for the first time, effectively tied eligibility for price support to restrictions on acreage planted, quantities sold, or both.

The 1933 Act successfully improved net farm income.[2] Income increased 250 percent from the dismal $2 billion in 1932 (37). Acreage for harvested crops

[2]Before 1958, net farm income statistics cited here did not include inventory changes.

declined 13 percent. Wheat acreage dropped 12 percent, corn acreage 10 percent, and cotton more than 25 percent. A drought in 1934 also helped reduce stocks. Inventories had declined, and prices had risen by the end of 1935. For some commodities, prices were twice their 1932 level. Supply control proved to be effective in supporting prices and farm income.

In January 1936, the Supreme Court ruled that the supply control features of the 1933 Act were unconstitutional and voided the use of processing taxes to fund the program. The ruling left the Government without a workable supply control program. In response, Congress passed the Soil Conservation and Domestic Allotment Act in February 1936.

The 1936 Act reestablished the Government's authority to entice farmers to idle land by offering longer term soil conservation payments to farmers for shifting acreage from "soil-depleting" crops to "soil-conserving" crops (11, 30, 32). "Soil-depleting" crops were cash crops, such as wheat, cotton, corn, tobacco, and sugar beets, which were in excess supply. "Soil-conserving" crops were grasses and legumes. But, the supply control program tools lost their focus on specific commodities. The "soil-depleting" crops were lumped together in a general "soil-depleting base." The program implementing the act did not sufficiently control output, particularly for crops such as wheat and cotton. Inventories grew, and prices dropped again. Nevertheless, the basic elements of short-term and long-term supply adjustment programs were established by 1936.

The Agricultural Adjustment Act of 1938 broadened and strengthened the 1936 Act by increasing the Government's role in commodity markets (11, 30, 32). The new legislation returned the commodity-specific focus to attempts to control supply. The act authorized acreage allotments for corn, cotton, rice, and wheat. Other legislation covered tobacco allotments.[3] The act required the Secretary of Agriculture to announce acreage allotments, defining the national acreage allotment as the acreage necessary to satisfy domestic and export demand. Allotments were proportioned to individual farms according to past planting history. Acreage allotments restricted production by limiting the number of acres a farmer could plant for harvest and still receive price supports.

Because of difficulties in controlling production with acreage allotments, Congress provided an additional supply management tool, marketing quotas. The 1938 Act designated quotas for tobacco, corn, wheat, cotton, and rice. Congress added peanuts in 1941. When supplies were expected to exceed specified levels, the Secretary was required to proclaim a national marketing

[3]The 1933 Act originated the designation of "acreage allotment." That provision was the basis from which voluntary reductions were made under that act.

quota for designated crops (29). The quotas would take effect only when approved by a two-thirds majority of the eligible producers voting in a referendum and if approved, were mandatory for all producers.

The marketing quota essentially restricted production by limiting the amount of a commodity a producer could sell. The national marketing quota for a given commodity was established and prorated to producers in the same fashion as that for acreage allotments.

The Secretary could use acreage allotments, with or without marketing quotas, to bring supply of specified commodities in line with requirements (31). When used without marketing quotas, acreage allotments restrict production by limiting the number of acres a producer can plant for harvest and still receive price support. When used with marketing quotas, acreage allotments are also the basis for determining the amount that each farmer may market or have available for market without penalty. The Government seemingly had the tools to control both acreage and quantities, but the programs met with mixed success. Growers did not always approve referendums authorizing marketing quotas. For example, although marketing quotas were proclaimed for cotton, rice, and tobacco for the 1939-40 marketing years, only cotton quotas became effective. The large number of producers, particularly for grains, also made enforcement difficult.

Acreage allotments for corn and acreage allotments or marketing quotas or both for cotton, tobacco, and wheat effectively reduced acreage planted during the years they were in effect, however. Wheat acreage dropped from 80 million acres in 1937 to 62 million in 1941, corn acreage from 102 million in 1936 to 87 million in 1941, and cotton acreage from 34 million in 1937 to 22 million in 1941.

Despite the success observed in contracting acreage, production did not decline as much. Production of corn, for example, remained stable at 2.2-2.4 billion bushels despite a 10-percent decline in acreage. Wheat production increased 50 million bushels over the period despite the 20-percent drop in acreage. Because of increasing yields, programs that controlled acreage did not effectively control production. Increasing productivity, technological innovation, and more intensive production practices exacerbated the supply problem.

Continued higher farm production after 1937 resulted in a decline in commodity prices of about 20 percent from 1938 through 1940. Only nonrecourse loans and payments helped prevent a more drastic decline in farm income. Direct Government payments peaked at 35 percent of net cash income in 1939. Net farm income stabilized at about $4.3 billion during 1938-40 (37).

The outbreak of World War II brought relief to concerns over rising stock levels (30, 32). Inventories of commodities owned by the Commodity Credit Corporation (CCC) became military reserves and troublesome inventories were drawn down. Commodity prices stopped falling, and planted acreage began rising. By 1941, farm prices and incomes began to increase in response to the war economy.

The collapse of commodity prices after World War I was an experience legislators did not want to repeat after World War II. Thus, the Steagall Amendment of 1941 extended high price supports for 2 years after the war ended (30, 32). Later legislation eventually led to the support of prices at 90 percent of parity through 1950. (See the Glossary, page 383, for a discussion of parity prices.)

The 1950's brought other problems. For example, commodity prices, supported at high levels after World War II, enticed farmers to produce. Inventories rose immediately after the War but declined during the Korean war. However, stockpiles, especially those carried by the CCC, began to grow once the Korean war ended in 1953. The specter of surpluses and the need to control supply again dominated agricultural policymaking. The Secretary of Agriculture announced marketing quotas in 1954 for wheat and cotton (30, 32). The major types of tobacco and peanuts continued under marketing quotas, and corn acreage allotments were reinstated in 1954.

By the mid-1950's, with production continuing to outstrip requirements and surpluses growing, Congress and the administration felt that a larger acreage reduction program was necessary. The Agricultural Act of 1956 created the Soil Bank Program of long- and short-term removal of land from production (30, 32). The program consisted of an annual acreage reserve and a long-term conservation reserve. Farmers reduced land planted to crops below established allotments or bases and received payments for diverting acreage to conserving uses. Plantings again declined, but yield growth tempered production adjustments. The program ended in 1958 because of its high cost and its failure to significantly reduce production. Payments to farmers exceeded $1 billion in both 1957 and 1958, a fivefold increase from the level of 1949. Nonetheless, long-term retirement totaled 22.5 million acres in 1959. During 1955-59, farmers idled 12-17 million acres in the annual supply management programs.

Agricultural legislation proliferated during the early 1960's. Of particular note was a movement toward voluntary programs. Farmers felt that many of the mandatory programs based on the 1938 Act (allotments and marketing quotas), denied their flexibility in decisionmaking. The Agricultural Act of 1961 authorized voluntary acreage diversion programs to control the production of corn and sorghum (30, 32). Under this program, farmers had to divert at least

a required minimum of their feed grain base acres to be eligible for support payments. For some years, an optional paid land diversion was offered to encourage producers to idle more land. The act also required wheat producers to reduce acreage by 10 percent of their farm allotment with the option of payments for additional reductions.

The Cropland Conversion Program of 1962 provided for the conversion of land used for the production of surplus crops to long-range income-producing uses, such as forests, grasses, water storage (dams), wildlife habitats, or recreational facilities (30, 32). The program operated through 1967, with agreements lasting up to 10 years.

The Agricultural Act of 1964 established a voluntary wheat program similar to that for feed grains (30, 32). Growers who complied with their allotment and voluntarily reduced acreage received benefits. Growers also received marketing certificates whose value depended on domestic and export use.

The Food and Agricultural Act of 1965 eliminated marketing quotas and extended voluntary acreage controls to Upland cotton (27, 31). Also, the Cropland Adjustment Program was offered on a limited scale in 1966 and 1967, with agreements lasting up to 10 years. This program provided for more open space and other recreational opportunities for urban areas. Throughout the 1960's, an average of 19.2 million acres were idled annually under long-term programs, and 33.4 million acres were idled annually under short-term programs. By the close of the decade, short-term programs dominated long-term conservation programs as the primary component of supply control. The number of acres idled in the short run exceeded those idled for longer terms by nearly 650 percent in 1969. Not until the 1980's would long-term programs again play a significant role in supply control.

The 1965 Act also addressed surplus milk production. Producers in a milk marketing area were each given a fluid milk base, determined by their respective marketings in the base period. A producer, holding a base, could reduce marketings without adversely affecting the determination of future base. Thus, producers no longer had to maintain maximum production to preserve their participation (base) in the market for fluid milk.[4] Producers received the higher "fluid milk price" on the base rather than a "blend price" on all production. Milk produced above the base was priced at the lower "manufacturing" level.

[4]The planting requirement for program crops did not change. Producers of wheat, feed grains, and Upland cotton who planted less than 90 percent of the acreage allotment to the crop or an eligible substitute lost a portion (up to 20 percent) of it the following year equivalent to the percentage underplanted. Failure to plant in 3 consecutive years would result in a loss of the allotment.

The growth in agricultural productivity eroded the effectiveness of acreage diversion programs in the 1960's in controlling crop supplies. By the 1970's, acreage diversion programs were considered too rigid, and farmers wanted more flexibility in their planting decisions for greater production efficiency. The Agricultural Act of 1970 authorized a set-aside program for grains and Upland cotton that eliminated individual crop-by-crop controls characteristic of past programs (30, 32). Except for maintaining set-aside and a conserving base (and limitations on those crops still under quota), farmers had no other restrictions on what they grew. However, set-aside programs did not sufficiently control supplies of individual crops in the short run and participation or enrollment in long-term programs was minimal. More flexibility for producers seemingly meant less production control for Government.

The Rice Production Act of 1975 extended voluntary acreage controls to rice and initiated target prices for the 1976 and 1977 crops (32). The act suspended marketing quotas.

Commodity shortages caused prices to soar in the early to mid-1970's. Consequently, supply controls were nonexistent between 1974 and 1977. However, the profitable period of the early 1970's, very low interest rates, and price supports based on cost of production provided a safety net under agricultural products that spurred expansion globally. But, acreage control programs again became necessary in 1978 and 1979. To better reflect the current environment, acreage programs under 1977 legislation required acreage idled to be a percentage of current plantings as opposed to historical bases and allotments. That requirement was meant to give producers some added flexibility in their planting decisions.

The peanut program became controversial because the minimum peanut allotment, increasing price support levels, and increasing yields resulted in surplus production and caused program costs to escalate. The 1977 Act introduced the two-tier price support program for quota peanuts and additional peanuts (12, 32, 34). Quota peanuts are those considered to be marketed from a farm and do not exceed the farm's poundage quota. Additional peanuts are those sold from a farm over quota or those marketed from a farm that has no quota. However, additionals are subject to restricted marketings (domestic nonedible and export). Both quota and additional peanuts have price supports; however, quota peanuts have a much higher level of support. The act set a minimum level for the national poundage quota that could be reduced by 5 percent each year.

More specific commodity control was required at the beginning of the 1980's. The Agriculture and Food Act of 1981 repealed the acreage allotment and marketing quota system for rice and authorized voluntary acreage controls (32). The 1981 Act authorized an acreage limitation program for wheat, feed

grains, rice, and Upland cotton. The act established an acreage "base" (acreage considered planted to a program crop in the year immediately preceding the year for which the determination is made) for each program crop. The planting restriction under an acreage limitation program was determined by applying a percentage reduction to the respective crop base for which the program was offered. This legislation returned a commodity-specific focus to supply control programs and allowed the Secretary to specify reductions for each program crop (which was particularly necessary for wheat since stocks were growing).

The surplus grain problem led to the Payment-in-Kind (PIK) Program of 1983. This program removed 78 million acres from production, the largest single-year removal of acreage up to that time (32). The PIK program and drought, which just happened to occur the same year, reduced inventories and increased market prices. However, stocks began to increase again in 1984. The Extra Long Staple Cotton Act of 1983 eliminated marketing quotas and acreage allotments and authorized voluntary acreage controls and target prices (32).

The Dairy and Tobacco Adjustment Act of 1983 authorized a milk diversion program (32). Producers who reduced their milk marketings 5-30 percent below their base production for 1981-82 or 1982 were paid $10 per hundred-weight of reduction. Table 1 summarizes annual production programs since 1945. Table 2 presents cropland planted and idled under various programs since 1955.

Current Supply Control Programs

By 1985, the supply control elements of farm programs were effectively tied to price support and stock control elements. The Food Security Act of 1985 authorized two new supply control programs, milk production termination and conservation reserve programs (8). The act also incorporated conservation compliance, "sodbuster," and "swampbuster" provisions in crop programs to more closely coordinate the operations of crop support and conservation programs. The act's supply control programs include acreage allotments, marketing quotas, paid land diversion, set-aside and acreage reduction programs, Conservation Reserve Program, milk diversion, and milk production termination programs.

Acreage Allotments and Marketing Quotas

Marketing quotas affect the supply of burley tobacco, and both marketing quotas and allotments affect flue-cured tobacco. Acreage allotments (without

Table 1—Acreage allotments, marketing quotas, acreage bases, and program acreages for basic crops

Crop	1945	1946-47	1948	1949	1950	1951	1952-53	1954	1955	1956
Wheat [1]	N	N	N	N	A	A [2]	N	M	M	M
Corn	N	N	N	N	A [3]	N [2]	N	A [3]	A [3]	A [4]
Cotton:										
Upland	N	N	N	N	M	N	N	M	M	M
Extra long staple	N	N	N	N	N	N	N	M	M	M
Rice	N	N	N	N	A	A [2]	N	N	M	M
Peanuts	N	N	M [5]	M	M	M	M	M	M	M
Tobacco	M	M	M	M	M	M	M	M	M	M

See footnotes at the end of table.

Continued—

Table 1—Acreage allotments, marketing quotas, acreage bases, and program acreages for basic crops—Continued

Crop	1957-58	1959-63	1964-73	1974-75	1976	1977	1978-79	1980-81	1982-83	1984-87
Wheat [1]	M	M [6]	A	A [7]	A [7]	A [7]	P [8]	P [9]	B [10]	B [10]
Corn	A [11]	B	B	A [7]	A [7]	A [7]	P [8]	P [9]	B [10]	B [10]
Cotton:										
Upland	M	M	A	A	A	A	P [8]	P [9]	B [10]	B [10]
Extra long staple	M	M	M	M	M	M	M	M	M	B [10]
Rice	M	M	M	A	A [7]	A [7]	A [7]	A [7]	B [10]	B [10]
Peanuts	M	M	M	M	M	M	M	M	M [12]	M
Tobacco	M	M	M [13]	M	M	M	M	M	M	M

A = Acreage allotments. B = Acreage bases. M = Marketing quotas. N = No production adjustment program. P = Program acreages.
[1] For 1964-70 crops, effective only in commercial wheat States, those with more than 25,000 planted acres. [2] For 1951, wheat and rice allotments were in effect for a time, but were terminated early in 1951; corn allotments were terminated before announcement of the actual allotment. [3] Effective only in the "commercial corn area" defined by law as all counties in which the average production of corn (excluding corn used as silage) during the 10 years immediately preceding the year for which such area is determined, after adjusting for abnormal weather conditions, is 450 bushels or more per farm and 4 bushels or more for each acre in the county. [4] Allotments used only in connection with price-support determination. [5] Terminated during year.
[6] Quotas on wheat voted out for 1963. [7] For payment purposes only, if necessary. [8] The Food and Agriculture Act of 1977 replaced allotments with national program acreage and normal crop acreage and terminated marketing quotas. [9] Normal crop acreage requirements not in effect. [10] According to the Agriculture and Food Act of 1981, national program acreage and normal crop acreage concepts are not applicable when an acreage reduction program is in effect. [11] Growers voted to end corn allotments in a referendum on November 25, 1958, replaced with base acreages. [12] Acreage allotments for 1982-85 peanut crops eliminated by the Agricultural and Food Act of 1981. However, poundage quotas for 1982-85 crops were approved in referendum vote, January 1982. [13] A poundage program for burley tobacco authorized by legislation approved April 14, 1971; farm marketing quotas established on a poundage basis rather than a marketing basis.
Source: (17, 18, 19, 20, 21, 22, 23, 24, 30).

Table 2—Acreage planted to principal crops and idled [1]

Crop year	Principal crops planted	Annual reduction	0/92, 50/92[2]	Long-term reduction	All idled	Total
			Million acres			
1955	349.4	0	0	0	0	349.4
1956	340.9	12.0	0	1.4	13.4	354.3
1957	329.5	21.4	0	6.4	27.8	357.3
1958	326.8	17.2	0	9.9	27.1	353.9
1959	327.8	0	0	22.5	22.5	350.3
1960	324.3	0	0	28.7	28.7	353.0
1961	308.1	25.2	0	28.5	53.7	361.8
1962	297.6	38.9	0	25.8	64.7	362.3
1963	299.2	31.7	0	24.4	56.1	355.3
1964	298.5	37.6	0	17.5	55.1	353.6
1965	297.2	41.9	0	14.4	56.3	353.5
1966	293.1	47.5	0	15.7	63.2	356.3
1967	305.8	25.2	0	15.6	40.8	346.6
1968	299.4	35.7	0	13.7	49.4	348.8
1969	291.2	50.2	0	7.8	58.0	349.2

See footnotes at the end of table.

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Table 2—Acreage planted to principal crops and idled [1]—Continued

Crop year	Principal crops planted	Annual reduction	0/92, 50/92[2]	Long-term reduction	All idled	Total
			Million acres			
1970	293.2	53.1	0	3.9	57.0	350.2
1971	305.8	33.8	0	3.4	37.2	343.0
1972	294.6	58.7	0	2.8	61.5	356.1
1973	318.4	16.3	0	2.8	19.1	337.5
1974	326.1	0	0	2.7	2.7	328.8
1975	332.2	0	0	2.4	2.4	334.6
1976	336.1	0	0	2.1	2.1	338.2
1977	344.9	0	0	1.0	1.0	345.9
1978	336.4	18.2	0	0	18.2	354.6
1979	345.8	13.0	0	0	13.0	358.8
1980	355.7	0	0	0	0	355.7
1981	363.2	0	0	0	0	363.2
1982	358.7	11.1	0	0	11.1	369.8
1983	309.5	77.9	0	0	77.9	387.4
1984	345.1	27.0	0	0	27.0	372.1
1985	342.2	30.7	0	0	30.7	372.9
1986	327.3	42.6	3.5	2.0	48.1	375.4
1987	305.1	53.2	7.0	15.7	75.9	381.0
1988	308.3	44.3	8.8	24.5	77.6	385.9

[1] Reported as of January 13, 1989. [2] Under the 0/92 rule, growers that plant between 0 and 92 percent of their permitted acreage and devote the remaining permitted acreage to a conserving use are eligible to receive deficiency payments on 92 percent of their permitted acreage. The 50/92 rule is similar, the only difference being that growers plant between 50 and 92 percent of their permitted acreage.

marketing quotas) are used for all other tobacco programs. Specific provisions of legislation (P.L. 99-272) enacted in 1986 were designed to make U.S. tobacco more price competitive in world markets (9). This legislation significantly changed the quota-setting procedure, price support levels, and no-net-cost assessments for burley and flue-cured tobacco.[5] These adjustments were necessary to reduce surplus tobacco stocks and make the no-net-cost aspect of the program effective. Between November 1985 and November 1987, unsold flue-cured loan stocks, excluding the 1987 crop, fell 48 percent to 398 million pounds, and unsold burley loan stocks fell 59 percent to 231 million pounds, demonstrating the effectiveness of the program in controlling supplies. With the depletion of surplus stocks, the Secretary set marketing quotas and allotments to allow increases in production since 1987 to keep leaf supply and demand in balance. Thus, quotas and allotments have been effective production control programs for tobacco.

As long as the peanut market continues to be stable, marketing poundage quotas will effectively maintain a balance between peanut supply and demand (34). The market has not experienced large changes in demand. With the limitations placed on just how much the quota can be adjusted annually, whether the program could react appropriately if a major shock to either demand or production occurs is unclear.

Set-Aside and Acreage Reduction Programs

The 1985 Act continued the authority for the Secretary to implement either acreage reduction programs (ARP) or set-aside programs for wheat and feed grains when supplies are excessive. However, the act authorizes only ARP's for cotton and rice. The 1985 Act clearly specified stock-based trigger levels for an acreage control program. The Secretary has discretionary ranges to set acreage reduction requirements for wheat and feed grains; a minimum level of acreage adjustment is required when carryover stocks are expected to exceed certain levels (table 3) (8). The Secretary will limit acreages if the total supply of such crop is likely to be excessive without a program (29).

The 1985 Act specified that an annual farm acreage base equals the total of the crop acreage base established for that farm for that year, the average acreage planted to soybeans on that farm in 1986 and subsequent years, and the

[5]The No-Net-Cost Tobacco Program Act of 1982 revised the tobacco program so that it would not cost the taxpayers anything beyond administrative costs. To be eligible for support, producers of all program varieties of tobacco must contribute to a fund established by the cooperative association that makes price support loans available to producers. The fund assessments are set to assure the program operates at no net cost.

average acreage devoted to conservation use other than ARP's on the farm in 1986 and subsequent years (8). The sum of the wheat, feed grain, Upland cotton, and rice acreage bases on any farm in any year cannot exceed the farm acreage base for that farm, unless the excess is due to an established practice of double cropping. Individual crop acreage bases can increase in any year by up to 10 percent of the farm acreage base. However, any increase must be offset by a decrease in one or more of the other crop bases on that farm, so that there is no change in the farm acreage base in that year. The 1981 Act did not define a farm acreage base.

Under the 1985 Act, program yields for 1986 and 1987 crops of wheat, feed grains, Upland cotton, and rice were held constant (average program yield of the farm during crop years 1981 through 1985, excluding the highest and the lowest yield) (8). For 1988 and 1989 crops, although the Secretary could have chosen to do otherwise, these program yields were held constant. This provision was included to help control Government outlays to agriculture, as deficiency payments depend in part on the level of program yields. Program yields for extra long staple cotton (based on the actual yields during the preceding 3 years, adjusted for abnormal yields resulting from conditions beyond the control of the producer) fluctuated (8).

Table 3—Wheat and feed grain acreage reduction programs

Crop year	Wheat: Allowable reduction with carryover stocks of--	
	1 billion bushels or less	Greater than 1 billion bushels
	Percent	
1986	0 - 15	15 - 22.5[1]
1987	0 - 20	20 - 27.5
1988-90	0 - 20	20 - 30.0

	Feed grains: Allowable reduction with corn carryover stocks of--	
	2 billion bushels or less	Greater than 2 billion bushels
	Percent	
1986	0 - 12.5	12.5 - 17.5[1]
1987-90	0 - 12.5	12.5 - 20.0

[1] A 2.5-percent paid land diversion was also required with payment-in-kind.

Recent acreage reduction programs have also included provisions (such as 50/92 and 0/92 rules) that allow farmers who plant less than their permitted acreage to receive deficiency payments on a portion of their underplanted acreage. These provisions were an attempt to encourage more idle acreage, encourage plantings of nonprogram crops, and to decouple planting decisions from program benefits.

Paid Land Diversion

If the Secretary determines that additional acreage reduction for a program crop is needed, the Secretary may offer producers a voluntary paid land diversion (PLD) program whether or not an acreage set-aside or reduction program is in effect (29). In some years, as in 1986, participation in the PLD has been required as part of the crop support program. In either case, such acreage must be devoted to approved conservation uses. The PLD payment can be made in cash, in kind, or in certificates that may be redeemed through the CCC for a specific commodity or any commodity.

Conservation Provisions

The conservation title of the 1985 Act attempts to link agricultural support to conservation issues. The act implements conservation compliance, "sodbuster," and "swampbuster" provisions for eligibility for program benefits. Conservation compliance applies to land where annually tilled crops were grown at least once during 1981-85 and will apply to all highly erodible land in annual production by 1990 (25). However, if such land is highly erodible, then the farmer must follow an approved conservation plan, or the land will be ineligible for program benefits. The sodbuster provision applies to highly erodible land that was not planted to crops during 1981-85 (25). The swampbuster provision, with some exceptions, applies to the conversion of natural wetlands to cropland use after December 23, 1985 (25).

Conservation Reserve Program

The conservation title also authorizes the Conservation Reserve Program (CRP). The goal of this program is to remove 40-45 million acres of highly erodible land from cultivation by 1990 (2, 25, 28, 36). Retiring acres will also help control the supplies of grains, soybeans, and cotton. Other goals include improved water quality, increased woodland resources, better habitat for fish and wildlife, and income support for farmers. The CRP differs from earlier reserves in that only cropland fields with highly erodible soils and an active erosion problem are eligible. The principal discretionary factors of the CRP are the eligibility requirements for participation including the definition of highly erodible cropland, bid pool size (including the delineation of the areas

to receive allotments for acreages accepted), and bid selection or weights given to each program objective. Producers who sign 10-year contracts agree to convert highly erodible cropland to approved conservation uses in exchange for rental payments and payments to share the cost of establishing conservation practices. Crop bases, quotas, and allotments are reduced by the ratio of cropland on the farm to acreage put into the reserve. The producer chooses which bases, quotas, or allotments to reduce. Table 4 presents crop acres accepted into the CRP through the seventh signup.

Dairy

The 1985 Act continued the authorization for milk diversion programs. Also, the act mandated a milk production termination program, a voluntary 18-month program that began April 1, 1986 (26). Under the terms of the act, producers could enter into contracts with the Commodity Credit Corporation by submitting bids to dispose of their entire dairy herds and terminate any interest they had in production of milk for a period of 3, 4, or 5 years; however, the Secretary announced only a 5-year program. The producer was

Table 4—Crop acres accepted into the Conservation Reserve Program [1]

Crop	1986	1987	1988	1989	Total
			1,000 acres		
Program crops:					
Wheat	554	3,617	2,930	1,299	8,400
Corn	151	2,157	520	313	3,141
Sorghum	231	995	624	221	2,071
Barley	139	954	780	325	2,198
Oats	76	437	351	152	1,016
Cotton–					
Upland	50	633	339	137	1,159
Extra long staple	0	1	0	0	1
Rice	1	2	2	2	7
Peanuts	0	0	4	0	4
Total	1,202	8,796	5,550	2,449	17,997
Nonprogram crops	841	4,874	3,206	1,212	10,133
Total accepted	2,043	13,670	8,756	3,661	28,130

[1] Final numbers which reflect first through seventh signup which closed August 31, 1988.

limited to disposal of the herd by selling for slaughter or exporting the dairy cows within a designated disposal period. The program payments, beginning upon disposition of herd, were based on a producer's history of milk marketings and the bid that was offered (dollars/hundredweight) to cease production.

The milk diversion program and the milk production termination program have been the only attempts at voluntary supply management in the dairy industry (33). The Secretary may establish either program in 1989 or 1990 to avoid burdensome supplies. The last milk diversion program was offered in 1983. To date, under the 1985 Act, only the mandated termination program has been offered to farmers.

Milk Diversion Program

In 1983, marketings of program participants were about 22 percent of the U.S. total (13). However, actual reductions in 1984 milk production (down 3.1 percent) were smaller than indicated because nonparticipants increased milk production and new producers entered the industry after the program became effective. Furthermore, a survey indicated that producers intended to expand milk production 7.8-10.2 percent at the end of the program (1). Thus, the supply control effects of the program were strictly short run.

Milk Production Termination Program

Marketings of participants in the mandated program were about 8 percent of milk produced in 1985. Yet, milk production increased 0.2 billion pounds in 1986 because the program was not in effect for the whole year, program herd termination was distributed over the 18-month period, and nonparticipants increased milk production. However, this rise was below the increase in commercial use, such that sales reduced surplus stocks. Although the program did result in decreased production in 1987, productivity growth per cow and expansion by others in the sector negated any permanent decreases in supplies.

Incentives To Participate in Current Supply Control Programs

PLD, CRP, milk diversion, and milk production termination programs pay producers directly to participate. The payment levels for CRP and milk production termination programs are determined by competitive bids. The payment levels for PLD and milk diversion programs are set as terms of the programs. The Secretary can affect participation in these programs by adjusting the levels of the maximum acceptable bid or the program payment

levels. Acreage reduction and set-aside programs provide no direct payment incentives for a producer to participate. These programs are a cost the producer pays to receive support program benefits. For any of the supply control programs, farmers must decide whether participating in the program is to their advantage. This decision must be made individually because each farm is assigned its own program parameters (program acres, program yields, quotas).

Price and Income Support Programs

Individuals participate in annual crop programs for the price and income support benefits they receive. The higher the target price and loan rate are in relation to the expected market clearing price, the greater the incentive to participate. However, the range between the target price and loan rate (maximum possible deficiency payment rate) is also important. Increases in the acreage reduction requirement must generally be accompanied by increases in support levels to maintain participation in the program. A farmer need not participate in crop support programs to participate in the CRP. However, increases in crop price support levels will generally lead to increases in the level of program payments necessary to encourage participation in the CRP.

In dairy, all milk producers benefit from the Federal price support program, but supply control is voluntary. The higher the guaranteed return for producing milk, the higher the program payments have to be to encourage producers to participate in the milk supply control programs. Thus, milk supply control programs actually compete against price support programs for participants.

Acreage Base and Program Yields

Current legislation determines acreage bases and program yields. Although there is allowance for limited increases in a particular crop base, program yields are held constant. As program yields fall further behind actual yields, support programs become less attractive to farmers because higher levels of price support are required to compete against expected returns from the market. However, target prices could be increased, offsetting some or all of the yield differential.

Supply Control Issues

Supply control issues arise from the cost-benefit analysis of the programs themselves. The initial concern is whether the programs accomplish their

goals, and whether the program benefits exceed the costs, where individual producers benefit and society bears the cost.

Effectiveness of Acreage Reduction Programs

We measure the efficiency of acreage reduction programs by comparing the amount of land idled with the adjustment in harvested acres and the adjustment in production. Supply control measures have never been completely effective. Farmers tend to idle the least productive land, resulting in an overall increase in average productivity of planted acreage (production slippage). A study of diverted cropland concluded that diverted acres were 80-90 percent as productive as planted acres on average (38). Slippage refers to the portion of acreage idled by an ARP for which there is no corresponding decrease in production (6, 7). On average (1982-84), acreage reduction programs were 76 percent effective for corn and 62 percent effective for wheat, which is consistent with earlier findings of diversion programs being 50-60 percent effective (7).[6] The effectiveness of supply control programs varies annually based on the terms of acreage reduction programs and the incentives to participate as provided by price and income support levels in relation to the market price.

Terms of Acreage Reduction Programs

Because of changes in the terms of acreage control programs, there is little meaning in comparing slippage from one period to the next. The set-aside program in the early 1970's allowed farmers to more freely adjust planting and idle acreage within the terms of the program. As a result of this flexibility, early set-aside programs did little to control the plantings of specific crops.

The Food and Agricultural Act of 1977 tightened the acreage control provisions of the set-aside program with the adoption of the national program acreage concept. The national program acreage was the number of harvested acres required to meet estimated domestic and export needs (less imports) plus any desired increase or decrease in carryout stocks. Set-aside requirements had to be applied against current years' acres planted for harvest. When a set-aside was in effect for one or more of the crops of wheat, feed grains, Upland cotton, or rice, the Secretary could require that acreage normally planted to crops designated to be reduced by the amount of the set-aside. Then a farm's acreage planted to these crops, plus any set-aside acreage, could not exceed the established normal crop acreage for the farm.

[6]These studies considered acreage slippage, which refers to the proportion of idled acreage for which there is no corresponding reduction in harvested acreage.

Under the terms of ARP's in the 1980's, planted acreage plus idled acreage for a program crop had to be equal to or less than the base acreage for the crop. Therefore, acreage reduction program legislation allows more control over the plantings of specific crops than does a set-aside program.

Since voluntary controls were initiated in the 1960's, various compliance restrictions have been used. Under cross-compliance, the grower must participate in all programs or at least plant within the base of nonparticipating crops. Under offsetting compliance, the grower with multiple farms must participate in the programs on all of the farms or at least plant within the base of nonparticipating crops. These restrictions make acreage reduction programs more effective in terms of reducing slippage, but reduce the incentives of affected farmers to participate in support programs.

Participation in Acreage Reduction Programs

Voluntary acreage reduction programs can effectively control production only if a sufficient number of farmers participate. With the advent of target prices, the main benefit of crop programs is that they support income of participants. These programs also support farm prices, benefiting all farmers. An increase in the acreage reduction requirement with no change in either the support level or market price reduces participation. More acreage will be planted outside the program-reducing production controls. Because of these factors, acreage reduction programs must be accompanied by sufficient income support incentives to encourage the desired level of participation.

Excess Capacity

Supporting prices above the free market level encourages more investment in agriculture which increases productivity and exacerbates the excess capacity problem. Longrun excess capacity in U.S. agriculture is a major reason for having supply control programs. Excess capacity is defined as the difference between the potential supply of farm output (actual production plus potential output from acreage reduction program) and commercial demand (total use adjusted for noncommercial exports) at prevailing prices (5). For crops, expressing longrun excess capacity in acreage equivalents indicates that excess capacity reached about 60 million acres, or close to 20 percent of total harvested acres in 1985. Those figures are a fivefold increase over the early 1970's when excess capacity averaged 12 million acres or 4 percent of total cropland.

Before 1975, there was little longrun excess capacity in dairy because of marketing orders and other programs that removed surplus and controlled milk production (5). Also, price supports were not based on production costs. The

1975 Act based price supports on production costs. Between 1975 and 1983, longrun excess capacity increased from less than 2 percent in 1975 to more than 12 percent in 1983. Since 1983, excess capacity has fallen with reduced dairy herds.

Annual supply control programs do not reduce excess capacity because they do not remove resources permanently from production. The 1985 Act has, through the CRP, removed over 28 million acres, 16.7 percent of total cropland, from production for 10 years. Only 18 million of these acres are actually program acres, however, while the other 10 million are nonprogram acres. When compared with 60.2 and 53.2 million acres removed under annual programs in 1987 and 1988, long-term removal programs do not significantly affect excess capacity.

Effects on Land Values

Although production control programs for wheat, feed grains, rice, and cotton have evolved away from using allotments and marketing quotas, policymakers continue to suggest mandatory production controls as an alternative policy for reducing surplus production, increasing farm income, and reducing farm program costs. Such controls could achieve the above-mentioned goals, but their effects would not benefit the country as a whole, according to a recent study (39). Because program benefits increase land values, they largely go to existing land owners. Higher land prices increase the difficulty of entry into farming. The volume of farm products transported, processed, and marketed could fall, and food and feed prices would rise. Employment in the agribusiness sector would fall as facilities are underused. Export markets would be lost, increasing the need for export enhancement programs, and inflation might rise.

The design of the supply control program determines whether program benefits increase land values. When price and income support benefits apply to specific acreage, then benefits of the farm program increase the value of that acreage and of acreage not in the program (16). Program benefits largely go to existing landowners. Higher valued land increases the cost of farming, complicating new farmers' entry to farming and increasing the cost of production for those already farming. If benefits tied to specific acreage are removed, then land values will decrease. The extent of the decrease will depend on alternatives to program crops. For example, recent changes in the tobacco program allowed marketing quotas to be sold apart from the land (35). Land values declined by an amount equal to the average per acre value of the marketing quota.

Effects on Agribusiness, Farm Communities, and Consumers

Effects of supply controls on input markets depend upon the number of acres removed from production (4, 39). By planting fewer acres, a farmer reduces the use of seed, fertilizer, fuel, and pesticides; the need for operating capital; and the use of farm equipment, extending equipment life and reducing repair costs. Production facilities are underused, and employment falls in the input industry.

Effects of supply controls on food and feed processors and distributors depend upon the resulting production and price levels (4, 39). Smaller volumes of commodities would be transported, processed, and marketed resulting in a higher market price. Production facilities would be underused, and employment would fall in the food and feed processing and distribution industries.

Effects of supply controls on consumers depend upon what happens throughout the marketing chain (4, 39). Generally increased costs in any link of the chain ultimately go to the consumer. Food costs would rise, and inflation might increase.

However, if the program improves farmers' cash-flow positions, they would be able to make capital purchases, reduce debt, or increase savings (4, 39). But, the improved cash-flow might not go to the purchase of goods and services in the local community. Thus, program benefits accrue to producers and are not necessarily shared with the local community.

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Chapter 11

Agricultural Export Programs and Food Aid

Mark Smith and Nicole Ballenger*

The United States assists U.S. agricultural exports with programs to match competitors' subsidized prices, help overcome importers' foreign exchange constraints to purchasing U.S. agricultural commodities, build long-term markets, and provide food aid. These programs stimulate export volume and revenues, and boost U.S. market share. But, they involve budgetary and off-budget costs and affect domestic stock levels, farm prices and incomes, consumer prices, and farm program costs. Whether costs outweigh benefits is unclear.

The 1990 farm bill debate will take place in a greatly different climate than that which surrounded the 1985 legislation. The Food Security Act of 1985 confronted an environment of high stock levels for commodities covered by price and income support programs and high domestic support prices in relation to world prices. That environment encouraged export programs designed to revitalize U.S. agricultural exports. A key element of several export programs is the increased use of stocks held by the Commodity Credit Corporation (CCC) for both inkind export bonuses (that is, bonuses paid in terms of commodities rather than cash) and food donations.

This chapter reviews the current U.S. export and food aid programs, details key program changes associated with the 1985 Act, and discusses the types of benefits and costs under the programs.

Export Programs and Their Objectives

The U.S. Government assists U.S. agricultural exports with various policies and programs. These efforts are designed to improve the country's short-term export performance by helping exporters meet price competition and by expanding the demand for U.S. exports by relieving importers' foreign

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exchange constraints. Some programs promote long-term market development by building foreign consumer demand for U.S. products, and others provide food aid.

Meeting Price Competition

Two programs since 1985 help U.S. exporters meet foreign price competition. The Export Enhancement Program (EEP) has domestic as well as international effects. The marketing loan program for rice and cotton introduces a new element to the domestic price support program, with strong implications for exports of these commodities (8).[1]

The EEP accounts for most of the growth in resources devoted to U.S. agricultural export programs since 1985 (table 1). The EEP was announced in May 1985 to help U.S. exporters match price competition of subsidizing exporters in targeted markets. The program operates through a two-step, competitive bid process. Initially, USDA targets a country for a specific quantity of a commodity. Next, U.S. exporters bid against other exporters for sales in the targeted market. Knowing they might receive a CCC bonus enables U.S. exporters to match subsidized competition. After U.S. exporters have won sales contingent on receiving a bonus, they then bid against each other for the bonus, which is awarded to the exporter (or exporters) whose sales price and bonus bid fall within acceptable ranges. The successful exporter(s) receive the bonus in the form of generic certificates that can be exchanged for any CCC-owned commodity. Table 2 shows major markets for selected commodities in fiscal year 1988. Fiscal year 1988 sales were about $3.3 billion.

The 1985 Act authorized a new marketing loan program for rice and cotton whereby U.S. producers may repay their CCC loans at either the loan rate or world price, whichever is lower. This program encourages U.S. suppliers to market rice and cotton rather than forfeit their supplies to the CCC, even when prices are below the loan rate. A key difference between the export aspects of the marketing loan program and the EEP is that the EEP is targeted on a commodity and country basis, but the marketing loan program is global for rice and cotton. Specific EEP sales receive a subsidy, whereas under the marketing loan program all rice and cotton for export (and for domestic use) receive a subsidy when the loan rate is above the world price.

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

Meeting Importers' Need for Credit

The CCC offers two commercial export credit guarantee programs to assist U.S. agricultural exports by helping importers overcome foreign exchange constraints. These programs guarantee repayment of private credit extended for the purchase of U.S. agricultural commodities. Thus, these programs may help some food aid recipients purchase food in commercial markets. The CCC Export Credit Guarantee Program (GSM-102), operating since fiscal year 1981, guarantees repayment of credit extended for up to 3 years. Iraq, Mexico, Algeria, the Republic of Korea, and Egypt are major markets under this program. A breakdown of major markets by commodity is shown in table 2. Exports under the fiscal year 1988 GSM-102 program were almost $3.6 billion.

The 1985 Act complemented the GSM-102 program with a second program, the Intermediate Export Credit Guarantee Program (GSM-103), which

Table 1—Program levels: Commodity export programs [1]

Fiscal year	P.L. 480 [2]		Credit guarantees [2,3]	Export subsidies	Cooperator program [4]	Targeted export assistance
	Titles I/III	Title II				
			Million dollars			
1980	922	729	2,200	NA	18	NA
1981	927	788	2,300	NA	19	NA
1982	825	608	2,800	NA	22	NA
1983	872	600	5,150	20 [5]	23	NA
1984	872	740	4,675	NA	32	NA
1985	1,106	1,068	5,000	n.a.	36	NA
1986	989	751	5,264	287 [6]	41	110
1987	911	552	5,500	933 [6]	27	110
1988	767	715	5,500	992 [6]	34	110
1989	852	630	5,500	770 [7]	34 [8]	170 [9]

NA = Not applicable.
n.a. = Not available.

[1] Program levels reflect total financial value of benefits provided. [2] Source: (9). [3] GSM-5: 1980, 1983-84; GSM-101: 1980-81; GSM-102: 1981-present; GSM-103: 1986-present. [4] Source: (11). [5] CCC exports and payments, payments made under section 32, and CCC export differentials (differences between U.S. domestic market price and the CCC sales price for commodities sold for export from CCC stocks). Source: (3). [6] Market value of EEP bonuses; 1986 includes small amount from 1985. [7] As set by Congress in the Fiscal Year 1989 Appropriations Act. [8] Estimate. [9] As set in the Fiscal Year 1989 Appropriations Act, with an additional $30 million available at the Secretary's discretion.

Table 2—Export program sales by selected commodity and principal market, fiscal year 1988 [1]

Program	Wheat	Feed grains	Rice	Oilseeds	Vegetable oils
P.L. 480 title I	Egypt Sri Lanka Bangladesh Sudan Morocco	Jamaica Tunisia Peru El Salvador Ghana	Philippines Bangladesh Zaire Peru Senegal	El Salvador Tunisia Jamaica	Pakistan Egypt Morocco Dominican Republic El Salvador
GSM-102	Algeria Egypt South Korea Iraq Mexico	Mexico Algeria Iraq South Korea Chile	Iraq Senegal Jamaica Haiti Trinidad and Tobago	Mexico S. Korea Colombia Trinidad and Tobago Honduras	Pakistan Algeria Mexico Iraq Tunisia
GSM-103	Morocco Bangladesh Tunisia	Tunisia Morocco Jordan			

See footnotes at the end of table.

Continued—

Table 2—Export program sales by selected commodity and principal market, fiscal year 1988 [1]—Continued

Program	Wheat	Feed grains	Rice	Oilseeds	Vegetable oils
Export Enhancement Program (EEP)	Soviet Union China India Algeria Egypt	Algeria Saudi Arabia Poland Israel Iraq	Jordan Turkey	India Turkey Algeria Tunisia Morocco	
GSM-102 and EEP [2]	Algeria Egypt Iraq Mexico Tunisia	Algeria Iraq		Turkey Algeria Tunisia Morocco	
GSM-103 and EEP [2]	Morocco Tunisia	Tunisia			

[1] Country listings show top five markets, where applicable.
[2] Countries for which credit guarantees were approved and EEP bonuses were awarded in fiscal year 1988.
Source: (12).

guarantees repayment of private credit extended for 3-10 years. The longer repayment period allowed under the GSM-103 program can be especially useful for countries graduating from U.S. food aid programs but having difficulty purchasing with shorter term GSM-102 credit guarantees. Chief markets under the GSM-103 program are Morocco and Iraq (table 2). Exports under the fiscal year 1988 program were nearly $295 million.

Title I of the P.L. 480 food aid program involves concessional sales to developing countries. Under the program, the United States provides long-term concessional credit to recipient countries to purchase designated U.S. agricultural commodities (table 2). Credit under this program is extended at interest rates much lower than market rates and for up to 40 years. Cash sales of U.S. agricultural goods for local currencies were authorized by the Food Security Act of 1985. P.L. 480 title I helps the recipient government maintain food imports and still be able to import capital goods for economic development. The recipient government must undertake specified self-help measures for further development, such as improving marketing systems or storage facilities. Fiscal year 1988 sales under title I were about $720 million.

Promoting Long-Term Market Development

The United States also assists agricultural exporters through programs to build overseas demand for U.S. farm commodities. Two principal market development programs are the cooperator program, part of the foreign market development program, and the Targeted Export Assistance (TEA) Program. A variety of other programs also assist in developing markets for U.S. agricultural goods.

The cooperator program is a longstanding export promotion program in which producer groups cooperate with the Foreign Agricultural Service (FAS) in promoting exports of their commodities. The U.S. Wheat Associates, Cotton Council International, and the California Raisin Advisory Board are examples of cooperator groups. The U.S. Government and the cooperators jointly fund the program to finance trade fairs, demonstration projects, and other promotion activities. The fiscal year 1988 program level was about $33.5 million (table 1).

The TEA program, authorized by the 1985 Act, partially offsets the costs of export promotion activities for commodity exports disadvantaged by trade barriers and subsidies of other importing and exporting nations. The TEA program benefits commodities that have been found, under section 301 of the Trade Act of 1974, to have had their exports adversely affected by a foreign government's policies or that have suffered related retaliatory action. Targeted commodities have included high-value products such as fruits, vegetables, nuts, and various other commodities. The CCC provides generic certificates

that may be exchanged for CCC commodities or sold to help finance market promotions in a targeted market. USDA allocated $110 million for the fiscal year 1988 program, and Congress set the fiscal year 1989 program at $170 million, with another $30 million available at the Secretary's discretion (table 1).

FAS also provides information and assistance to U.S. exporters through various means including agricultural trade offices in selected regions around the world, the Agricultural Information Marketing Service to link foreign importers with potential U.S. suppliers, the export incentive program to assist exporters of branded, consumer-ready products, and FAS cooperation with regional and State export groups.

Providing Food Aid

The United States provides more food aid than any other donor. In addition to the concessional sales programs of title I, food is granted under P.L. 480 title II, and section 416(b) of the Agricultural Act of 1949, as amended. Since 1955, U.S. commodities and products have been provided through private voluntary organizations, government-to-government channels, and, later, the World Food Program of the Food and Agriculture Organization of the United Nations. Donations of surplus CCC commodities under the section 416 program, reinstituted in 1983, have been similarly channeled.

A key difference between P.L. 480 title II and section 416 is that the latter depends on the availability of uncommitted, surplus CCC commodities. Title II, however, receives annual budget appropriations to pay for food donations regardless of the availability of CCC stocks. Congress has also mandated an annual minimum volume of 1.9 million tons of title II donations.

Under P.L. 480 title III, the Food for Development program, eligible countries may have title I loans forgiven if the local currency generated from the title I commodity sales is used to finance mutually satisfactory development projects.

Major Changes in Export Programs in the Food Security Act of 1985

The 1985 Act authorized three main commercial export initiatives, the EEP, the GSM-103 program, and the TEA program, and changed and expanded U.S. food aid programs.

Although the EEP had already been announced in the spring of 1985, the 1985 Act and the Food Security Improvements Act of 1986 contained provisions for

minimum and maximum amounts of bonuses to be provided through fiscal year 1988, and it mandated the inclusion of certain livestock products under the program. The $1-billion minimum may have led to a sharp expansion of the program, and the $1.5-billion maximum was reached in the second half of 1987. To avoid program interruption, the Secretary of Agriculture continued to operate the EEP under authority granted by the CCC Charter Act.

The 1985 Act made many changes to U.S. food aid programs. P.L. 480 title I was amended to authorize sales of U.S. agricultural commodities for the recipient's local currencies, rather than solely under long-term credit sales. Similar authorizations were made in the early days of the title I program. Under current law, however, the United States loans the local currencies generated by these sales to local financial intermediaries that in turn make loans to assist local private enterprises. Thus, a greater share of title I resources are channeled through the private, rather than the public, sector.

Other provisions of the 1985 Act concerned title II and section 416 management. The act increased the share of title II and section 416 donations sold for cash to help improve the effectiveness of the delivery of the remaining commodities. Also, a greater share of food aid commodities must be carried on U.S. flag vessels. The 1985 Act expanded the types of commodities that may be donated under section 416 to include all edible agricultural commodities acquired by the CCC. Minimum amounts of commodity donations were set for the first time, subject to availability of CCC stocks.

Section 416 or title I authorities may now be used to provide commodities under the new, multiyear Food for Progress Program to assist developing countries committed to market-oriented agricultural policy reform. Guinea, Madagascar, and Ecuador have participated in the program. At least 75,000 tons of section 416 commodities must be distributed annually through fiscal year 1990. The CCC may purchase commodities for the Food for Progress program if CCC stocks are insufficient.

Legislation passed since the 1985 Act authorized formation of agricultural trade and development missions to encourage greater U.S. private sector and foreign country participation in U.S. agricultural trade and aid programs. The mission's members are relatively high-level representatives of both public and private sectors. They will meet with host country representatives to ascertain the U.S. trade and aid programs that could help meet the host country's food and economic needs while furthering U.S. trade interests.

Program Evaluation

Export programs have probably increased exports above what they otherwise would have been, but the extent to which they have done so is unclear. Determining whether the benefits outweigh the costs of these programs requires further research.

The concept of the "additionality" of an export program is critical to program evaluation. Additionality refers to the percentage of a program's exports that occurred mainly because of the program. If all of a commodity exported under a program were additional, then the additionality of a program would be 100 percent. If foreign buyers simply shifted their planned purchases to purchases under a program, then the additionality would be zero.

The additionality of a program is especially important in evaluating a program's benefits and costs. If all the exports under a program are additional, then even though the program's costs may be high, the costs may be outweighed by the benefits of the additional export revenue. Conversely, if the additionality of the program is zero, then even if the cost of the program is low, all costs are incurred for shipments that would have taken place anyway. The higher the per unit cost of an export program, the higher the additionality of the program is needed to match costs per exported unit. The additionality of these programs is an important research question that has not been resolved.

Program Benefits

The direct benefits of export programs include short-term effects on export volume and revenue, U.S. market shares, and long-term market development effects. Other, indirect benefits include reduced Government expenditures for farm price and income support and lower CCC grain storage costs because of reduced stocks.

A simple performance measure of export programs is the amount of commodities shipped under the programs (table 3). The value of fiscal year 1988 exports under the CCC's export credit guarantee programs, U.S. food aid programs, and EEP sales totaled about $8 billion, up significantly from fiscal year 1987 levels. (This figure includes double counting because of EEP sales made in conjunction with CCC export credit guarantees.) These programs have recently accounted for a growing share of several commodity exports. In particular, export programs accounted for about 70 percent of U.S. wheat and flour exports in fiscal year 1987. However, an export program's share of total exports is only an initial indicator of program performance, and does not reflect the program's additionality, among other considerations.

Table 3—Value of U.S. agricultural exports assisted by selected export programs [1]

Fiscal year	Food aid			Export credits and guarantees	Export price subsidies	Total U.S. agricultural exports
	P.L. 480		Sec. 416			
	Titles I/III	Title II				
	Million dollars					
1980	865	476	0	1,417	0	40,481
1981	790	543	0	1,871	0	43,780
1982	722	385	0	1,390	0	39,097
1983	810	385	0	4,060	104 [2]	34,769
1984	775	602	129	3,830	0	38,027
1985	928	698	279	2,807	n.a.	31,201
1986	589	372	137	2,413	805 [3 4]	26,309
1987	697	248	133	2,745	1,698 [4]	27,876
1988	716	200	94	3,707	3,270 [4]	35,334

n.a. = Not available.

[1] 1987 and 1988 data are preliminary. [2] CCC sales at reduced price. [3] Includes small amounts sold in 1985. [4] Data reflect sales, not shipments, and include overlapping sales under export credit guarantee programs.

Source: Export credits and subsidies, (11).

Determining the short-term benefits of export programs is difficult because many other factors influence U.S. agricultural exports. Since fiscal year 1986, when the 1985 Act was signed, U.S. agricultural exports have increased significantly. Between fiscal years 1986 and 1987, agricultural exports rose $1.6 billion and almost 20 million tons. Fiscal year 1988 agricultural exports rose again by almost $7.5 billion and 19 million tons. The U.S. share of world wheat trade rose from slightly less than 30 percent in the 1985/86 crop year to more than 40 percent in 1987/88; the U.S. share of world corn trade grew from 58 percent in 1985/86 to more than 75 percent in 1987/88.

Many factors contributed to expanded U.S. exports, including lower loan rates, dollar depreciation, and smaller and poorer quality supplies in other countries. Furthermore, a shift in the composition of fiscal year 1987 U.S. exports away from bulk commodities toward high-value products helped boost export revenue. Attributing specific shares of the increase in agricultural exports to different, though simultaneous, factors requires rigorous analysis.

Some research has been completed on the effect of the EEP on U.S. wheat exports. Bailey used an econometric model of world wheat trade and concluded that between 1985/86 and 1988/89, the EEP should account for an increase of about 10 percent in U.S. export volume (1). He showed that EEP accounted for a 20-percent increase in 1986/87 and a 7-percent increase in 1987/88. Haley used a different analytical method and found that, depending on alternative assumptions of the extent to which the European Community (EC) would have aggressively subsidized exports in the absence of the EEP, the program increased U.S. exports about 10 or 30 percent in 1986/87 (4). Hillberg, using another model, found that the EEP increased U.S. wheat exports by 2-3 percent during late 1985 and early 1986 and by about 12-14 percent during the second quarter of 1987 (5).

Programs such as the EEP and CCC export credit guarantees may have mainly short-term effects because they deal more with homogeneous commodities than, say, the TEA program. Markets for homogeneous commodities are typically more price sensitive than those for easily differentiated products. Hence, price is important to importers of bulk commodities when they make their purchase decisions. While the EEP and credit guarantee programs may boost short-term exports, long-term market development may be difficult to base on price subsidy and credit guarantee programs.

A long-term benefit of some export programs is the development of markets for U.S. commodities. To develop long-term markets, U.S. commodities must be introduced, consumer tastes and processor preferences must change, and potential purchasers must have the income to purchase the U.S. commodities they desire. Partly to achieve this end, U.S. bulk commodities have been introduced in many countries under P.L. 480. The cooperator and TEA

programs promote U.S. commodities and brands of commodities (mostly high-value products) through advertising and other promotion activities mostly in countries having higher incomes than food aid recipients. Some analysts feel that market development depends on assistance to the recipients' overall economic development so they can purchase without any government assistance. P.L. 480 title I/III and the Food for Progress programs attempt to use food aid as a means to generate economic development and facilitate policy reform.

Although export programs attempt to increase U.S. agricultural exports, food aid under P.L. 480, especially titles II and III, and section 416 has a more humanitarian component. Many country recipients probably would not have imported the bulk of U.S. food donations without food aid programs. In fiscal year 1987, P.L. 480 title II food donations helped feed about 57 million individuals in 72 developing countries, which is more than the resident population of all New England and Mid-Atlantic States combined.

Program Costs

The direct costs of export programs involve both budget outlays and off-budget costs in terms of opportunity costs. These latter costs refer to foregone opportunities of using funds for other purposes because they were used for export programs. The costs associated with an export program vary by type of program.

The EEP and TEA programs incur opportunity costs. Generic certificates are provided as bonuses under the EEP as a price subsidy and under the TEA program as advertising/promotion assistance. Because certificates may be exchanged for CCC commodities acquired through domestic price support programs, these two export programs involve no budget outlays. This situation masks the opportunity cost for the CCC commodities. If the opportunity cost of CCC stocks is zero, then the program has no direct cost. However, as the effects of the 1988 drought cut surplus supplies and as commodity prices rise for various reasons, the assumption of zero opportunity cost is less plausible; the CCC might be able to generate revenue by selling the stocks rather than providing stocks as export subsidies. Also, when market prices are below loan rates, some recycling of stocks may occur, thus increasing Government farm program costs. Hillberg found this to occur in the early months of the EEP, when CCC stocks were provided as bonuses, but producers forfeited stocks to the CCC because of low farm prices in relation to the loan rate (5).

The cost of the CCC's export credit guarantee programs is low compared with the amount of credit guaranteed by the CCC. No cost is involved if the foreign importer repays the loan as scheduled. If the importer does not repay on schedule, then the U.S. creditor may place a claim on the CCC for payment.

Since fiscal year 1981, claims on the CCC have been 10-15 percent of the total amount of credit guarantees provided under the programs. However, because the debt situation of many countries has not greatly improved, potential costs under this program could be significant.

U.S. food aid programs incur a variety of costs. Opportunity costs are incurred under title I because the credit provided is very much below commercial interest rates. The U.S. Government could earn more using title I funds by investing them commercially rather than by providing them as concessional credit to developing countries. Because of the credit subsidy and length of time to repay the credit, the return on a title I loan is negative. Assuming a 10-percent discount rate, the present discounted value of a $100 title I loan is a little more than $30.

A budgetary cost under title I involves specific ocean freight charges. Title II costs include the cost of the commodities, and processing, packaging, and transportation costs. Section 416 costs, though not a budget item, are similar to title II expenses. U.S. food aid shipments are subject to cargo preference requirements which specify that 75 percent of such shipments be carried on U.S. flag vessels. This requirement is effectively a subsidy to U.S. maritime interests, part of which must be paid from the P.L. 480 budget.

Implications for the U.S. Farm Sector

The U.S. Government's continuing role in farm exports affects domestic stock levels, farm prices and incomes, consumer prices, and farm program costs.

Because of the high CCC stock levels of certain commodities when the 1985 Act was conceived, a key feature of the new and expanded export programs is their reliance on Government-owned surplus commodities for foreign donations (section 416), for payments of inkind subsidies to participants in the EEP, and for advertising/promotion assistance for participants in the TEA program. This approach was thought to have the advantage of lower budget costs than would be associated with cash subsidy payments and of reducing Government stockholding costs by drawing down Government stock levels.

To evaluate the effects of the programs on stock levels, one must consider the use of generic, rather than commodity-specific, certificates redeemable for CCC stocks, opportunities for rotating commodities paid inkind back into CCC holdings, and the existence of a market for the generic certificates (that is, they can be sold rather than exchanged). Market conditions, particularly the relationship between market prices and loan rates, determine the extent to which CCC stocks released in exchange for certificates are either sold on the market or recycled into reserves. Furthermore, the provisions of the domestic

commodity programs, including acreage reduction programs, loan rates and target prices, and generic certificates to pay deficiency payments help determine the rate at which CCC stocks are accumulated or reduced.

A simple indicator of the EEP's potential effect on stock levels is a comparison of the change in CCC stock levels with the quantity equivalent of EEP bonuses. Between June 1, 1987, and May 31, 1988, CCC wheat stocks declined by 380 million bushels (10). The market value of EEP bonuses for all commodities sold during that year under the program was about $1.2 billion. If all certificates associated with EEP sales were redeemed for wheat stocks, these export bonuses would have caused CCC wheat stocks to drop by about 475 million bushels. Some of the EEP certificates were redeemed for commodities other than wheat, but this comparison shows that certificates awarded under the EEP have great potential to affect CCC stock levels.

CCC stocks have declined for several commodities for which EEP and other export programs have become important, including wheat, barley, and rice. Government-owned dairy stocks, particularly cheese and nonfat dry milk, have been dramatically reduced, partly because of their use for both overseas and domestic donations under section 416. Extremely low stocks provide less of a buffer for markets from supply shocks and may limit the ability to respond to international food crises. Changing stock conditions will raise questions about the desirability of promoting exports with inkind subsidies.

As export programs affect stock levels, lower stocks will also affect export programs. For example, section 416 donations of dairy products ceased after uncommitted CCC stocks were depleted. As U.S. rice supplies tightened in fiscal year 1988, less rice was available under P.L. 480 title I. Should CCC wheat stocks become depleted, generic certificates provided under the EEP (or any agricultural program) could mostly be redeemed for CCC corn or sorghum rather than wheat. Whether such commodities and the amount of premium or discount on generic certificates are acceptable could affect the attractiveness of the EEP to exporters, thus affecting exports under the program.

Export programs of the United States (and of other countries) potentially can expand foreign demand for agricultural commodities, thereby strengthening commodity prices. In the short run, the release of CCC stocks through inkind subsidy programs can depress U.S. prices, but if such programs increase demand and significantly reduce surpluses over the long term, prices should strengthen. Prices for a number of commodities rose in 1988 partly due to the decline in exportable CCC inventories in the United States following heavy use of export programs. Increased average U.S. farm prices tend to be passed along to consumers at the processing and retail levels. Thus, programs like the EEP transfer the costs of price-support programs from taxpayers (who must pay stockholding costs and deficiency payments) to consumers.

Recent studies attempted to isolate the effect of the EEP on U.S. wheat prices in selected periods. Haley estimated that the EEP increased the U.S. wheat price 7 or 20 percent during the 1986/87 base year, depending on assumed EC export subsidies (4). Hillberg's analysis of the first two quarters of EEP found a very slight increase in U.S. wheat prices (5).

To the extent that export programs increase average farm prices for program commodities, these programs help reduce Government deficiency payments and storage costs. Deficiency payments are made on the basis of the difference between target prices and the higher of the loan rate or a 5-month average market price. For several commodities, such as wheat, rice, corn, and barley, average farm prices have risen above loan rates. Prices above the loan rate give producers an incentive to repay their CCC loan, redeem the commodities they pledged as collateral, and sell them on the market. This repayment reduces the CCC's acquisition of stocks when producers forfeit their collateral and, hence, reduces CCC storage costs.

Competitor Country Issues

The expanded role for export programs in the 1985 Act heightened other exporting countries' concerns about the effects of U.S. programs on international trade and markets. In particular, the EEP raised concerns that subsidized U.S. sales would displace sales of nonsubsidizing competitors or force them to compete at lower prices. On the other hand, where U.S. programs help strengthen importing countries' ability to expand their international trade, other exporters may also benefit.

The EC is the principal target of the EEP. The EC's Common Agricultural Policy (CAP) relies on export subsidies (called restitution payments) to sell relatively high-priced EC commodities at lower world prices. As the world price falls or as price competition intensifies, the subsidy the EC must provide to make a sale must grow. Thus, the displacement of EC export sales by U.S. EEP sales may depend on the EC's willingness to increase its export subsidies and its budget exposure. If the EEP is effective at raising commodity prices over the longer term, then the budget pressure on the EC and other subsidizing exporters will lessen. The EEP probably accounted for 35-40 percent of the increase in EC wheat export subsidies, which grew from $365 million in 1985 to $1.8 billion in 1988 (1).

In the North African wheat market, where the EC presence has been strong, EEP sales have significantly strengthened the U.S. export share in relation to that of the EC. Other exporters' shares of this market have also declined, but not as markedly as the EC's. In 1985/86, the U.S. share of the commercial North African wheat market was about 35 percent but grew to about 65

percent in 1986/87. The EC's share declined from around 25 percent in 1985/86 to about 10 percent in 1986/87. However, the EC's presence in other wheat markets (such as Brazil) grew and the EC's share of total wheat trade remained more or less steady during the 1985/86-86/87 period (6).

Importing Country Issues

U.S. export programs enable importing countries to consume more agricultural goods through donations, reduced prices, or favorable credit terms. These programs provide a transfer of resources from the United States to developing countries and, in some cases, countries with centrally planned economies. In fiscal year 1988, the value of EEP export subsidies was more than 65 percent of the value of resources provided under the P.L. 480 programs. U.S. export programs transfer benefits from U.S. taxpayers to consumers abroad or to their governments. This transfer may provide more affordable food to urban or other consumers or help recipient governments use foreign exchange for investment or other projects. A recent study on the effect of a food-for-work program in Kenya indicates that the program increased agricultural production, income, capital investment, employment, and marketable supplies (2).

However, such resource transfers are criticized on several fronts. First, providing inexpensive imports may change dietary habits and "hook" consumers on imported commodities rather than provide a market for domestic producers of indigenous foods. A related argument is that food aid or subsidized imports may depress the importing country's farm prices and reduce incentives for domestic agricultural producers. Third, with a flow of inexpensive food from donors, recipient governments have less incentive to reform policies to develop self-sufficiency either by increasing production or generating foreign exchange to purchase imported foodstuffs. The food aid literature has long dealt with the question of these "disincentive effects" (7).

Specific success and failure stories abound, but few general conclusions may be found. Maxwell and Singer proposed that the effect of food aid depends on the recipients' management and use of the commodities (7).

Conclusions

Export programs, including price subsidies, credit guarantee programs, market development assistance, and food aid expanded markedly after 1985, especially with the EEP. These programs should have contributed to increased U.S. agricultural exports and market shares (particularly in selected regions), reduced stock levels, and firmer commodity prices. Quantitative analyses of

the EEP tend to support these expectations, although other factors also played a role. To the extent that export credit guarantee programs were used in conjunction with EEP sales, the same conclusions may apply to the credit guarantee programs. P.L. 480 title I could theoretically help build long-term markets, but its effectiveness has not been clearly measured. P.L. 480 title II and section 416 donations are tools for both domestic stock management and overseas humanitarian relief.

Some of the effects of the Food Security Act of 1985 are still unfolding and are difficult to assess, especially in a quickly changing environment. Furthermore, program benefits in terms of higher exports, lower stocks, and higher commodity prices may not be viewed as desirable in an era of drought-reduced domestic supplies. The debate surrounding the 1990 farm legislation will clearly occur in a very different agricultural economic environment, one that will question the extended use of export assistance programs.

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Chapter 12

U.S. Domestic Food Assistance Programs:

Federal Costs and Public Benefits

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Domestic food assistance programs have improved the nutrition of low-income Americans. The costs of these programs rose from $8.5 billion in 1977 to $21.2 billion in 1988. Participation in most of the programs peaked in the early 1980's and then declined, mainly because of improved economic conditions. During the 1980's, the greatest increase in expenditures has been for commodity distribution programs and for the Special Supplemental Food Program for Women, Infants, and Children. Food assistance programs have generally provided desired nutritional benefits and have helped control Government inventories of surplus foods. Passage of the Hunger Prevention Act of 1988 initiated important changes in some food assistance programs.

U.S. food assistance programs began during the Great Depression. Since then, new programs have been implemented and expanded until nearly 40 million people, over 16 percent of our population, received food assistance in 1987.

Today's food assistance programs are designed to improve the nutritional status of low-income people and other target groups and to provide an outlet for surplus commodities. Domestic food assistance programs also have indirect and sometimes unintended economic effects. For example, these programs have a stabilizing influence on the food production and marketing sector, on the U.S. gross national product (GNP), and on income distribution. Some programs also displace commercial sales, and others increase retail prices.

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This chapter describes the history of domestic food assistance programs during the 1980's and provides available evidence on the direct and indirect effects of these programs. It also discusses food assistance policy issues for the 1990's.

Program Descriptions

The U.S. Government spent over $21.2 billion in fiscal year 1988 for domestic food and nutrition assistance programs (19, table 1).[1] This expenditure was nearly twice what the U.S. Department of Agriculture (USDA) paid farmers through the various commodity price support programs. Since 1980, expenditures for food and nutrition assistance programs have increased at a compound annual rate of 4.4 percent. However, in constant 1988 dollars, these expenditures represent an increase at an annual rate of 1.0 percent (table 1).

Four major factors contributed to overall increases in program expenditures since 1980. First, program benefits are annually adjusted for inflation. Second, the Temporary Emergency Food Assistance Program (TEFAP) was created in 1982. Third, the Special Supplemental Food Program for Women, Infants, and Children (WIC program) more than doubled in size. Fourth, the 1981-82 recession was responsible for substantial unemployment and increased participation in domestic food programs, particularly food stamps. However, the decline in the unemployment rate and the improved economic climate once recovery began have reversed this trend.

The increased expenditures for food assistance programs have resulted in numerous administrative changes in those programs, especially in the Food Stamp Program. Changes in the early 1980's had the objective of targeting benefits to those with the greatest need and improving program quality control systems. These changes tightened eligibility requirements and created new program management and control systems. However, provisions in the Hunger Prevention Act of 1988 changed some food stamp regulations to provide increased access to the program.

Family Nutrition Programs

The family nutrition programs consist of the Food Stamp Program, the Nutrition Assistance Program for Puerto Rico, and the Food Distribution Program on Indian Reservations. The Food Stamp Program is the largest, serving 18.7 million people monthly at a cost of $12.3 billion in fiscal year 1988. The number of participants in this program increased during the early

[1]Underscored numbers in parentheses identify literature cited in the References at the end of the chapter.

1980's but has declined since 1983, primarily due to an improving economy (table 2).

Expenditures on the Food Stamp Program accounted for 58.2 percent of the total dollars spent on food assistance in 1988, down from 58.6 percent in 1980. Both expenditures on the Food Stamp Program and on all food assistance programs have grown at a compound annual rate of about 4 percent since

Table 1—Total cost of food assistance programs

Fiscal year	Food stamps[1]	Food distribution[2]	Women, infants, and children[3]	Child nutrition[4]	Total	
					Current dollars[5]	Constant dollars[6]
			Million dollars			
1977	5,461.0	61.9	255.9	2,678.3	8,457.1	15,495.0
1978	5,519.7	95.7	379.6	2,936.6	9,005.1	14,844.4
1979	6,939.8	150.0	525.4	3,468.7	11,157.9	16,537.9
1980	9,206.5	194.4	727.7	4,033.9	14,242.9	19,369.6
1981	11,255.2	239.9	871.6	4,221.3	16,636.0	20,923.1
1982	11,043.8	467.2	948.8	3,733.2	16,275.3	19,689.1
1983	12,675.7	1,356.9	1,126.0	4,061.9	19,302.9	22,874.3
1984	12,407.5	1,489.8	1,388.1	4,265.9	19,634.2	22,419.1
1985	12,531.9	1,439.2	1,489.3	4,391.0	19,935.9	22,318.3
1986	12,462.1	1,380.9	1,582.9	4,625.5	20,129.9	21,860.3
1987	12,461.4	1,312.9	1,679.6	4,883.3	20,421.4	21,274.6
1988	13,223.5	1,059.7	1,801.1	5,040.8	21,211.1	21,211.1

[1] Includes benefits, State administrative and other costs, and nutrition assistance to Puerto Rico and the Northern Marianas during 1982-88. [2] Includes entitlement, bonus, and free commodities, and cash in lieu of commodities; administrative expenses; Nutrition Program for the Elderly; Commodity Distribution to Charitable Institutions; Temporary Emergency Food Assistance Program; and the Commodity Supplemental Food Program. Excludes child nutrition programs. [3] Supplemental Food Program for Women, Infants, and Children includes program evaluation funds from fiscal year 1980 onwards. [4] Includes school programs, Child Care Food Program, Summer Food Service Program, State administrative expenses, Nutrition Education and Training Program, nutrition studies, and Food Service Equipment Assistance Program in 1981. [5] Total includes Food Program Administration (FPA) funds. Constant 1988 dollar expenditures were calculated by adjusting expenditures on the Food Stamp, food distribution, and women, infants, and children programs by the ratios of the food-at-home Consumer Price Index (CPI) for the year to the food-at-home CPI for 1988. The expenditure on the child nutrition program was adjusted using the ratio of food away from home CPI for the year, and FPA funds were adjusted using the ratio of the all-item CPI for the year. Expenditures in constant 1988 dollars is the sum of the adjusted expenditures of all programs plus FPA funds.

Source: (19).

1980. However, in terms of purchasing power for food at home, the average real benefits per food stamp recipient increased more than 10 percent over this period. In a typical day, an estimated 1 out of 13 Americans uses food stamps. On an annual basis, about one out of seven Americans uses food stamps (9).

In July 1982, the Food Stamp Program in Puerto Rico was replaced by the Nutrition Assistance Program (NAP) for Puerto Rico, a block grant program under which Puerto Rico receives the cost of food assistance benefits plus 50 percent of their administrative costs. Benefits are in cash. The Food Distribution Program on Indian Reservations (FDPIR) operates as a substitute for the Food Stamp Program on or near Indian reservations.

Child Nutrition Programs

USDA operates five child nutrition programs: the National School Lunch Program, the School Breakfast Program, the Special Milk Program, the Child Care Food Program, and the Summer Food Service Program. In fiscal year

Table 2—Food Stamp Program benefits, participation, and costs[1]

Fiscal year	Average participation	Monthly benefits per person	Total benefits	Total Federal costs [2]
	Millions	Dollars	Million dollars	
1977	15.6	23.81	4,458.0	4,830.6
1978	14.4	25.73	4,446.3	4,802.2
1979	15.9	30.04	5,731.7	6,165.7
1980	19.2	34.23	7,893.0	8,352.1
1981	20.6	39.40	9,750.8	10,317.6
1982	20.4	39.05	9,528.0	10,145.2
1983	21.6	42.98	11,152.3	11,847.1
1984	20.9	42.74	10,696.1	11,578.8
1985	19.9	44.99	10,743.6	11,703.2
1986	19.4	45.49	10,605.2	11,638.4
1987	19.1	45.78	10,500.3	11,605.1
1988	18.7	49.77	11,142.7	12,340.6

[1] Puerto Rico excluded.
[2] Total Federal cost consists of total benefits plus State administrative expenses and other program costs.
Source: (19).

1988, Federal expenditures on these programs totaled $5.0 billion, including the value of donated commodities, a 3.2-percent increase over their 1987 level (table 1).

The child nutrition programs have not grown at the same rate as total food assistance expenditures. Out of the total expenditure on food assistance programs, the share for the child nutrition programs fell from 28.3 percent in 1980 to 23.8 percent in 1988 (table 1). The slower growth of the National School Lunch Program compared with other programs accounted for most of that decline. School enrollments have declined over this period, reducing these programs' share of total expenditures, but reduced enrollments account for only about 10 percent of the decline.

Beginning in fiscal year 1982, legislation limited the scope of the National School Lunch Program. Expenditures dropped by 5 percent in current dollars (table 3). An important factor contributing to the changes in the National School Lunch Program in the early 1980's was that more than 50 percent of the National School Lunch Program meals were served to students not defined as needy.[2] By comparison, only 10.8 percent of the recipients in the School Breakfast Program and 14.5 percent in the Child Care Food Program were not needy.

The National School Lunch Program is available to virtually every school child, whereas the School Breakfast Program and the Child Care Food Program tend to operate in needy areas. The number of children participating in the School Breakfast Program increased by 1.2 million during 1977-88, but this program remains small compared with the National School Lunch Program (table 4). In 1988, the School Breakfast Program was about one-sixth the size of the lunch program (table 3).

The Child Care Food Program has registered the sharpest growth of all the child nutrition programs during the 1980's. One reason is that the number of private nonprofit daycare homes participating substantially increased, peaking in fiscal year 1988 at 125,200. Continued growth in the number of children in child care facilities indicates that political support for the Child Care Food Program will probably continue to grow and to receive greater attention from Federal authorities.

[2]Children from households with income exceeding 185 percent of the official poverty level are not "needy" by definition. In 1989, the official eligibility threshold for a family of four was an annual income of less than $22,385.

Supplemental Food Programs

The Special Supplemental Food Program for Women, Infants, and Children (WIC) provides food assistance to low income women, infants, and children up to 5 years who are nutritionally at risk.

Although all food assistance programs cite improved nutrition as an objective, only WIC requires the determination of the recipient's nutritional need. To be eligible for WIC, a potential recipient must be found nutritionally at risk by a physician, nutritionist, nurse, or other health official. The targeted recipients of WIC are pregnant, nursing, and post partum women, infants, and children up to 5 years who are at nutritional risk and whose family income is at or below 185 percent of the poverty level. WIC operates as a State grant program with funding allocation based on a formula rather than solely on the number of participants. Its share of total food assistance program expenditures was 8.2 percent in 1988 compared with 3 percent in 1977 (table 1). The average monthly number of participants in 1988 was 3.6 million, almost 90 percent higher than in 1980.

According to a 1987 Food and Nutrition Service (FNS) study, only about 40 percent of the fully eligible women, infants, and children participated in WIC

Table 3—Total cost of school food programs

Fiscal year	National School Lunch Program	School Breakfast Program	Special Milk Program	Total cash cost	Total cost[1]
			Million dollars		
1977	1,570.3	148.6	150.0	1,868.9	2,409.7
1978	1,808.3	181.2	135.3	2,124.8	2,667.7
1979	1,983.7	231.0	133.6	2,348.3	3,093.2
1980	2,279.4	287.8	145.2	2,712.4	3,616.9
1981	2,380.6	331.7	100.8	2,813.1	3,708.3
1982	2,185.4	317.3	18.3	2,521.0	3,277.9
1983	2,401.8	343.8	17.4	2,763.0	3,563.9
1984	2,507.7	364.0	16.0	2,887.7	3,715.2
1985	2,578.4	379.3	15.8	2,973.5	3,774.7
1986	2,714.6	406.3	15.5	3,136.4	3,958.3
1987	2,797.1	446.8	15.5	3,259.5	4,147.6
1988	2,919.7	483.7	19.0	3,422.5	4,225.8

[1] Total cost equals total cash plus the value of donated commodities.
Source: (19).

in 1984 (17). Almost 80 percent of the participants were infants or children. To target limited resources to those persons in greatest need, WIC uses a participant priority system. When local WIC agencies reach their maximum caseload, pregnant women and infants with the most serious nutritional need are enrolled first. To accommodate more recipients with existing funding and to offset rapidly rising infant formula prices, many States are negotiating contracts directly with manufacturers for the purchase of infant formula. Some States have negotiated discounts of as much as 70 percent off the retail price. These contracts will enable those States to provide benefits to a greater number of recipients. Almost all States have such contracts in place for fiscal year 1990. The effect of these contacts on non-WIC purchasers of infant formula is unknown.

Food Distribution Programs

The major food distribution programs are the Nutrition Program for the Elderly, the Commodity Distribution Program to Charitable Institutions, the Commodity Supplemental Food Program, and the Temporary Emergency Food Assistance Program (TEFAP). This administrative classification of programs does not include the National School Lunch Program and some other programs that also distribute commodities.

Table 4—Monthly participation in major food assistance programs

Year	Food Stamp Program[1]	National School Lunch Program[2]	School Breakfast Program[2]	Women, infants, and children program
		Millions		
1977	15.6	26.2	2.5	0.8
1978	14.4	26.7	2.8	1.2
1979	15.9	27.0	3.3	1.5
1980	19.2	26.6	3.6	1.9
1981	20.6	25.8	3.8	2.1
1982	20.4	22.9	3.3	2.2
1983	21.6	23.0	3.4	2.5
1984	20.9	23.4	3.4	3.0
1985	19.9	23.6	3.4	3.1
1986	19.4	23.7	3.5	3.3
1987	19.1	23.9	3.6	3.4
1988	18.7	24.2	3.7	3.6

[1] Excludes Puerto Rico.
[2] Nine-month average.
Source: (19).

Expenditures for these programs have increased markedly since 1980 but dropped sharply in 1988 (table 1). Food distribution programs accounted for about 5 percent of all expenditures on food assistance programs in 1988, up from just over 1 percent in 1980. TEFAP accounts for most of the variation in expenditures exhibited by these programs.

Food distribution programs have historically been associated with surplus commodities obtained through farm price support programs. If support prices are set above market prices, the Government purchases the surplus commodities and, thus, accumulates inventories. As inventories grow, storage costs rise, and the Government eventually seeks ways to dispose of these inventories. The Government usually distributes surplus commodities through domestic or foreign food assistance programs. These programs alter traditional marketing channels and may displace some commercial sales.

The largest of the food distribution programs during the 1980's was TEFAP. Begun in 1982, TEFAP is an example of a food distribution program that originated because of large Government holdings. This program distributed surplus cheese, butter, honey, rice, dry milk, cornmeal, and flour. A 1986 FNS study estimated that 15-18 million households received some TEFAP commodities in that year (18). The distribution of large amounts of surplus cheese and butter displaced commercial cheese and margarine sales. This displacement became a contentious issue. Large dispersements and reduced levels of Government purchases of surplus commodities have depleted stocks of many commodities distributed under TEFAP. In response, some Government stocks of commodities that were destined for export have been diverted to TEFAP, and Congress has budgeted funds for the open market purchase of commodities.

The Hunger Prevention Act of 1988 extended TEFAP through 1991. However, because of the lack of surplus Government commodities, TEFAP will be a much different program than in the past when surplus commodities were plentiful. The 1988 Act authorized the annual purchase of $120 million worth of commodities in the open market for TEFAP distribution. The purchases will tend to increase the price of the commodities and may reduce consumption by people who do not receive TEFAP assistance. The exact extent of the effects on commodity prices and consumption levels will depend on the current market supply and demand conditions for the particular commodity.

The purchase of commodities in the open market appears to represent a shift in TEFAP from a surplus disposal program to a nutrition assistance program. This shift also illustrates the difficulty of basing a long-term food assistance policy for the low-income population on fluctuating and uncertain supplies of Government surplus commodities. Current changes in TEFAP are similar

to certain aspects in the evolution of the National School Lunch Program. The earliest assistance for school lunch program operations was begun in the 1930's primarily as a result of an agricultural policy which placed emphasis on the disposal of surplus commodities (20). However, within a decade cash grants were made to schools and funds were authorized without regard to the existence of surpluses. In 1988, only 19 percent of the expenditures by the National School Lunch Program were in the form of food acquired by USDA through price support and surplus removal programs.

Effectiveness of the Food Assistance Programs

All food assistance programs are transfer programs in which taxpayers provide benefits to program participants, primarily low-income households. The transfer can be as cash, vouchers or stamps, or commodities. The mix of current food assistance programs combines the Food Stamp Program, which is available to households meeting certain income and asset requirements, with a variety of other programs such as WIC or the Food Distribution Program on Indian Reservations targeted for particular low-income groups and the National School Lunch Program which provides nutritional benefits to both needy and nonneedy children.

Most food assistance programs, except the Nutrition Assistance Program for Puerto Rico, are inkind transfers rather than direct cash assistance. These inkind programs are able to provide specific food-related benefits to target population groups deemed to have special nutritional needs. Efforts to improve the targeting of program benefits through particular forms of inkind benefits or eligibility requirements incur added administrative costs.

Administrative costs for some food assistance programs have recently increased more rapidly than benefits have increased. For example, the Federal costs of running the Food Stamp Program increased in 1988 to about 10 percent of total program costs from 5.5 percent in 1980. Increasing cost has led to a desire by some for greater flexibility in administering the programs and for program simplification. For example, at one extreme, cash-only welfare programs would provide State administrators with flexibility by allowing them to consolidate all welfare benefits into a single payment. However, this approach may reduce the ability to control the use of food benefits by recipients and may increase program participation and total costs.

The trade-off between increased flexibility and greater cost saving, and greater ability to target benefits, will continue to face all food assistance programs.

Inkind transfers, either actual commodities or food stamps, require recipients to use the transfer for food purchases. This goal can only be partially successful, however, because the recipient can use food stamps or the commodity to substitute for cash which might have been previously spent on food. In fact, the intent could be completely offset if the recipient simply substitutes food stamps or the donated commodity for previous food expenditures and uses that money for nonfood purchases. However, the degree to which food purchases are, in fact, replaced has not been precisely determined.

Support for food assistance sometimes depends on the method of distribution. For example, farmers support commodity distribution programs, in part, because such food assistance programs provide a direct outlet for their surplus commodities. Without this feature, farmers may have less incentive to support food assistance programs. Thus, if farm policy were to change towards a more free-market orientation where fewer surpluses accumulated, some farmers may be less likely to support food assistance programs.

The retail grocery industry provides another example of the potential support of food assistance programs. This industry has an incentive to support the Food Stamp Program because food stamps use traditional food marketing channels. The alternative of direct food distribution in place of food stamps would bypass these channels and might displace some commercial sales. Alternatively, an assistance program based on cash payments instead of stamps would use traditional channels but might or might not add additional benefits to the grocery industry.

The Food Stamp Program

Numerous studies have estimated that the Food Stamp Program significantly increases the food spending of low-income households (2, 3, 4, 5, 10). Each dollar's worth of stamps increases food spending by 11-24 cents. USDA economists have estimated that the entire program increases aggregate U.S. food spending by 0.3-0.7 percent (3, 15).

How the Food Stamp Program affects nutrition is less clear. Some studies have found no significant effect. However, these studies concentrate on specific local areas that may not be representative of the U.S. population. A 1983 USDA nationwide study indicates that the Food Stamp Program improved the at-home diets of low-income people (2). Additional studies will be necessary to provide a definitive answer.

The benefits of this program to farmers are modest. In 1976, total farm income increased by $350-$750 million, or 0.2-0.5 percent of total farm receipts (11).

Other beneficiaries receiving income indirectly generated by the Food Stamp Program include the transportation sector ($50-$120 million) and the food retailing sector ($50-$510 million) (11). A greater proportion of food sales in small stores, compared with large stores, historically involve food stamps. Thus, small stores may benefit more from food stamps.

The program's estimated effect on retail prices depends on the extent to which the stamps increase food spending by the recipients. The 1979 USDA Special Nationwide Food Consumption Survey of Low Income Households found that food stamps led to a 5-percent increase in food spending by recipients (8). Other studies have found the increase to be as large as 10 percent. If 10 percent is correct, the Food Stamp Program may have increased retail food prices 0.08-4 percent, depending on the commodity (14).

Any increase in food prices will increase the Consumer Price Index (CPI). For example, if the Food Stamp Program increases food prices by 1 percent, the CPI would increase about 0.16 percent because of the weight given food in the CPI. The cost of other entitlement programs, such as Social Security, that have benefits indexed to the CPI would also increase, depending on how these programs adjust their benefits to changes in the CPI. If all programs matched changes in the CPI, benefits payments for these programs would increase by 0.16 percent.

The influence of food stamps on other sectors of the economy is small but significant to particular individuals. USDA researchers adapted a 1967 U.S. Department of Commerce simulation technique to estimate the net economic effects of the Food Stamp Program. They assumed that Federal personal income taxes were increased by the amount needed to fund food stamps. For 1976, they found that the Food Stamp Program increased total business receipts by $544.4 million and GNP by $306.5 million (11). This increase is less than 0.02 percent of GNP. The increase would be larger if taxes were not increased to pay for the stamps.

Another benefit of the Food Stamp Program is its role of counteracting or reducing the effect of an economic downturn. Participation and program expenditures increase when personal income falls and unemployment increases. Thus, the Food Stamp Program acts as a welfare safety net and helps stimulate the overall economy.

The National School Lunch Program and National School Breakfast Program

Researchers have found that participation in the National School Lunch Program improves the nutritional status of all school-aged children but especially for those from low-income households (1, 12). For example, a

needy child, 12-18 years old, participating in the National School Lunch Program, obtained an average of 728 more calories daily than a nonparticipating child. On the other hand, less needy participants in the same age group received only 169 more calories daily than a nonparticipating child (1).

A 1984 FNS study found that lunch-time consumption of all nutrients except vitamin C by older children in the National School Lunch Program increased. For children 6-11 years old, the results were less consistent. The researchers found that needy children who participated daily obtained slightly more protein, calcium, riboflavin, phosphorus, and vitamins A and B_6 but less magnesium and vitamin C than nonparticipants. These conclusions were based on a nationally representative sample of 6,556 students in grades 1-12 in 90 school districts obtained during the 1980-81 school year (6).

Some evidence of the effect of the children nutrition programs on younger children is reported in a recent study of elementary age children in Lawrence, Massachusetts (12). The authors of this study concluded that the School Breakfast Program improves academic performance and reduces tardiness of participating children.

The National School Lunch Program generally increases the market for agricultural commodities. A study by USDA's Economic Research Service found evidence that demand rose for red meats, poultry, and milk because of the program (10). Demand for fruits, vegetables, and eggs rose less.

The WIC Program

The WIC program is intended to (1) improve the nutritional status of and (2) provide increased access to a health care network for its participants. WIC benefits are monthly food supplements, nutrition education, and referrals to other health and social services.

A 1984 study found that the birth weights of infants born to women who participated in the WIC program were higher than those born to low-income mothers who did not participate. The study also concluded that participating women and their children were more likely to be healthy during and immediately after the pregnancy (7). However, these results cannot be generalized to the total population. A 1986 USDA study of the effectiveness of WIC showed mixed results (14). In this study, there was no consistent evidence that the program increased birth weights. Some evidence suggested, however, that the program lowered the number of premature births.

Other studies have reported on the effectiveness of the WIC Program. A U.S. General Accounting Office (GAO) report found that the general evaluations of

the WIC Program have not provided conclusive evidence on the effectiveness of the program (16). GAO recommended ways to improve both the delivery of foods and services and the procedures for program evaluation.

The Temporary Emergency Food Assistance Program

A surplus commodity distribution program such as TEFAP, prior to 1987, has two major effects. The donated commodity increases consumption by participants and displaces commercial sales by altering traditional marketing channels. The size of these two effects is likely to vary by commodity, method of distribution, and target population.

USDA research into the magnitude of the displacement of commercial sales by TEFAP has concentrated on the largest TEFAP donations, cheese and butter. Estimates of displaced commercial sales vary according to the sources of data and methods used. The best estimate is that 35 pounds of commercial cheese sales are displaced for every 100 pounds of TEFAP cheese donations. About half of the displaced sales come from the cheese purchased for consumption at home (18). TEFAP butter donations displace few, if any, commercial sales of butter because the target population consumed little butter prior to the program. However, TEFAP butter donations apparently displaced margarine sales pound for pound. This result shows that, in some cases, commodity donations can affect closely related nonprogram commodities.

Estimates on the magnitude of the net increase in consumption created by TEFAP are more tentative. A preliminary ERS estimate for cheese is that about 60 percent of TEFAP donations result in increased consumption. Overall, TEFAP has helped increase the level of food consumption although some marketing channels were altered.

Food Assistance Policy

The administration of food assistance programs is shaped by often conflicting influences of program targeting, simplification and flexibility, and administrative expenses. Program targeting attempts to limit the growth of food assistance expenditures by directing benefits to those most in need. Targeting methods include changing eligibility requirements, controlling the form of program benefits, reducing program abuses, and reducing administrative error rates. However, overemphasis on targeting can increase administrative expenses as regulations and program controls grow increasingly complex and burdensome. Program simplification and increased flexibility

may lower administrative expenses, but total expenses may increase due to relaxed targeting and increased program participation rates. Budget limitations and public perceptions of program effectiveness help shape the course of program choices between targeting and simplification.

In the past, reforms motivated by concern about program simplification, flexibility, and administrative expenses included the establishment of food assistance block grants to replace Federal programs and a Food Stamp Program that would provide cash rather than stamps. Neither of these reforms has been implemented, except for the creation of the Nutrition Assistance Program for Puerto Rico. However, both were promoted as ways to increase flexibility and save on administrative costs but at the loss of some ability to control the use of food benefits by recipients.

One way of characterizing the determination of the level of food assistance funding is in terms of two conflicting influences: a budgetary influence and an expansionary influence. The budgetary influence attempts to control or reduce the total cost of food assistance programs. Yet, nominal dollar outlays on all food assistance programs increased in the 1980's. However, real expenditures (constant 1988 dollars) for these programs have declined 7.3 percent since peaking in 1983 (table 1).

The expansionary influence attempts to increase the funding for food assistance programs by either increasing the scope of existing programs or creating new programs. The increased funding of both the Child Care Food Program and WIC, the creation and renewal of TEFAP four separate times, the increase in food stamp participation from about 50 percent of the eligible households in the middle 1970's to about 67 percent in the late 1980's, and an increase of about 30 percent in inflation-adjusted food stamp benefits per recipient all indicate an upward trend in food assistance expenditures. More recently, the presence of this influence is illustrated by the gradual increase in food stamp benefits to 103 percent of the Thrifty Food Plan by 1991 and changes to improve access to the Food Stamp Program mandated in the Hunger Prevention Act of 1988. The Thrifty Food Plan is a market-basket list of nutritionally adequate foods developed by USDA.

The funding level and scope of domestic food assistance programs will remain a volatile issue, potentially generating significant political debate. The level and intensity of this debate will depend upon the public perception of the extent of "hunger" in the United States. Measuring hunger is difficult, however, because it has many facets and is subject to a wide range of interpretations. How one chooses to define hunger may depend on the food policy issues of concern.

Two definitions of hunger are frequently used. One defines hunger in terms of malnutrition. Measures such as anemia, low weight, and infant mortality are used. In recent years, these measures have been improving. The other defines hunger as a lack of "food security." Food security is the condition in which there is access at all times to nutritionally adequate food from normal food channels. This second definition leads to a much broader concept of hunger.

Many who support expanding food assistance programs cite the increase in the number of food banks and soup kitchens as evidence of food insecurity and growing hunger in the United States. Others argue that the number of people using food banks and soup kitchens may reflect poor people trying to save money that they would otherwise spend on food. Other arguments also point out that the growth in the number of these food outlets may have been encouraged by a favorable change in the tax code affecting food donations and by the increased distribution of commodities through programs such as TEFAP.

The Hunger Prevention Act of 1988 signals a possible heightened Congressional concern about hunger and malnutrition with a move towards greater funding of food assistance programs. Whether additional funds to help the low-income population should be spent on food assistance or on other pressing needs such as housing, medical care, drug abuse prevention, or job training is a difficult question to answer. Such an answer would depend to a large extent on the perception of hunger and malnutrition in the United States and on the level of public empathy towards the need for food assistance.

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Chapter 13

The Distribution of Direct Program Payments, 1986

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The more than 1.5 million American farms are greatly diverse in terms of input use, agricultural output, costs, and income. However, the farm sector's net income is concentrated in the top 60,000 farms. Only about a third of all farms get most of the direct Federal income payments. About half of the direct payments go to about 127,000 farms that earn more than $40,000 each, including those direct payments.

Since the early 1900's, economists and policymakers have known that agriculture included chronically low-income, low-resource farmers who sold very little to the market, part-time farmers who held nonfarm jobs, and commercial farmers who depended on the market for their income. From the beginning of farm commodity programs in 1929, the benefits of the programs have gone to farms that produced the supported commodity. Benefits accrued either through higher prices or direct income-enhancement payments. Because larger farms produced the largest share of the specific program commodities for commercial markets, these farmers have received most of the direct benefits of the income-enhancement programs. Policymakers have recognized that the benefits did not go to the poor or to those who produced little of the program commodities. As early as 1933, Rexford Tugwell, who became the Administrator of the Resettlement Administration, U.S. Department of Agriculture, argued for programs that went beyond the Agricultural Adjustment Act of 1933 to address the problems of the rural poor (1).[1]

In 1945, William Nicholls remarked that,

> Recent agricultural policy has been primarily oriented toward the problem of unstable and low aggregate farm income. ... it has by-passed still broader resource problems closely related to rural

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[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

> poverty. One half of the nation's farms contribute less than one tenth of total farm-product sales. Price policy cannot solve this economic problem. Rather it is apt to continue to increase the disparity. Low family incomes within agriculture must be supplemented by means which will promote rather than hinder human mobility (6).

Many later studies have validated these early observations about the distribution of production and, by implication, the distribution of benefits. In 1969, Schultz pointed out that the smallest 50 percent of U.S. farms produced about 5 percent of the output (8). In 1982, Census of Agriculture data showed the smallest 50 percent producing 3 percent (9). The basic findings of these studies confirm the association of benefits with production and the increasing concentration of production. However, measures of the association of program payments with income were not available. Before 1984, the diversity among agricultural producers was usually described by using classifications such as value of sales, acres, or type of farm. In 1984, analysts lacking a measurement of direct distribution of net income implemented classification by debt/asset groupings as a rather crude procedure to identify farms that might have financial problems (5).

Classifying farms by income groupings, such as net cash farm income (operating margin) or gross family cash income (net cash farm income plus off-farm income) has only been possible since 1985, when USDA's National Agricultural Statistics Service (NASS) began collecting data that allowed analysts to estimate net cash farm income and gross family cash income for farms included in the Farm Costs and Returns Survey (FCRS).

This chapter provides detailed estimates on the distribution of direct Government payments to producers by net cash farm income and gross family cash income classes, value of sales, debt/asset ratio, and commodity specialty. Appendix tables detail the net and gross income distributions.

Significance of the 1986 and 1987 Data

The 1986 data are the first collected that show how the Food Security Act of 1985 distributed direct payments. The 1985 Act left target prices high and stable, allowed loan rates to decline quickly, and increased the level of direct payments sharply. Direct payments became a major source of income to those who produced program commodities. The 1987 data provide a second year of information about how payments are distributed and tend to confirm the 1986 data (app. tables 2 and 4).

Description of the Data and Definitions

The 1986 and 1987 Farm Costs and Returns Survey (FCRS) data were classified by net cash farm income or gross cash family income, and then by value of sales, debt/asset ratio, and type of farm or specialty, because the latter classifications are familiar to most analysts. The grouping of net farm cash income and gross family cash income into classes with boundaries as shown in table 1 are for convenience in analysis. They have no particular economic or statistical significance.

Net cash farm income equals cash receipts minus cash expenses for farm operation. Deductions were not made for depreciation, inventory adjustment, debt repayment, or family living expenses. A negative net cash farm income shows that the business suffered operating losses and was required to use savings, borrow against or sell assets, or draw on nonfarm income to remain in business.

Gross family cash income equals net cash farm income plus off-farm income of the family. This measure represents the income available for debt repayment, family living, investment, and income taxes. A negative gross cash family income shows that losses were so large that no residual from the combined farm and nonfarm income was left for family living, debt repayment, or investment. A family in this position would have to use savings, borrow additional funds, or sell assets to provide necessities.

The survey data do not allow estimation of the number of farms that would have had negative incomes if programs had not been in place or if they had not received payments. Simply subtracting payments from current income would be inappropriate.

A survey cell count of 30 observations was the minimum used for analysis. This provided the most extensive classification possible and yet maintained the reliability of the estimates. The data presented here are weighted expansions of the survey data and represent estimates of U.S. totals for the categories discussed.

Direct comparisons between specific cells for 1986 and 1987 are, for the most part, statistically insignificant. That is, the differences could be expected to occur with a high degree of probability for any samples drawn even if there was no real difference in the population in the two years. The data show that similar patterns existed across population groups in both years.

Income Estimates

The data in this report are a set of cross-sectional snapshots showing the diversity of farms and the distribution of direct payments. Net cash farm income is used as the primary classifier in this report because it is a good indicator of the financial condition of farm firms. Also, there is considerable interest in the relationship of net cash income and direct payments.

The 1986 survey data were collected from about 12,200 farms that represent 1.5 million farms. The 1.5 million farms received $91.9 billion from sales of farm products. The farms represented by the survey received $21.6 billion dollars in net cash farm income in 1986 (table 1). Within the aggregate data, individual farms vary from large to small, profitable to unprofitable, financially sound to insolvent. The net cash income of $21.6 billion resulted from 800,000 farms that had a positive net income of $30.5 billion and 700,000 farms that lost $8.9 billion combined. Over half of the $30.5 billion that went to farms with positive income went to the 60,000 farms that had $100,000 dollars or more in net cash income. Losses were less concentrated than net income, with just over a fourth of the losses falling on the 10,500 farms who lost $100,000 or more. The data illustrate the difficulty of describing the condition of agriculture with aggregate or average data. That is, both net income and net losses tend to be concentrated with most of the net income going to a small percentage of the high-income farms.

The 1987 survey data represented about 1.6 million farms. These farms received about $27 billion in net cash income, $19 billion to the 72,000 firms that had more than $100,000 in net cash farm income.

Distribution of Payments by Net Income Classes

Classifying farms by value of sales, debt/asset ratio, commodity, and income class provides a clear picture of the concentration of payments on large crop farms with positive farm incomes. About a third of the farms received direct Government payments (table 2). Direct payments were made to all groups based on the extent that they produced or had historically produced program commodities.

Survey estimates for 1986 show that 537,000 farmers—36 percent of the represented farms—received $7.9 billion in direct payments from farm programs in 1986. Almost 970,000 received no direct payments. Of the $7.9 billion in direct payments, about $1.8 billion or 23 percent, went to 36,000 farms that had net cash farm income of more than $100,000 (fig. 1). About $2 billion went to 91,000 farms with net cash farm income of $40,000 to $99,999,

and about $2 billion went to 164,000 farms with net cash farm incomes of $10,000 to $39,999. About 82 percent of all direct payments went to the 74 percent of the farms that had positive incomes after receiving the payments. The 196,000 largest farms (as measured by value of sales) receiving payments had sales of over $100,000 and received $5.3 billion in direct payments, or about 67 percent of the payments. However, 31,000 of the large farms continued to lose money even after receiving payments.

For all farms receiving payments, direct payments averaged $14,614 (app. table 1). For the 36,000 farms with net cash farm income over $100,000, payments averaged $50,440. Only 20 percent of the farms with sales of less than $40,000 received payments. Of the 484,000 farms with less than $40,000 in sales and a loss of up to $10,000, 56,000 received average payments of $2,366 per farm. Losses averaged $3,664 for that group of 484,000 farms.

Some surveyed farms had average payments of more than $50,000, but that does not mean that individuals exceeded the limit of $50,000 per person imposed by legislation. Several program farms or "persons" defined by the Agricultural Stabilization and Conservation Service (ASCS) as eligible for payments may legally be involved in one FCRS farm business. Thus, the payments on an FCRS farm may legally exceed $50,000.

Figure 1
Distribution of farms, farms receiving direct Government payments, and payments, 1986

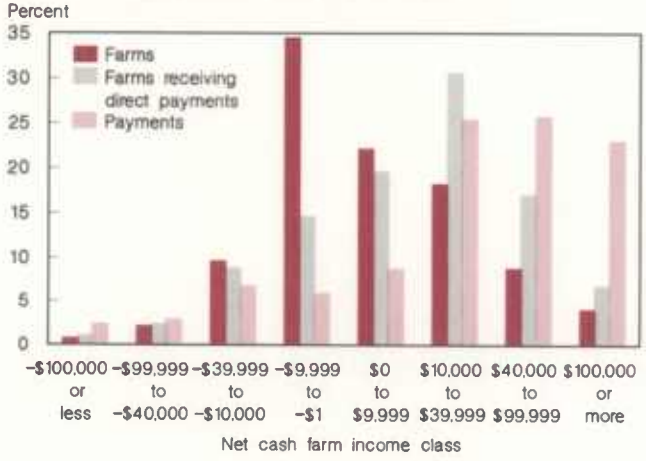

Table 1—Farms reporting net cash farm income and net cash farm income by value of sales class, specialty, and debt/asset ratio, 1986

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,999	$40,000 to $99,999	$100,000 or more	All farms
					1,000 farms				
Farms reporting cash income:									
All farms	11	32	145	520	334	274	132	60	1,506
Value of sales--									
$250,000 or more	4	3	3	1	2	9	20	43	88
$100,000 to $249,999	3	9	16	8	15	67	82	16	215
$40,000 to $99,999	2	6	22	26	45	126	27	1	255
$39,999 or less	2	13	102	484	272	73	3	0	949
Specialty--									
Crop	6	14	54	171	145	120	65	29	602
Livestock farms	5	18	91	349	189	154	67	31	904
Cash grain farms	4	6	29	79	81	89	47	18	352
Debt/asset ratio--									
Less than 0.4	7	17	94	439	281	206	96	42	1,180
0.4 to 0.69	2	7	27	53	32	42	21	10	196
0.7 to 0.99	1	5	14	14	12	15	10	5	75
1 or more	1	3	10	13	9	11	5	3	55

See footnotes at the end of table.

Continued—

Table 1—Farms reporting net cash farm income and net cash farm income by value of sales class, specialty, and debt/asset ratio, 1986—Continued

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,999	$40,000 to $99,999	$100,000 or more	All farms
	Billion dollars								
Net cash farm income:									
All farms	-2,392	-1,879	-2,745	-1,928	1,239	5,933	8,201	15,195	21,628
Value of sales–									
$250,000 or more	-1,387	-230	-100	-6	11	229	1,462	12,846	12,827
$100,000 to $249,999	-547	-572	-373	-38	80	1,780	5,090	2,060	7,500
$40,000 to $99,999	-240	-330	-483	-111	239	2,774	1,487	259	3,596
$39,999 or less	-218	-747	-1,789	-1,773	907	1,146	156	22	-2,295
Specialty–									
Crop	-1,233	-831	-1,057	-630	564	2,578	4,122	7,481	10,995
Livestock farms	-1,157	-1,048	-1,687	-1,297	675	3,354	4,078	7,715	10,633
Cash Grain farms	-623	-381	-563	-331	348	1,877	2,977	3,288	6,592
Debt/asset ratio–									
Less than 0.4	-1,608	-987	-1,734	-1,535	986	4,385	5,881	10,075	15,463
0.4 to 0.69	-403	-423	-544	-265	146	950	1,372	2,345	3,177
0.7 to 0.99	-113	-318	-262	-69	61	338	628	1,786	2,050
1 or more	-267	-151	-203	-59	46	261	320	990	938

Note: Totals may not add because of rounding.
Source: 1986 Farm Costs and Returns Survey.

Table 2—Distribution of direct Government payments by net cash farm income, value of sales, specialty, and debt/asset ratio, 1986

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,999	$40,000 to $99,999	$100,000 or more	All farms
	Million dollars								
Direct Government payments:									
All farms	177	217	529	455	687	1,984	2,009	1,796	7,854
Value of sales--									
$250,000 or more	111	77	83	38	61	203	436	1,285	2,293
$100,000 to $249,999	63	101	222	131	175	736	1,163	421	3,012
$40,000 to $99,999	2	30	158	154	213	782	374	90	1,803
$39,999 or less	1	9	66	133	238	263	36	0	746
Specialty--									
Crop farms	132	178	390	329	508	1,360	1,418	1,289	5,603
Livestock farms	45	39	139	126	180	624	591	507	2,251
Cash grain farms	101	123	324	287	438	1,214	1,194	961	4,644
Debt/asset ratio--									
Less than 0.4	97	90	235	223	330	1,166	1,235	1,161	4,537
0.4 to 0.69	52	59	121	144	203	467	414	308	1,767
0.7 to 0.99	13	46	105	48	100	212	217	162	902
1 or more	15	22	68	40	55	140	142	165	648

See footnotes at the end of table.

Continued—

Table 2—Distribution of direct Government payments by net cash farm income, value of sales, specialty, and debt/assest ratio, 1986—Continued

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,999	$40,000 to $99,999	$100,000 or more	All farms
					1,000 farms				
Farms reporting direct payments:									
All farms	5	12	47	78	105	164	91	36	537
Value of sales–									
$250,000 or more	2	2	3	1	1	6	13	23	51
$100,000 to $249,999	3	5	10	5	10	44	56	12	145
$40,000 to $99,999	0	2	14	15	23	78	20	1	155
$39,999 or less	0	2	19	56	71	35	2	0	186
Specialty–									
Crop farms	3	8	28	41	65	89	52	22	308
Livestock farms	2	4	19	37	40	75	39	14	229
Cash grain farms	3	5	22	34	56	79	45	17	260
Debt/asset ratio–									
Less than 0.4	3	6	25	56	70	111	62	25	359
0.4 to 0.69	1	3	9	13	21	31	16	6	101
0.7 to 0.99	0	3	7	4	9	12	7	3	45
1 or more	0	1	5	4	6	9	5	2	32

Note: Totals may not add because of rounding.
Source: 1986 Farm Cost and Returns Survey.

For 1987, the survey data show that 594,000 farms received $10.4 billion in direct payments. Of this total, $8.1 billion went to 324,000 farm with net farm income over $10,000. Over 50 percent of the payments went to 140,000 farms that had net incomes over $40,000 (app.table 2). However, 141,000 farms had negative cash incomes from farming even after they received a total of $1.9 billion in direct payments. Over 75 percent of the farms receiving payments had debts that totaled less than 40 percent of assets. About 75 percent of the farms receiving payments sold less than $100,000 worth of farm products and they received just over 50 percent of the payments.

Gross Family Cash Income

Net farm cash income is a reasonably good measure of the soundness of the farm business, but it is an inadequate measure of family income. Adding off-farm income to net cash farm income provides a more complete measure of family income, called "gross family cash income," because no allowance has been made for principal repayment or family living expenses.

Off-farm income totaled $36.6 billion in 1986, and 42 percent went to farms that lost $1 to $9,999 (app. table 3). Farms with less than $40,000 in sales received 75 percent of the total.

Of the $10.4 billion in direct payments to farmers in 1987, about $6.5 billion went to 240,000 farmers with gross family cash incomes exceeding $40,000. About 52,000 farms continued to have negative family income even after receiving $1.1 billion in direct payments (app. table 4).

Direct payments tended to be concentrated on the larger farms as measured by gross sales and gross cash family income classes (table 3). However, almost 12 percent of the direct payments went to farms that had a negative family income even after including the payment and off-farm income. Those producers probably would have been in much more serious financial condition had they not received any Government aid.

Summary

Agricultural production is carried out by a diverse set of business firms with greatly differing input, output, cost, and income relationships. Income is concentrated on large farms. Losses tend to be concentrated on small farms as measured by value of sales. Direct income support, aimed at the 33 percent of producers who produce program commodities, is concentrated on large farms, where the majority of production occurs. Assets and debts tend to be concentrated on farms where there is the greatest ability to repay debt. The

Table 3—Distribution of direct Government payments by gross family cash income, value of sales, specialty, and debt/asset ratio, 1986

Item	Gross family cash income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	All farms
	Million dollars								
Total direct payments:									
All sales classes	156	168	343	249	452	2,039	2,235	2,212	7,854
$250,000 or more	95	68	65	47	49	189	391	1,388	2,293
$100,000 to $249,999	60	78	155	101	124	672	1,147	676	3,012
$40,000 to $99,999	2	17	101	68	163	739	587	127	1,803
$39,999 or less	0	5	22	33	116	439	111	21	746
Specialty–									
Crops	121	135	259	173	329	1,414	1,559	1,613	5,603
Livestock	25	33	84	76	123	624	676	598	2,250
Debt/asset ratio–									
Less than 0.4	84	77	151	111	216	1,103	1,412	1,381	4,537
0.4 to 0.69	47	36	89	71	107	545	462	411	1,767
0.7 to 0.99	10	34	64	47	74	225	204	245	902
1 or more	15	21	39	21	55	166	158	174	648

See footnotes at the end of table.

Continued—

Table 3—Distribution of direct Government payments by gross family cash income, value of sales, specialty, and debt/asset ratio, 1986—Continued

Item	Gross family cash income								All farms
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	
	1,000 farms								
Farms reporting direct payments:									
All sales classes	4	9	22	25	66	224	136	51	538
$250,000 or more	2	2	2	1	1	5	12	25	51
$100,000 to $249,999	2	5	7	5	6	41	60	19	145
$40,000 to $99,999	0	1	9	7	16	77	40	4	155
$39,999 or less	0	1	4	12	43	101	23	2	186
Specialty–									
Crops	3	6	15	12	35	127	79	32	308
Livestock	1	3	8	13	31	97	57	18	229
Farms receiving payments:									
Debt/asset ratio–									
Less than 0.4	3	4	10	16	46	148	95	35	358
0.4 to 0.69	1	2	4	4	11	45	25	9	101
0.7 to 0.99	0	1	4	2	5	17	10	5	45
1 or more	0	1	3	1	5	13	6	2	32
All farms	4	9	22	25	66	224	136	51	538

Note: Totals may not add due to rounding.
Source: 1986 Farm Costs and Returns Survey.

farms with the highest value of sales and the highest family cash income tended to have the highest gross family cash income/asset ratio. Farms with sales of less than $40,000 had very low incomes in relation to assets. Even with off-farm income included, about 11 percent of farm families had negative incomes (losses) in 1986, but 27 percent of the losers had family cash income over $40,000. Because of the diversity of the sector, changes in aggregate and average farm income are misleading indicators of changes in the well-being of farmers. Data for 1987 show that direct payments, although larger, were distributed in about the same relative proportions among groups as in 1986.

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Appendix table 1—Average direct Government payments by net cash income, value of sales, specialty, and debt/asset ratio, 1986

Item	Net cash farm income								All farms
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	
	Dollars								
Average payments per farm:									
All farms	32,470	18,064	11,297	5,859	6,525	12,131	22,089	50,440	14,614
Value of sales–									
$250,000 or more	48,113	39,658	29,279	42,393	47,325	34,481	32,879	56,663	44,893
$100,000 to $249,999	24,694	18,752	21,446	25,081	17,255	16,730	20,703	36,217	20,708
$40,000 to $99,999	11,464	12,350	11,013	9,984	9,249	9,998	18,884	70,160	11,654
$39,999 or less	1,877	4,105	3,422	2,366	3,365	7,416	21,009	7,696	4,008
Specialty–									
Crop farms	39,551	21,488	13,932	8,010	7,789	15,298	27,377	59,177	18,173
Livestock farms	21,242	10,406	7,381	3,449	4,476	8,361	15,091	36,683	9,824
Cash grain farms	36,427	24,959	14,755	8,497	7,890	15,408	26,533	56,553	17,871
Debt/asset ratio–									
Less than 0.4	29,488	15,969	9,382	3,990	4,712	10,472	19,782	46,378	12,647
0.4 to 0.69	35,482	19,791	13,278	10,797	9,560	14,948	25,530	51,685	17,413
0.7 to 0.99	34,428	18,342	14,266	11,105	11,774	17,265	30,440	56,716	19,921
1 or more	47,621	24,605	12,846	9,859	9,680	15,978	27,686	93,594	20,289

See footnotes at the end of table.

Continued—

Appendix table 1—Average direct Government payments by net cash income, value of sales, specialty, and debt/asset ratio, 1986—Continued

Item	Net cash farm income								All farms
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	
	Percent								
Share of payments within income class:									
All farms	100	100	100	100	100	100	100	100	100
Value of sales–									
$250,000 or more	63	36	16	8	9	10	22	72	29
$100,000 to $249,999	36	46	42	29	25	37	58	23	38
$40,000 to $99,999	1	14	30	34	31	39	19	5	23
$39,999 or less	0	4	12	29	35	13	2	0	10
Specialty–									
Crop farms	75	82	74	72	74	69	71	72	71
Livestock farms	25	18	26	28	26	31	29	28	29
Cash grain farms	57	57	61	63	64	61	59	54	59
Debt/asset ratio–									
Less than 0.4	55	41	44	49	48	59	62	65	58
0.4 to 0.69	29	27	23	32	29	24	21	17	23
0.7 to 0.99	7	21	20	10	15	11	11	9	11
1 or more	8	10	13	9	8	7	7	9	8

Note: Totals may not add due to rounding.
Source: 1986 Farm Costs and Returns Survey.

Appendix table 2—Direct payments by net cash farm income classes, 1987

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	Total
	Million dollars								
All farms	187	342	717	625	1,057	2,800	2,833	2,455	10,391
Value of sales–									
$250,000 or more	115	94	34	23	27	83	310	1,290	1,906
$100,000 to $249,999	26	80	180	76	150	512	1,207	912	2,965
$40,000 to $99,999	33	86	190	186	250	1,071	1,081	192	2,899
$39,999 or less	14	82	313	340	631	1,133	235	61	2,621
Specialty–									
Crop farms	126	270	539	467	787	1,953	1,981	1,809	7,965
Livestock farms	32	61	158	131	240	767	771	576	2,736
Debt/asset ratio–									
Less than 0.4	93	168	439	394	705	1,977	2,029	1,778	7,582
0.4 to 0.69	73	65	149	144	185	538	460	437	2,051
0.7 to 0.99	7	76	74	38	78	111	197	115	696
1 or more	9	23	36	31	59	94	65	54	371

See footnotes at the end of table.

Continued—

Appendix table 2—Direct payments by net cash farm income classes, 1987—Continued

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	Total
					1,000 farms				
All farms	3	11	43	84	128	184	96	44	594
Value of sales–									
$250,000 or more	2	2	1	0	1	2	9	24	40
$100,000 to 249,999	1	2	6	3	6	24	44	18	103
$40,000 to $99,999	1	3	8	13	15	73	38	2	152
$39,999 or less	0	4	28	68	107	85	5	1	299
Specialty–									
Crop farms	2	7	27	49	86	110	57	28	366
Livestock farms	1	4	17	35	42	74	39	16	228
Debt/asset ratio–									
Less than 0.4	2	6	29	63	106	141	74	34	455
0.4 to 0.69	1	2	8	14	12	28	14	7	87
0.7 to 0.99	0	1	4	4	5	8	6	2	31
1 or more	0	1	2	4	5	7	2	1	21

Note: Totals may not add due to rounding.
Source: 1987 Farm Costs and Returns Survey.

Appendix table 3—Distribution of off-farm income by value of sales and net cash farm income, 1986

Item	Net cash farm income								All farms
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	
	Million dollars								
Total off-farm income:									
All farms	354	1,737	6,678	15,361	5,680	3,453	1,996	1,324	36,583
Value of sales--									
$250,000 or more	165	157	206	11	28	149	334	1,112	2,161
$100,000 to $249,999	52	125	201	448	142	756	1,198	183	3,104
$40,000 to $99,999	87	157	607	485	724	1,348	405	26	3,840
$39,999 or less	51	1,298	5,664	14,417	4,786	1,201	59	3	27,478
Share of off-farm income:					Percent				
All farms	1.0	4.7	18.3	42.0	15.5	9.4	5.5	3.6	100.0
Value of sales--									
$250,000 or more	.5	.4	.6	0	.1	.4	.9	3.0	5.9
$100,000 to $249,999	.1	.3	.5	1.2	.4	2.1	3.3	.5	8.5
$40,000 to $99,999	.2	.4	1.7	1.3	2.0	3.7	1.1	.1	10.5
$39,999 less	.1	3.5	15.5	39.4	13.1	3.3	.2	0	75.1

See footnotes at the end of table.

Continued—

Appendix table 3—Distribution of off-farm income by value of sales and net cash farm income, 1986—Continued

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	All farms
					1,000 farms				
Farms reporting off-farm income:									
All farms	5.7	23.4	123.0	478.5	285.4	208.4	98.8	39.2	1,262.4
Value of sales–									
$250,000 or more	2.2	2.1	3.2	.9	1.7	6.8	14.2	28.4	59.4
$100,000 to $249,999	2.2	5.2	11.4	6.8	10.8	48.7	60.1	9.7	154.9
$40,000 to $99,999	.6	4.7	17.4	22.6	35.1	95.6	22.1	1.0	199.1
$39,999 or less	.8	11.4	91.0	448.2	237.8	57.3	2.4	.1	849.0
Share of farms reporting off-farm income:					Percent				
All farms	.5	1.9	9.7	37.9	22.6	16.5	7.8	3.1	100.0
Value of sales–									
$250,000 or more	.2	.2	.3	.1	.1	.5	1.1	2.3	4.7
$100,000 to $249,999	.2	.4	.9	.5	.9	3.9	4.8	.8	12.3
$40,000 to $99,999	0	.4	1.4	1.8	2.8	7.6	1.7	.1	15.8
$39,999 or less	.1	.9	7.2	35.5	18.8	4.5	.2	0	67.3

Note: Totals may not add because of rounding.
Source: 1986 Farm Costs and Returns Survey.

Appendix table 4—Direct payments and farms receiving direct payments by total family cash income class, value of sales, specialty, and debt/asset ratio, 1987

Item	Net cash farm income								
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	Total
	Million dollars								
Direct Government payments:									
All farms	151	269	417	310	567	2,488	3,521	2,979	10,391
Value of sales–									
$250,000 or more	90	87	33	12	12	75	253	1,356	1,906
$100,000 to $249,999	24	59	112	89	100	363	1,171	1,136	2,965
$40,000 to $99,999	25	58	108	102	194	846	1,322	344	2,899
$39,999 or less	12	64	164	107	260	1,204	774	143	2,621
Specialty–									
Crop farms	126	212	323	232	464	1,788	2,546	2,274	7,965
Livestock farms	24	57	94	79	103	700	974	705	2,736
Debt/asset ratio–									
Less than 0.4	77	140	263	217	362	1,750	2,604	2,171	7,584
0.4 to 0.69	59	40	97	45	143	483	585	600	2,052
0.7 to 0.99	6	71	32	38	37	151	218	144	697
1 or more	8	19	25	11	25	105	113	123	319

See footnotes at the end of table.

Continued—

Appendix table 4—Direct payments and farms receiving direct payments by total family cash income class, value of sales, specialty, and debt/asset ratio, 1987—Continued

Item	Net cash farm income								Total
	-$100,000 or less	-$99,999 to -$40,000	-$39,999 to -$10,000	-$9,999 to -$1	$0 to $9,999	$10,000 to $39,000	$40,000 to $99,999	$100,000 or more	
	1,000 farms								
Farms receiving payments:									
All farms	3	7	20	22	56	246	177	63	594
Value of sales–									
$250,000 or more	1	1	1	0	0	2	8	26	40
$100,000 to $249,999	0	2	4	3	3	18	48	25	103
$40,000 to $99,999	1	2	5	6	10	63	60	7	152
$39,999 or less	0	3	11	13	43	163	62	5	299
Specialty–									
Crop farms	2	5	13	12	35	148	111	40	366
Livestock farms	1	3	8	9	21	98	67	23	228
Debt/asset ratio–									
Less to 1	1	5	12	17	43	188	141	47	455
0.4 to 0.69	1	1	5	2	9	36	23	11	87
0.7 to 0.99	0	1	2	2	2	13	8	3	31
1 or more	0	1	1	1	2	10	5	2	21

Note: May not add to total due to rounding.
Source: 1987 Farm Costs and Returns Survey.

Chapter 14

Factors Influencing the Recent Expansion In U.S. Wheat Exports

Kenneth W. Bailey*

U.S. wheat exports have increased significantly since the passage of the Food Security Act of 1985. About 50 percent of the increase can be attributed to provisions in this law, mainly aimed at making U.S. farm goods more competitive in world markets. The rest was due to such factors as domestic changes in import demand in the Soviet Union and China (40 percent) and reduced competitor yields (10 percent), factors that are unrelated to changes in world prices and U.S. farm policy.

U.S. wheat exports fell in the early 1980's from a high of 1.8 billion bushels in 1981/82 to 0.9 billion bushels in 1985/86 because U.S. agricultural exports were increasingly uncompetitive. Wheat exports have grown significantly since implementation of the Food Security Act of 1985, growing 74 percent to 1.6 billion bushels by 1987/88.

A major question facing U.S. policymakers is how much of this recent export expansion can be attributed to the 1985 Act. This chapter estimates the effect of the 1985 Act on wheat exports from 1985/86-88/89. I first isolated the factors that led to this expansion, and then computed the amount of the increase caused by each factor. The results can help policymakers assess the effectiveness of the 1985 Act in making the U.S. more competitive in the world market and in expanding wheat exports.

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Farm Policy and U.S. Exports

One of the major objectives of the Food Security Act of 1985 was to make the United States more competitive in world grain markets. The 1985 Act provided the Secretary of Agriculture with discretionary authority to offer export bonuses, as part of the Export Enhancement Program (EEP), to targeted foreign buyers to compete with subsidies offered by the European Community (EC). The 1985 Act also provided the Secretary with greater flexibility in setting loan rates. The Secretary, assuming that foreign demand for U.S. grains would increase if prices dropped, subsequently offered bonuses and reduced loan rates in 1986/87-88/89.

A major theme throughout the congressional debate on the 1985 Act was the loss of U.S. export market share to competing exporters. The cause of this export decline has been hotly debated, and that debate is still unresolved. One hypothesis claims that U.S. agricultural export embargoes in the 1970's reduced U.S. exports and farm prices and income in the 1980's. Embargoes undermined U.S. credibility as a supplier and encouraged competitor production under this hypothesis. This hypothesis, however, has been challenged by a study commissioned by USDA's Economic Research Service (ERS) to fulfill a congressional mandate in the 1985 Supplemental Appropriations Bill (8).[1] The resulting study concluded that:

> Embargoes did not cause the farm crisis of the 1980's and an aggressive export subsidy program to reduce surplus commodity stocks would not have prevented it. The cause more likely rests with ... the rising U.S. dollar, global recession, and high real interest rates.

The ERS study and analysis done elsewhere suggest that the high value of the U.S. dollar, coupled with high and inflexible loan rates created a "price umbrella" under which foreign countries expanded production of grains (6). That expansion, a world recession, and an international debt crisis reduced U.S. sales and market share in a shrinking world market. This hypothesis was echoed by Robert L. Thompson, USDA's former Assistant Secretary for Economics:

> As long as U.S. farm policy kept price supports above the world market-clearing price, our farmers would remain uncompetitive and export levels would continue to erode. Worse still, high U.S. price supports and acreage reduction programs provided incentives for

[1]Underscored numbers in parentheses identity literature cited in the References at the end of this chapter.

foreign expansion of agricultural output. The 1985 Farm Bill recognized these problems (7).

Assessing Recent Export Expansion

To analyze the effects of the Food Security Act programs on the wheat market, one must address several important issues. First, what factors were involved? Economic theory and recent studies suggest several factors. Second, one must be able to measure the importance of each of these factors. Such a measure provides the basis for answering other questions. For example, what would U.S. wheat exports have been had the level of these factors been different? This question is difficult to address because it involves analyzing the world wheat market under various assumptions. I developed the world wheat simulation model used in this analysis to assess the interaction of the major world wheat traders (1, 2, 3, 4). The simulation model uses equations provided by the Center for Agricultural and Rural Development (CARD) to explain trade by the Soviet Union and other importing regions (5).

I used the model to gauge the importance of several factors contributing to the rise in U.S. wheat exports. The model tested each factor by constraining that factor to its actual 1985/86 level to generate hypothetical export levels for 1985/86-88/89. Differences in export levels between these runs and actual exports provide an approximate measure of the factor's contributions to export expansion.

In a final simulation, I constrained all critical factors to their 1985/86 levels, reran the model for the 1985/86-88/89 period, and noted the change in U.S. exports. This test provided a lower export bound, because it suggests how low U.S. exports would have been without the 1985 Act's changes and reinforcing market developments (fig. 1). I then compared the individual simulations to the lower export bound to measure the effectiveness of the 1985 Act.

Factors Linked to Export Expansion

I initially tested five factors that may have contributed, individually or collectively, to the recent expansion in U.S. wheat exports:

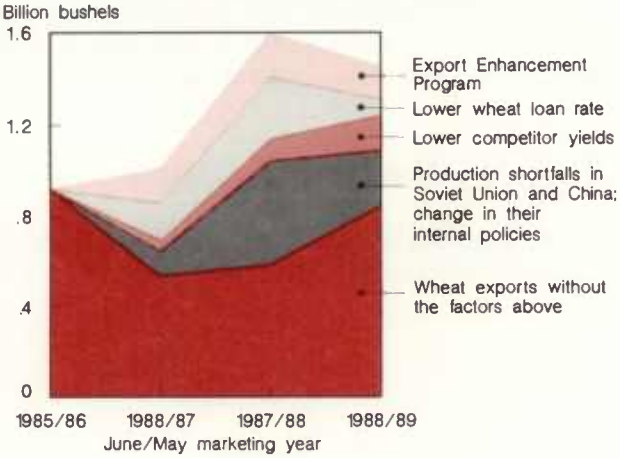
- The EEP,
- Lower wheat loan rates,
- Reduced wheat yields in competing countries,

- Depreciation in the value of the U.S. dollar, and
- Other factors, unrelated to the EEP and the lower loan rates, that expanded imports by the Soviet Union and China.

The EEP and lower wheat loan rates were provided for in the Food Security Act of 1985. The Findley Amendment to the 1985 Act gives the Secretary of Agriculture even greater discretion in lowering the loan rate to avoid lower exports and large ending stocks (see the Glossary, page 383, for a description of the Findley Amendment and other terms). The Secretary has used that provision and others in the 1985 Act to drop wheat loan rates sharply. The loan rate in 1985, the last year under the 1981 Act, was $3.30 per bushel. The wheat loan rate fell to $2.40 per bushel in 1986, $2.28 in 1987, and $2.21 in 1988 under the 1985 Act. The EEP has been used, in conjunction with Commodity Credit Corporation (CCC) export guarantees (GSM-102, GSM-103), to make U.S. exports more competitive in international markets by lowering U.S. prices in targeted markets where competitor subsidies have eroded U.S. market shares. Over $1.3 billion in EEP bonuses were distributed in 1987/88, with the average bonus equal to a discount of $37 on a ton of wheat that sold for $115.

Lower yields in competitor nations due to the adverse effects of weather reduced the amount of wheat in the world market, expanding the demand for

Figure 1
Farm policy is only half the story: Other factors also helped increase wheat exports



U.S. grains. For example, Canadian wheat yields fell from 1.9 metric tons per hectare in 1987/88 to 1.2 metric tons in 1988/89 due to the North American drought, which reduced Canadian wheat production by 40 percent from the year before. Model estimates suggest that had Canadian yields not fallen, U.S. wheat exports in 1988/89 would have declined by 61 million to 1.4 billion bushels, and the U.S. farm price would have been just $3.26 per bushel.

I also analyzed depreciation in the U.S. dollar in relation to the currencies of major competing exporters. With world wheat trade denominated largely in dollars, a depreciation in the dollar lowers export earnings in local currencies for export competitors, and lowers the price importing nations face in their currencies. Thus, I hypothesized a depreciation of the U.S. dollar to lower foreign production, increase world imports, and enhance U.S. exports.

A final factor under consideration is the recent surge in imports by the Soviet Union and China, significantly increasing U.S. wheat exports (table 1). My analysis measured the extent to which the import expansion was because of lower world and U.S. prices or because of internal factors unrelated to price.

Table 1—Wheat production and imports by the Soviet Union and China

Item	1985/86	1986/87	1987/88	1988/89 [1]
		Million metric tons		
Production:				
Soviet Union	78.1	92.3	83.3	84.5
China	85.8	90.0	87.8	87.5
Total	163.9	182.3	171.1	172.0
Imports:				
Soviet Union	15.7	16.0	21.5	15.0
China	6.6	8.5	15.0	16.5
Total	22.3	24.5	36.5	31.5

[1] Preliminary.
Source: (9, May 1989).

Overall Results

My analysis suggests that U.S. wheat exports would have fallen in 1986/87 and then risen to just less than 900 million bushels in 1988/89 had the factors noted above not been at work to expand exports (table 2, fig. 1). These estimates suggest that U.S. wheat exports increased significantly each year due to the factors isolated by the model. About 30 percent of this expansion in 1986/87 and about 20 percent in 1987/88-88/89 were due to EEP's lower U.S. export price in targeted markets. The lower wheat loan rate, dropping U.S. export prices to all buyers, was responsible for about 30 percent of the export expansion in 1986/87 and 1987/88, and 11 percent in 1988/89. Lower yields in competing countries accounted for 10 percent of the expansion in both 1986/87 and 1987/88 and 25 percent in 1988/89.

Most of the increase, however, was unrelated to the world price that increased imports by the Soviet Union and China. Even if one assumes that these two countries respond to changes in prices when they make import decisions, the bulk of their increase in imports remains unexplained. Production shortfalls and changes in domestic policy that ultimately encouraged imports appear to

Table 2—Factors that increased U.S. wheat exports [1]

Item	1986/87	1987/88	1988/89
		Million bushels	
Actual U.S. exports [2]	1,003	1,592	1,450
Low export scenario [3]	536	586	840
Market expansion [4]	467	1,006	610
		Percent	
Share of market expansion explained by following factors:			
EEP	31.4	18.6	23.4
Lower U.S. loan rate	35.0	26.6	11.0
Lower competitor yields	10.0	9.6	25.0
Soviet and Chinese imports	23.6	42.2	40.7
Depreciated dollar	0	0	0

[1] June/May crop year.
[2] Source: (9, Nov. 1988).
[3] Model scenario with all five factors constrained to 1985/86 levels.
[4] The year-by-year difference between actual exports and the low export scenario.

have been critical. These factors accounted for about 25 percent of the export expansion isolated by the model in 1986/87 and about 40 percent in 1987/88 and 1988/89.

None of the expansion during marketing years 1986-88 can be attributed to the depreciated value of the U.S. dollar in relation to other currencies. That depreciation caused competing countries to lower their export prices to remain competitive with the United States. The drop in competitor prices did not lead to lower production or exports because domestic policies in competing countries countered any fall in producer earnings. Changes in the dollar probably do not affect imports by the Soviet Union and China because other internal factors primarily determine their import decisions. Thus, the demand for U.S. wheat exports has not changed significantly because of exchange rate fluctuations. However, a weaker dollar lowers the price importers face and may increase U.S. wheat exports over a longer period of time.

Export Enhancement Program

The EEP is a targeted export bonus program designed to expand demand for U.S. wheat by allowing U.S. exporters to discount their prices by increasing the amount of U.S. stock available to the market. The program provides a bonus to U.S. export merchants in the form of generic certificates redeemable for commodities held by the CCC. The bonus is awarded on a competitive bid basis. U.S. export merchants can match prices of competing exporters in targeted markets knowing they might receive a bonus from the CCC in the form of a generic certificate. The EEP acts to expand the overall demand for U.S. wheat by lowering the price targeted markets pay by the amount of the bonus. Because the bonus is issued in the form of a generic certificate, exchanges for wheat increase the amount of grain available to the market and reduce U.S. Government stocks. These two results combine to expand the volume of U.S. wheat exports.

The amount of wheat shipped under the EEP has increased from 10 percent of total U.S. exports in 1985/86 to 65 percent in 1987/88. However, my analysis suggests that some of the wheat shipped under the EEP would have been exported regardless of the program because of the other factors mentioned. My model's comparison of scenarios with and without EEP suggests that total U.S. wheat exports increased 20 percent in 1986/87, 7 percent in 1987/88, and an estimated 6 percent in 1988/89 because of the EEP (table 3). Also, additionality, the percentage of EEP exports that occur solely because of the program, fell significantly in 1987/88 and 1988/89, indicating that the effectiveness of the program to expand U.S. wheat exports declined significantly with changes in market conditions.

The ability of the EEP to expand U.S. wheat exports depends critically on prevailing market conditions. World grain supplies were very large in relation to demand in 1986/87, and competition among exporting countries for markets was very keen. Moreover, much of the U.S. supply was tied up in Government stocks unavailable to the market. The EEP in this environment helped make the United States more competitive in targeted markets, especially against the EC in North Africa, a market that is highly responsive to changes in the world price of wheat. The EEP expanded U.S. wheat exports by 20 percent in 1986/87 above what they would have been without the program. Additionality was approximately 73 percent in 1986/87. That is, 27 percent of EEP shipments in 1986/87 would have been shipped regardless of the program and were thus commercially displaced.

Market conditions changed appreciably in 1987/88 as competitor production fell and Soviet and Chinese import demand grew significantly because of domestic factors. Thus, competition among exporting countries dropped markedly. Export expansion due to the program probably fell to less than 10 percent, with additionality also less than 10 percent in 1987/88. The EEP was less effective than in 1986/87 despite a fourfold increase in estimated bonus

Table 3—Effects of the Export Enhancement Program on U.S. wheat exports [1]

Item	1986/87	1987/88	1988/89
		Million bushels	
U.S. wheat exports:			
Actual exports [2]	1,003	1,592	1,450
Exports without EEP [3]	834	1,488	1,367
Export expansion due to EEP	169	104	83
Estimated EEP shipments	233	1,043	n.a.
		Percent	
Export increase due to EEP [4]	20	7	6
Additionality [5]	73	10	9

n.a. = Not available.

[1] June/May marketing year
[2] Source: (9, Nov. 1988).
[3] The level of exports that would have occurred without the EEP.
[4] Above U.S. wheat exports without EEP.
[5] The percentage of EEP shipments that occurred solely because of the program.

outlays to $1 billion dollars in 1987/88. Market conditions further changed in 1988/89 as the supplies of U.S. wheat available for export fell significantly because generic certificates issued under the 1985 Act decreased Government stocks and because of the drought. The drought also cut the Canadian crop by 50 percent. The result was very keen competition among importers for available world supplies. These market conditions further reduced the effectiveness of the EEP in generating export expansion, and additionality probably fell further.

Wheat Loan Rate

The Food Security Act of 1985 lowered the U.S. wheat loan rate from $3.30 per bushel in 1985/86 to $2.28 in 1988/89. This lower wheat loan rate translated directly into lower U.S. export prices that sparked about 30 percent of the export expansion isolated by the model in 1986/87 and 1987/88, and 11 percent in 1988/89 (fig. 1, table 2). The lower loan rate resulted in marginally lower competitor production and higher import demand. Harvested area in competing wheat exporting nations fell only 1-5 percent from what it would have been with the higher loan rate despite significantly reduced price supports. Generous agricultural support programs, particularly in the EC and Canada, isolate producers from changes in the world price, thus leaving planted area unresponsive to lower world prices.

The major effect of the lower wheat loan rate under the 1985 Act then, increased exports aside, was to sharply lower U.S. Government-controlled wheat stocks from what they would have been under a $3.30 loan rate. Maintaining the loan rate at the 1985 level would have meant large forfeitures by producers to the CCC to support the wheat farm price at $3.30 per bushel. Wheat normally produced for export would have continued to fall into CCC storage under a high and rigid loan rate.

Competitor Production

Wheat yields in the EC and Australia fell below their 1985/86 levels in both 1986/87 and 1987/88 due to adverse weather. The drought of 1988 accounted for most of the drop in Canadian wheat production from 26 million metric tons in 1987/88 to just 16 million metric tons in 1988/89. This shortfall reduced the amount available for export from those countries and increased the demand for U.S. wheat.

Because of the magnitude of these yield fluctuations, lower competitor yields had a minimal effect on U.S. wheat exports in 1986/87 and 1987/88, accounting for just 9 percent of the export expansion isolated by the model (fig. 1, table 2). However, the drought of 1988/89 significantly reduced Canadian wheat production and reduced U.S. wheat yields about 10 percent

from 1987/88. Therefore, reduced competitor yields accounted for 25 percent of the 1988/89 export expansion.

Imports by the Soviet Union and China

Total imports by the Soviet Union and China increased from 22.3 million metric tons in 1985/86 to an estimated 36.5 million metric tons in 1987/88, and then fell to a projected 31.5 million metric tons in 1988/89 (table 1). Some of this expansion was due to the lower wheat loan rate lowering export prices in general and the still lower U.S. prices of the EEP in these markets in particular. Most of their import expansion, however, was due to factors unrelated to the world wheat price, domestic production shortfalls and changes in domestic policies. These internal Soviet and Chinese developments accounted for 24 percent of the export expansion isolated by the model in 1986/87, and about 40 percent in 1987/88 and 1988/89 (fig. 1, table 2).

Soviet imports increased from 15.7 million metric tons in 1985/86 to an estimated 21.5 million metric tons by 1987/88, and then fell to a projected 15 million metric tons in 1988/89 (table 1). Soviet imports are related first and foremost to changes in Soviet wheat production, the U.S. wheat gulf ports price, the EEP bonus to the Soviet Union, and hard currency earnings from crude oil exports. Some of the recent import expansion, however, was due to a poor quality crop in 1987/88 which increased imports of bread-quality wheat needed to meet domestic food needs. Those nonprice factors especially increased Soviet imports.

Wheat imports by China increased from 6.6 million metric tons in 1985/86 to an estimated 15 million metric tons in 1987/88 and increased to a projected 16.5 million metric tons in 1988/89 (table 1). These higher imports were related to a growing population, rising incomes, and falling stocks in China. Recent economic reforms in China have increased personal incomes that led in turn to increased food demand. That higher demand outstripped domestic production and sharply lowered stocks. China chose to meet increased domestic demand and offset rapidly falling stocks with added imports. Some of the increase in total Chinese imports, however, is due to the price effects of lower wheat loan rates and the EEP. China has become more price responsive in recent years and may have taken advantage of the EEP offers by allocating more hard currency reserves to purchase a larger volume of grain to rebuild depleted stocks.

Conclusions

About 40 percent of the expansion in U.S. wheat exports since 1985/86 is directly attributable to expanded imports by the Soviet Union and China, related in part to EEP and lower loan rates, but largely due to internal factors such as production shortfalls and changes in domestic policies. Roughly half of the 1985/85-88/89 increase in U.S. wheat exports can be linked to policy changes in the Food Security Act of 1985. These changes include lower loan rates, the EEP, and generic certificates that made wheat available to the market.

The EEP program has been responsible for about 30 percent of the expansion in U.S. wheat exports in 1986/87 and about 20 percent of the expansion in 1987/88 and 1988/89. Although the amount of wheat shipped under the EEP has increased from 10 percent of total U.S. exports in 1985/86 to 65 percent in 1987/88, my analysis suggests that some of the wheat shipped under the EEP would have been exported without the program because of other factors mentioned. The effectiveness of the program in expanding U.S. wheat exports faded in 1987/88 and 1988/89 because of changing market conditions that reduced competition among the world's major exporters and increased competition among the world's importers.

Lower U.S. wheat loan rates significantly expanded U.S. wheat exports, particularly in 1986/87 and 1987/88, and significantly lowered U.S. wheat ending stocks. Lower loan rates made the United States more competitive in world markets and have lessened Government stocks. These lower stocks have lowered Government storage costs, helping to offset EEP costs.

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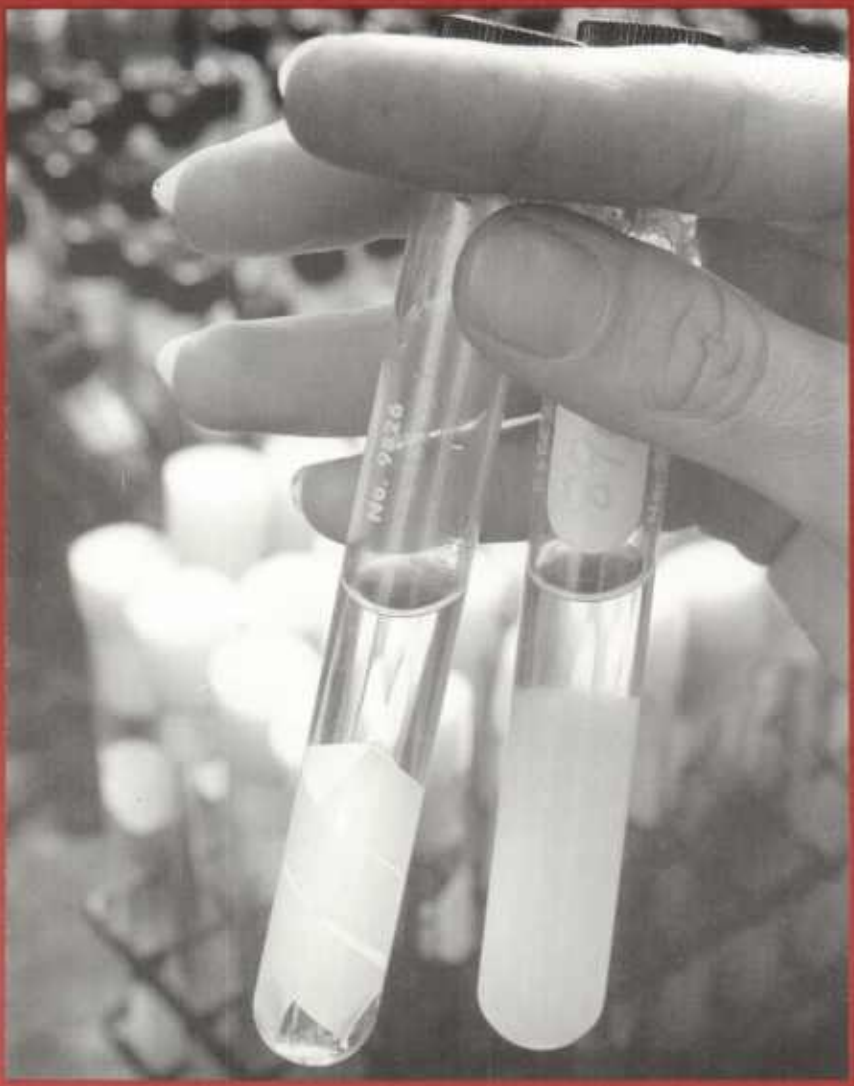
Emerging Issues



Chapter 15

World Agricultural Markets at Crossroads

Mathew Shane*

Global agricultural markets are experiencing serious conflicts between growing world interdependence in financial and commodity markets and domestically focused agricultural policies. The current multilateral negotiations under the auspices of the General Agreement on Tariffs and Trade offer a strategic opportunity to fundamentally alter the way international agriculture is conducted and to overcome these growing conflicts. Domestically focused policies have led to a misalignment of global production and consumption resulting in cycles of substantial global surpluses followed by periods of substantial shortages. The large government expenditures required by the current conflict will induce some agricultural trade liberalization even if the multilateral negotiations are not entirely successful.

Commodity trade grew rapidly in the late 1970's under conditions of rapidly increasing commodity prices.[1] The 1980's, however, brought global commodity markets to a crossroads. Surpluses have grown, induced by stagnant or declining trade. Global prices have fallen, and in response, many governments have increased subsidies to agriculture. Only with the 1988 drought in the United States have global demands exceeded supplies and commodity prices begun returning to 1970 levels. Domestically focused agricultural policies have conflicted with the pattern of growing international integration. The issue facing global trading nations is whether they can put their separate domestic interests aside and negotiate a new world order in agriculture to allow domestic agricultural markets to respond to global interdependence.

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[1]Prices for raw materials generally increased during 1973-81. For example, during 1972-80, the dollar price of bauxite and rubber quadrupled, the price for aluminum and coffee tripled, and nickel, copper, and manganese doubled. Other agriculture prices also increased substantially compared with their long-term patterns.

The objectives of this chapter are:

- To describe the changes in the global macroeconomic factors which are affecting world agricultural markets;

- To assess the implications of the conflicts between the changes in the global macroeconomy and domestically focused agricultural policies; and

- To assess the prospects of changes in agricultural policies to reduce the conflict.

Governments around the world intervene to achieve various domestic agricultural objectives. Such interventions prevent price signals in the international economy from being reflected in domestic prices, resulting in either too much or too little production or consumption or both. Developed countries generally protect their farmers with significant subsidies, while developing countries and countries with centrally planned economies often pursue policies that implicitly tax their agricultural producers. Thus, surpluses tend to accumulate in developed countries while shortages often appear in the developing countries and those with centrally planned economies.

The current problems in global commodity markets reflect the conflict between the growing integration of the world's economies and the independent pursuit of domestic agricultural policies that distort market signals and resource allocations. Furthermore, changes in the international trade environment have meant that national macroeconomic policies have a much greater effect on the trade sector than they did 20-30 years ago.

Agricultural trade has not been a part of the post-World War II trade liberalizing trend. In fact, agricultural policies have been largely exempted from the GATT rules. Tariffs on industrial countries' manufactured goods declined from 40 percent in the mid-1960's to 6-8 percent by 1974. After the Tokyo Round of GATT negotiations (1974-79), those tariffs fell another 30 percent or more. Nominal protection rates for agricultural commodities in industrial countries rose to 28 percent from 21 percent during 1965-74 and were 40 percent in 1988.

Because the policies of one country can affect others and because the rate of intervention in agriculture is so much higher than in industry, agriculture has been included in the current GATT multilateral trade negotiations. This action is especially important with increased government interventions in the 1980's. The current GATT negotiations are to include all forms of explicit or implicit subsidies. These negotiations offer major trading nations a strategic opportunity to fundamentally reformulate their agricultural policies so that those policies no longer distort trade.

Macroeconomic Factors Affecting World Agricultural Markets

Institutional developments outside of agriculture have fundamentally altered the environment in which agricultural trade operates. These developments have brought to the forefront issues that have been largely neglected or ignored in the past. Growing integration of the world economy, the development of a well-integrated world capital market, and the movement to flexible exchange rates are important issues for the agricultural sector. Macroeconomic policies now work through variations in exchange rates more than changes in interest rates. Therefore, these policies have greater effect on competition of trade-intensive sectors such as agriculture than on sectors that depend less on trade.

The Growing Integration of the World Economy

One of the most pronounced features of the postwar economy is the consistent pattern of growing world integration. Except for a few recession years and the years since 1981, world trade grew substantially faster than world gross domestic product (GDP) over the entire period (table 1). For example, developing countries' exports grew at 8 percent a year compared with 5 percent a year for their GDP since 1970. The consequence of this growing integration is that nations are much more interdependent than they were in the early 1960's, and changes in the world economy tend to affect domestic economies more significantly.

This pattern of growing integration also affects agricultural trade. However, this pattern is somewhat different from that of total trade dependence (table 2).[2] For developed countries, the agricultural trade dependence ratio, the percentage of agricultural production that is exported, is higher than for total trade, but the world's agricultural dependence ratio tends to be slightly lower than for total trade. The developing and centrally planned economies tend to depend on agricultural trade much less than on their overall trade, but the developing countries have a more consistent pattern of increasing agricultural trade dependence against the stable or declining pattern for overall trade.

One explanation for this growing interdependence between countries is that their agriculture sectors are increasingly specializing in certain commodities. In a world without direct government intervention, specialized production

[2]The total trade dependence ratio is defined as total exports of goods and nonfactor services divided by gross domestic product (GDP). The agricultural trade dependence ratio is measured by total agricultural exports and imports divided by two divided by agriculture's contribution to GDP.

Table 1—Real export/gross domestic product ratio, developed, developing, and centrally planned countries

Country group	1970	1975	1980	1982	1984	1986
			Percent			
World	15.9	17.1	18.7	18.7	19.1	20.6
Developed countries	15.2	17.5	20.1	20.3	21.0	22.8
European Community	22.0	25.9	29.0	30.4	32.0	35.7
United States	6.9	8.6	10.1	9.1	8.2	7.8
Developing countries	28.2	25.2	24.4	23.8	24.0	25.5
Low and middle income	26.8	23.6	19.2	17.5	17.5	17.4
Upper middle and high income	29.1	26.1	27.8	27.2	27.6	28.3
Countries with centrally planned economies	7.2	8.1	8.3	8.4	8.5	9.6

Table 2—Agricultural trade dependence rate [1]

Country group	1970	1975	1980	1982	1984	1986
			Percent			
World	11.0	13.2	15.9	17.6	16.0	16.4
Developed countries	44.1	55.5	93.1	74.4	65.1	93.6
European Community	39.4	42.1	48.0	40.7	43.0	50.3
United States	5.6	15.6	35.1	26.0	20.2	9.0
Developing countries	12.8	15.5	17.7	20.4	20.5	19.6
Low and middle income	12.2	13.0	12.5	14.2	13.4	14.0
Upper-middle and high income	13.9	20.0	26.3	30.7	32.4	28.9
Countries with centrally planned economies [2]	2.5	2.5	4.0	5.6	1.9	3.8

[1] The agricultural dependency ratio is the absolute value of net agricultural exports over agricultural gross domestic product. A country can have a ratio greater than 100 percent.
[2] The planned economies group includes only Hungary, Yugoslavia, and China because of limited available data.

would imply increasing world efficiency and movements towards trade based on comparative advantage. However, some of the specialization and increased trade dependence could be caused by the current level of government intervention.

Integration of World Financial Markets and Flexible Exchange Rates

One of the most important aspects of the growing integration of the world economy has been the emergence of well-integrated world financial markets. This development is closely associated with the increasing dependence on trade, the desire of world bankers and financiers to escape the growing regulation of domestic financial markets, and the consequences of oil shocks of the 1970's which led to large increases in international liquidity. All of these factors combined to generate the demand for offshore financial centers which could be used to move funds across national boundaries without regulations.

In the years immediately after World War II, international capital movements were almost exclusively related to trade or government-to-government transfers. However, the Eurodollar market emerged in the 1960's in response to sustained U.S. trade deficits. The Eurodollar market broadened to include all major European currencies and other offshore financial centers that emerged around the world. Major international capital markets now operate in all regions of the world. The emergence of huge dollar deposits associated with the oil shocks of the 1970's greatly increased the size of these markets.

The magnitude of private assets and transactions on these markets is so large that any government or set of governments would have difficulty significantly altering the flows. In mid-1987, offshore bank deposits exceeded $4 trillion, and total world exports were about $2 trillion. International financial flows are an estimated $40 trillion-plus, or more than 20 times that of trade flows. Financial flows now dominate trade flows in determining short-term currency movements.

The movement toward flexible exchange rates is a necessary outcome of the emerging international financial markets. Foreign currency reserves of all countries amounted to slightly less than $500 billion in 1987, only 12 percent of private currency deposits. In 1973, when the United States unilaterally went to a floating exchange rate, total foreign currency reserves were only $100 billion compared with offshore deposits of around $400 billion. In such an environment, no single country or group of countries could counteract the expectations of the private market and thus fundamentally alter the direction of change of exchange rates. By the time the United States went to a floating exchange rate, its total foreign currency reserves were less than $12 billion, an

amount clearly insufficient to stop any concerted private market pressure for an exchange rate change.

These changes in the international financial environment alter the way that monetary and fiscal policies affect domestic economies. Under a fixed exchange rate, monetary and fiscal policies work through changes in domestic interest rates and the rate of inflation. Under a flexible exchange rate, macroeconomic policies encourage the transfer of assets from one country to others. This transfer of assets leads to changes in exchange rates which by changing the relative profitability of industries induces transfers of resources from trade sectors, with export and import industries competing, to nontrade sectors or the reverse.

These effects of exchange rate changes on agriculture are particularly important for countries like the United States where agriculture is an important trade sector. The exchange rate tends to decline under conditions of easy monetary policy; if the exchange rate increases under tight monetary conditions, agriculture will become less competitive. Under the current flexible exchange rate system, changes in monetary policies in major countries such as the United States, Germany, and Japan can significantly affect world commodity markets.

Debt in Developing Countries and Global Agricultural Trade

The debt problem of developing countries resulted from many of the same phenomena that led to the integration of world financial markets and could not have arisen without that integration (4).[3] World debt, one of the more serious constraints to world trade and development in the 1980's, is a highly intractable problem that could plague the world economy for years to come (7). Financial constraints have led some countries to adjust as necessary, but repaying debt will severely restrain the policy options and budgetary flexibility of developing countries well into the 1990's.

The Consequences

The process of adjusting to the over-accumulation of debt in the 1970's has had several major consequences. Per capita economic activities in the developing countries have declined because of austerity policies that constrain budgets and imports. Imports have declined as governments have tried to

[3]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

control trade deficits. However, exports have not grown as expected, partly because so many countries have simultaneously tried to reduce imports and expand exports and partly because developed countries also are trying to overcome excessive government deficits generated from policies of the early 1980's.

Renewed growth in developing countries requires investment in new industries or in existing export industries to sustain export growth. The repayment of the debt accumulated in the 1970's has come from the resources that could have been used for national investments. This pattern of reduced investments suggests a sustained period of sluggish growth in debt-affected developing countries.

Global Demand Factors

Weak growth in international demand contributed significantly to the surpluses that existed before 1988. Global commodity demand results indirectly from the interaction of the world macroeconomic environment and the policies taken by trading nations. These create the environment under which factors such as population and income growth directly determine demand. Demand factors—including population growth, per capita income growth, export growth, and change in agricultural prices—declined significantly between the 1970's and the 1980's (table 3). Population growth has slowed in all countries except low and middle income developing countries where it has stayed the same. Per capita income growth has fallen and even become negative for all groups except the countries with centrally planned economies. Export growth has similarly declined except for low income countries and countries with centrally planned economies. Finally, as a reflection of the weakening of demand, agricultural prices that had increased during 1970-81, declined sharply during 1981-86. All of these factors combine to imply declines or reduced increases in agricultural trade demand in the near and intermediate term.

The demand environment for developing countries is a particular problem. The financial constraints of the debt problem and the instability in exchange rates and commodity prices have combined with a slowing of population and income growth. These factors together seriously reduce the rate at which the developing countries can increase purchases of agricultural commodities in the commercial market.

Weakness in international commodity markets is derived not only from slow demand growth, but also from the fact that supply has increased faster than demand. Yet recent supply constraints are becoming more seriously binding. With the advent of U.S. drought conditions following a period of deliberate

Table 3—Determinants of global agricultural demand

Item	World	Developing countries			Developed countries			Countries with centrally planned economies
		Total	Low income	High income	Total	European Community	United States	
				Percent				
Share of world population, 1986	100.00	54.51	42.15	12.37	14.72	5.35	5.07	30.76
Annual population growth rates:								
1970-80	1.84	2.41	2.45	2.31	.77	.34	1.05	1.48
1981-86	1.65	2.39	2.45	2.19	.54	.10	.92	.93
				1980 dollars				
Gross domestic product (GDP) per capita:								
1970	2,363	837	420	2,217	8,496	8,249	9,790	1,407
1975	2,576	974	468	2,658	9,453	9,186	10,534	1,577
1980	2,808	1,084	482	3,104	10,803	10,521	11,805	1,694
1986	2,931	1,073	484	3,082	12,027	11,356	13,056	1,869

Continued—

Table 3—Determinants of global agricultural demand—Continued

Item	World	Developing countries			Developed countries			Countries with centrally planned economies
		Total	Low income	High income	Total	European Community	United States	
				Percent				
Annual growth rate in GDP per capita:								
1970-81	1.61	2.40	1.32	3.11	2.34	2.21	1.93	1.72
1981-86	.80	-.23	-.06	-.15	1.87	1.60	1.56	1.94
				1980 dollars				
Exports per capita:								
1970	376	236	112	646	1,293	1,818	674	101
1975	441	245	111	694	1,658	2,375	908	128
1980	526	270	93	863	2,166	3,056	1,197	141
1986	603	263	84	873	2,746	4,059	1,018	180
				Percent				
Annual growth rate in exports per capita:								
1970-81	3.14	.92	-2.97	2.72	5.11	5.18	5.16	2.72
1981-86	2.68	.14	.81	.10	4.20	5.09	-2.78	5.82
Change in agricultural import prices:								
1970-81	8.59	9.67	9.82	9.61	9.59	9.59	8.58	6.21
1981-86	-3.46	-4.88	-5.42	-4.56	-2.84	-2.91	-1.64	-2.62

Source: (1, 8).

commodity stock reduction, we have seen a turnaround in shortrun commodity prices.

Technical Change and Global Trade

Technical change is the fundamental factor behind the continual increases in agricultural productivity. The rate of technical change is a direct result of government support of research and extension programs and the favorable investment climate created by government price support programs and tax policies.

Technical change has been a significant long-term factor in explaining the increases in yields in the developed countries and in the last 30 years in Asia. The relative rate of technical change of different crops compared with the compositional pattern of increasing food demand explains the shifts in global agricultural trade since World War II.

Recent surpluses generated an environment where the perceived outlook for major commodities was much dimmer than in the 1970's. Supply adjusted substantially via deliberate policy choices and weather-induced production shortfalls. Commodity stocks declined during 1988 because of sharply reduced production of grains in Australia, Canada, and Argentina. Furthermore, both the United States and the European Community (EC) had supply constraints in effect in 1987-88. These reactions to the surpluses of the last several years and the severe drought in the United States in 1988 increased the prices for basic agricultural commodities.

Furthermore, in the longer run, factors are operating to constrain the ability to continue to generate yield increases in grain crops based on a broader application of existing technology. Larger and larger percentages of research budgets are being spent on maintaining crop yields. Further extensive applications of existing yield-enhancing technologies are moving into more marginal areas where increasing yields come at a high and, perhaps, uneconomic cost. The prospects of severely constrained agricultural development budgets in both the developed and developing countries along with other factors constraining production suggests slower growth in production and thus a more favorable longer term prospect for agricultural markets.

A built-in bias tends to favor an increasing technological gap between developed and developing countries. The financial constraints in the developing countries keep them from participating fully in the next round of technical breakthroughs in agriculture based on biotechnology. Thus, the pattern of increasing interdependence between the developing and developed

economies should continue. The surpluses of the developed countries will continue to move toward the developing countries in the longer term.

Prospects for Changes in Agricultural Policies

Large imbalances in the marketplace can only be sustained with larger and larger budgetary outlays that at some point must severely constrain economic policy. The present global situation reflects such severe constraints. As part of the adjustment to the world debt problem, many developing countries have moved toward more market-oriented policies, leading to more efficient allocation processes in their economies. In some cases where governments have implicitly taxed their agricultural producers, this reorientation could lead to expanded agricultural production. However, in many cases, where self-sufficiency policies have been pursued, agricultural production might decline. In all cases, policy reforms should induce increasing openness and further increases in global trade.

The GATT negotiations may not produce liberalized global agricultural trade, but the budgetary pressures are sufficiently severe that some movement toward unilateral trade liberalization of the major agricultural developed countries is likely. The United States has already begun to move toward decoupled payments in the grains program. In the EC and Japan, U.S. pressure and potentially lost nonagricultural trade will probably lead to some concessions if not to total trade liberalization in agricultural markets.

The countries with centrally planned economies are also changing trade policies, more from the need to improve economic performance of the agricultural sector than from any multinational negotiations. The changes in China that initially led to 50-percent increases in major crops have slowed and significantly diversified agriculture toward cash crops. Nothing of this magnitude is yet evident in the Soviet Union or Eastern Europe. However, relaxation of central control, a process beginning in the Soviet Union and some Eastern European countries, could have a big payoff in agricultural output after a while.

Global agricultural markets are at crossroads. Forces outside of agriculture have changed the environment in which agriculture operates. Domestically focused policies have led to situations in which we have alternating global surpluses and shortages of commodity supplies. Pressures outside of agriculture are forcing changes in agricultural policies. Trade reform in different forms will lead to freer agricultural trade and markets where trade is much more related to fundamental economic factors. U.S. farmers can look forward to expanding foreign markets to again play a crucial role in their economic well-being.

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Chapter 16

Global Implications of Agricultural Trade Liberalization

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Agricultural trade liberalization by the industrial market economies would expand world trade and lead to higher world prices for most commodities. National welfare in all countries would improve. The producer losses that would result from the elimination of current farm programs in many countries could be offset by income payments that are unrelated to current production. Farmers would be equally well off, the trade and resource distortions caused by current agricultural policies would be eliminated, and the budget cost of supporting farm incomes in many countries would decline.

Agriculture has been a major issue during previous rounds of multilateral trade negotiations held under the General Agreement on Tariffs and Trade (GATT), but very little progress has been achieved in liberalizing agricultural trade. However, depressed world markets, growing commodity stocks, and the escalating cost of domestic farm programs in the 1980's have created a new urgency for agricultural policy reform. Attendees at the September 1986 GATT ministerial meeting held in Punta del Este, Uruguay, reached an agreement that emphasized the "urgent need to bring more discipline and predictability to world agricultural trade by correcting and preventing restrictions and distortions . . .so as to reduce the uncertainty, imbalances, and instability in world agricultural markets" (2).[1] Ministers agreed on three broad objectives for the Uruguay round: to improve market access by reducing import barriers, to increase discipline in the use of all subsidies and other measures affecting agricultural trade, and to minimize the

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[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

adverse effects that health and sanitary regulations can have on agricultural trade.

Since the 1986 ministerial declaration, member countries have presented several proposals for policy reform. The U.S. proposal, presented in July 1987, calls for member countries to completely phase out all policies that distort agricultural trade over a 10-year period. Bona fide food aid and policies that do not distort trade would be permitted. A similar proposal was later offered by the Cairns group of self-proclaimed nonsubsidizing exporters.[2]

The European Community (EC) proposal of October 1987 acknowledges the need to reduce support to agriculture. However, the EC has been unwilling to specify the degree to which it would reduce support. Its proposal emphasizes short-term actions to stabilize markets while maintaining its Common Agricultural Policy.

The negotiating process could be made easier if the effects of government intervention on world commodity markets are understood. This chapter analyzes the potential economic implications of removing all support to agriculture. Our policy reform scenario differs from the U.S. proposal in that we analyze the elimination of agricultural support only in industrial market economies.[3] The U.S. proposal would require policy changes by developing countries as well. Moreover, whereas the U.S. proposal is for a gradual reduction in only that support which distorts trade, our analysis assumes that all support is eliminated instantaneously. The appendix compares our analysis with that in other studies. The appendix also discusses issues concerning the shortcomings of trade liberalization studies and the need for caution in accepting the results.

Why Freer Trade?

The argument for freer trade relies largely on the concept of comparative advantage. That is, national and global economies would be most efficient if countries produce and export those goods with relatively low production costs.

A country can increase its income and consumption by trading goods that are relatively cheaper to produce for those that are relatively costlier to produce. The gains from freer trade come through efficient allocation of resources that reflects conditions in international markets.

[2]The Cairns group includes Argentina, Australia, Brazil, Canada, Chile, Columbia, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand, and Uruguay.

[3]The results in this chapter are based on an Economic Research Service (ERS) study on trade liberalization (7).

Many conditions can jeopardize free trade. Government intervention in the marketplace is one such condition. Government intervention provides incentives to producers and consumers that differ from the incentives in world markets. Resources that could have been used more efficiently in some other sector are attracted into the sector that receives government support. Such misallocation of resources lowers both national and global efficiency compared with a market with no government interference. Industrial countries typically employ agricultural support policies that encourage uneconomic production, reducing consumption, and creating excess supplies of agricultural products. World agricultural prices are therefore lower than they would be otherwise. If government intervention in agriculture were eliminated, world agricultural prices should rise, and the subsequent reallocation of resources should improve national and global economies.

Who actually benefits from freer trade is almost as important as the benefits themselves. Because resources are being transferred from the nonfarm sector to the farm sector, eliminating assistance to farmers should benefit consumers by lowering domestic food prices and should benefit taxpayers by lowering the costs of agricultural support programs. The effect of freer trade on producers is much less certain. If the higher world prices that result from freer trade more than compensate for the loss in government assistance, then producers will benefit. If the loss in assistance is greater than the price increase, producers will lose.

Despite the obvious benefits of free trade, governments continue to intervene in their agricultural sectors. Various justifications have been given, including food security, national defense, environmental protection, and raising government revenues. These explanations are ignored in the traditional free trade argument, and countries may consider themselves worse off with trade liberalization if these other national objectives are not met. Proposals for multilateral agricultural trade liberalization generally recognize the legitimacy of most of these national objectives. The proposals may not question countries' national objectives, but they do question the means by which these objectives are attained.

Economic Consequences of Liberalization

Falling international prices are among the most visible consequences of government intervention in agriculture. Eliminating all subsidies to agriculture in the industrialized countries would lower domestic farm prices in many of those countries but increase world prices for most commodities. (See "Interpreting Trade Liberalization Models," page 256.) Our analysis suggests that the rise in world prices would be greatest for dairy products followed by

Interpreting Trade Liberalization Models

These results were obtained from an ERS model. The model simulates the effects of eliminating all support to agriculture in the industrial market economies and is a useful tool for measuring the effects of policy changes. However, no model can take into account all the complexities of the real world and, by necessity, all models make simplifying assumptions. Results from the ERS model depend among other things on:

- The choice of 1986 as the base year—a different set of conditions could lead to different results;
- The selection of products—the ERS model excludes tropical products which account for nearly half the value of agricultural trade;
- The definition of a commodity—although the ERS model covers a large number of commodities (22 in total), each is assumed to be homogenous in international trade; for example, all types of beef are treated as one;
- The length of run—the ERS model produces medium-term estimates of policy effects; in the long term, investment and technology can also be altered;
- The appropriateness of economic and policy parameters in representing real world behavior;
- The accuracy of the policy response of countries not liberalizing agricultural trade; and
- The effects that agricultural liberalization can have on the rest of the economy.

Also, the ERS model is not a projections model. It does not tell us what would happen in the future if agricultural liberalization were to take place. Rather, it tells us what could have happened at a particular snapshot in time (1986) if government programs that support agriculture did not exist, all other conditions remaining the same. The results indicate directions of change that could occur based on historical conditions. In reality, exactly replicating conditions in the past is difficult because of the dynamic world economy we live in.

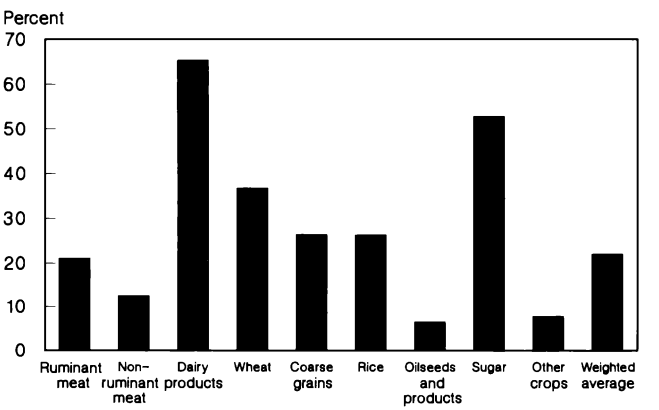
Some of these topics are discussed in more detail in the appendix to this chapter.

sugar (fig. 1). The large increases in world prices for dairy products and sugar reflect the high levels of assistance to these commodities in most industrial market economies and the importance of these economies in the world sugar and dairy markets. World prices for wheat, rice, coarse grains, and ruminant meat (beef, mutton, and lamb) also increase significantly for the same reasons. By contrast, world prices for oilseeds and oilseed products increase little, because agricultural policies in the industrial market economies do not generally support the prices of those commodities.

The production of most agricultural commodities in the industrial market economies will fall slightly with the removal of assistance (table 1). Increases in world prices do not completely offset the declines in producer prices resulting from the loss of government subsidies. Total farm output would fall 1 percent in the United States, 7 percent in the EC, and 32 percent in Japan. Production of most commodities in Australia and New Zealand would increase because higher domestic farm prices would more than compensate producers for the loss of government subsidies.

The global effects of trade liberalization would depend on the overall expansion of trade. World trade in rice and sugar would increase substantially, but trade in wheat and coarse grains would drop because of declining grain imports by developing countries and the elimination of export subsidies by the

Figure 1
World price effects of trade liberalization by the industrial market economies, 1986



Note: See table 1 for definitions of commodity groupings.
Source: (7).

Table 1—The production and trade effects of liberalization by industrial market economies (IME), 1986

Item [1]	United States	Canada	EC-12 [2]	Other Western Europe	Japan	Australia	New Zealand	IME [3]	Developing countries	World
						Percent				
Production quantity: [4]										
Ruminant meat	4	3	-15	-24	-13	8	11	-7	4	0
Nonruminant meat	0	-2	0	-9	-15	7	8	-3	2	0
Dairy products	-5	-4	0	-17	-18	8	15	-3	4	-1
Wheat	-6	-3	-16	-13	-61	10	23	-11	6	-1
Coarse grains	-4	-15	-4	-10	-71	5	11	-5	3	-2
Rice	-11	2	-32	5	-48	3	-1	-46	3	0
Oilseeds and products	2	1	-16	-1	-16	0	9	-4	0	-2
Sugar	-42	-10	-3	0	-34	14	0	-14	6	0
Other crops	-7	5	-11	-26	0	-1	7	-8	0	-1
Farm output	-1	-2	-7	-13	-32	7	10	-7	2	-1

See footnotes at end of table.

Continued—

Table 1—The production and trade effects of liberalization by industrial market economies (IME), 1986—Continued

Item [1]	United States	Canada	EC-12 [2]	Other Western Europe	Japan	Australia	New Zealand	IME [3]	Developing countries	World
					Million metric tons					
Trade volume: [5]										
Ruminant meat	1.1	0.1	-1.9	-0.2	-0.4	0.2	0.1	-1.0	0.9	0.4
Nonruminant meat	.4	.1	-.9	-.3	-.5	.1	0	-1.1	.6	.8
Dairy products	-.4	-.1	-.3	-.2	-.2	.1	.2	-.8	.5	.4
Wheat	-3.0	-.8	-12.9	-.7	-.8	1.6	.1	-16.5	11.9	-15.6
Coarse grains	-8.3	-3.2	-5.0	-1.0	3.9	.4	.1	-13.2	11.3	-3.0
Rice	-.4	0	-.6	0	-8.9	0	.1	-9.9	8.9	3.2
Oilseeds and products	1.7	.1	-1.7	.3	.5	0	0	.9	-.8	-1.5
Sugar	-3.4	0	-1.5	-.4	-.8	.5	0	-5.4	5.0	3.9
Other crops	-.2	0	0	0	0	0	0	-.2	.2	0

See footnotes at end of table.

Continued—

Table 1—The production and trade effects of liberalization by industrial market economies (IME), 1986—Continued

Item [1]	United States	Canada	EC-12 [2]	Other Western Europe	Japan	Australia	New Zealand	IME [3]	Developing countries	World
					Billion dollars					
Trade value: [6]										
Ruminant meat	2.5	0.2	-4.8	-0.5	-1.1	1.1	0.8	-1.8	1.6	2.5
Nonruminant meat	1.0	.1	-1.1	-.6	-1.9	.2	0	-2.4	.9	2.1
Dairy products	-1.2	-.3	.1	-.3	-.8	.6	1.6	-.3	-.8	5.1
Wheat	.7	.7	-1.4	-.1	-.4	.9	0	.5	-.1	.8
Coarse grains	.3	-.2	-.6	-.1	-.1	.1	0	-.6	.6	1.3
Rice	0	0	-.2	0	-2.4	0	0	-2.5	2.2	1.2
Oilseeds and products	.4	.2	-.7	.1	0	0	0	-.3	0	1.0
Sugar	-.9	0	-.3	-.1	-.2	.2	0	-1.1	1.4	1.7
Other crops	-.1	0	-.3	0	-.1	0	0	-.4	.3	.6
Total [7]	2.8	.7	-9.1	-1.8	-7.0	3.2	2.4	-8.7	6.2	16.3

[1] Commodity group definitions--Ruminant meat (beef, mutton, lamb), nonruminant meat (pork, poultry meat, eggs), dairy (milk, butter, cheese, milk powder), coarse grains (corn, other coarse grains), oilseeds and products (soybeans, soybean meal, soybean oil, other oilseeds, other oilseed meals, other oilseed oils); other crops (cotton, tobacco). [2] Belgium, Denmark, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, United Kingdom, and West Germany. [3] All countries with industrial market economies. [4] Production quantities are weighted by base production values. [5] A "+(-)" means an increase (decrease) in exports and/or a decrease (increase) in imports. [6] The signs, if trade value changes, may differ from signs of trade volume changes because price changes may more than compensate for quantity trade balance changes. [7] Totals may not add due to rounding.

Source: (7).

United States and the EC. Thus, total agricultural trade would change only moderately.

The U.S. agricultural trade balance would increase by nearly $3 billion. Most of this increase would come from declining meat imports and increased grain export revenues because of rising world prices. Australia and New Zealand would expand exports of animal products and improve their agricultural balance of trade by a combined $5.6 billion. The EC and Japan, on the other hand, have much larger agricultural trade deficits, because of increased imports of meats for the former and rice and meats for the latter. In response to higher world prices, developing countries would expand production and import fewer agricultural products. Their import costs would decline by $6.2 billion.

Protectionist agricultural policies in industrial market economies have reduced national incomes by encouraging inefficient use of resources. Those policies have also transferred incomes from the nonfarm sector to the farm sector and from consumers and national treasuries to agricultural producers. The consumer and national treasury costs of trade-distorting policies in most industrial market economies are considerably more than the benefits to producers. Our analysis indicates that in the industrial market economies, consumers and national treasuries gain $1.59 for every $1 that producers lose as a result of the removal of government support (table 2). U.S. consumers and the U.S. treasury gain $1.58 for every dollar lost by producers. The transfer gains are comparable in the EC ($1.62) but less in Japan ($1.39). Under current policies, only about two-thirds of the cost to consumers and treasuries benefits producers, and the rest is income lost to society.

Because protectionist agricultural policies have encouraged the inefficient use of resources, multilateral trade liberalization leads to a $35-billion annual increase in real income of the industrial market economies, about 10 percent of their combined agricultural gross domestic product (GDP) but less than 0.5 percent of their total GDP. Global real income gains are slightly less ($29.9 billion). The EC and the United States are the largest gainers ($14 billion and $8.6 billion), followed by Japan ($6.3 billion). Most of the gains to the United States come from Government budget savings, while those in the EC and Japan come from consumer savings.

On a per capita basis, the country that benefits the most from multilateral liberalization is New Zealand ($396). Much of the gains in New Zealand go to producers who would receive higher international prices for their exports. The net per capita benefits to the United States ($36), the EC ($43), and Japan ($52) are relatively low, less than 1 percent of per capita gross national product (GNP), because agriculture's contribution to GDP is very small (about 2 percent) in these regions, compared with 9 percent in New Zealand.

Table 2—The annual costs and benefits of trade liberalization to producers, consumers, and national treasuries in industrial market economies (IME), 1986

Country or region	Change in-- Producer welfare	Consumer welfare	Treasury savings	Total net benefits [1]	Benefit per capita	Benefit per dollar lost by producers	Net budget savings with decoupled payments
	Billion dollars				Dollars		Billion dollars
United States	-16.2	-4.6	30.3	8.6	36	1.58	14.1
Canada	-1.3	.2	3.8	2.6	101	3.03	2.5
European Community	-22.7	21.2	15.6	14.0	43	1.62	-7.2
Other Western Europe	-6.8	1.8	6.3	1.3	41	1.20	-.5
Japan	-21.8	24.7	5.7	6.3	52	1.39	-16.1
Australia	1.6	-1.5	1.1	1.1	71	.28	1.1
New Zealand	1.7	-.8	.5	1.3	396	.22	.5
IME	-65.6	40.9	63.1	35.3	46	1.59	-5.6
World	-38.4	10.4	62.8	29.9	6	n.a.	n.a.

n.a. = Not available.

[1] Includes losses by other groups, such as those holding quotas.

Source: (7).

Liberalization with Decoupled Adjustment Assistance

The U.S. GATT proposal of June 1987 would allow governments to make "decoupled" income payments to farmers. Such payments could be used to compensate farmers for the income losses that result from eliminating agricultural support policies. The payments could also be used to meet other national policy objectives without distorting trade.

There are several definitions of the term "decoupled." In the strictest sense, such payments should have no effect on a country's trade and thus would be independent of production, prices, or a farmer's decision to remain in agriculture. We used this definition in our analysis. Alternative, less stringent definitions could lead to different results.

Table 2 also indicates the net cost to national treasuries of trade liberalization with decoupled payments. We assumed that minimum cost programs can be designed that just offset the producer surplus losses in each country. Under these assumptions, trade liberalization would not change farm incomes in the United States but would save $14 billion in the budgetary costs of U.S. farm programs. Because Australian and New Zealand farmers benefit from trade liberalization, decoupled payment programs would not be necessary in these countries, and those governments would save the entire cost of their current programs.

Some countries, notably the EC members and Japan, would have higher budgetary costs because consumers now pay a substantial share of these countries' farm program costs through higher food prices. Trade liberalization with decoupled payments would lower consumer prices but shift the burden of supporting farm incomes directly into the governments' budgets. However, the overall cost to society of such a system would still be less than current programs. The increased taxes necessary to finance the decoupled payments would be less than the indirect taxes now paid by consumers under current programs. Furthermore, such a system would remove the trade-distorting effects of agricultural policies. Foreign producers would no longer bear part of the burden of protectionist policies in other countries.

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Appendix: Using Models To Analyze Trade Liberalization

That there are real income gains from trade liberalization is generally accepted. The magnitude of these gains, however, is very uncertain. Most quantitative analyses of trade liberalization are based on models. Ours is based on a multicommodity world model developed at the Economic Research Service (ERS), U.S. Department of Agriculture (USDA).

Models may underestimate the true gains to society from trade liberalization in several ways. Most studies deal only with a subset of agricultural products and often omit tropical products that account for nearly half the value of global

agricultural trade. Producers of these commodities tend to be protected in industrial market economies but taxed in developing countries. Including tropical products would increase the estimated benefits of agricultural trade liberalization to developing countries.

We used a partial equilibrium model of world agriculture in our analysis. A general equilibrium model, such as the model developed by the International Institute for Applied Systems Analysis (IIASA), could examine resource shifts between agriculture and the rest of the economy and provide greater insights into the effects of agricultural liberalization on factor markets and other sectors. Such models also allow us to better identify who gains from government support programs. For example, to what extent do program benefits increase land values? By including the rest of the economy, such models probably better estimate the overall gains from trade liberalization, particularly in those countries where agriculture is a significant portion of overall gross national product. Because agriculture is important in many developing countries, trade liberalization could lead to additional gains from faster economic growth.

The agricultural policies of many countries insulate their producers from world market conditions, adding to world market instability. Such protection is costly to those countries where producers are market oriented or which attempt to stabilize world prices. The United States, for example, has at various times used costly acreage control programs and stocking policies to stabilize prices. The increased price stability that results from trade liberalization would benefit the United States and other countries which now bear most of the burden of world market instability.

The great value of models is that they can take into account many complex economic relationships in a logical and consistent fashion. However, no model can take into account all the complexities of the real world and all models must, by necessity, make simplifying assumptions. Furthermore, trade liberalization will lead to changes that are beyond the bounds of historical experience in many countries. Model parameters, on the other hand, are either econometrically estimated or synthesized from econometric studies based on historical experience. Thus, models can only indicate the immediate direction of change following liberalization. Changing cost structures and efficiency gains, for example, could lead to a very different pattern of world production and trade in the long run.

Finally, we based our analysis on 1986 conditions. A different set of conditions would lead to different results. The distribution of gains can also depend very much on what policies countries adopt in the future. Farmers in a country that unilaterally liberalizes its agricultural sector, as New Zealand did just before 1986, will gain even more from multilateral liberalization.

Comparing the ERS Study with Other Studies

Because of the prominence agriculture has received in the Uruguay Round, several other studies have also looked at the global implications of trade liberalization. These studies include the work of the Organization for Economic Cooperation and Development (OECD) for the Ministerial Trade Mandate (4), the study by Tyers and Anderson for the World Bank's *World Development Report* (8, 9), and *Towards Free Trade in Agriculture* by IIASA's Food and Agriculture Program (5).

The world price effects generated by the major trade liberalization studies are compared and analyzed below. Analyzing the production, trade, and welfare implications reported in those studies is important but would require much more detailed information on the structure of each of the models and on the assumptions and elasticities that they use. Such information is for the most part not available. Nevertheless, understanding the world price changes that result from trade liberalization simplifies evaluating these other effects.

The world price changes generated by the studies are quite consistent, with the differences due primarily to different levels of protection. That the studies used different levels of protection is not surprising because the models were simulated for different time periods, and protection levels vary as domestic policies and world market conditions change.

The ERS and OECD analyses are based on static models that have been simulated for various historical periods. In this appendix, we report the OECD 1979-81 results and the ERS 1986 results. The Tyers and Anderson model, on the other hand, can be used in either a static or dynamic form. The static version was run for 1980-82, and the dynamic version was used to project results to 1995. The IIASA model, unlike the other three models, is a general equilibrium model that attempts to capture the interactions between the agricultural and nonagricultural sectors. The model has been used to project the effects of trade liberalization to the year 2000.

All of the studies predict that world prices for most agricultural commodities would generally rise following complete trade liberalization by the industrial market economies (app. table 1).[4] Two exceptions are slight declines in world prices for wheat and coarse grains from the OECD study and in nonruminant meat prices from the IIASA study. The price increases for dairy products vary considerably among the studies, but they agree that trade liberalization will most affect world dairy markets. The industrial market economies are major

[4]Because commodity coverage differs among these studies, we have aggregated model results to conform to the commodity groups used by Tyers and Anderson.

producers and consumers of dairy products, and most of their governments provide considerable support to their dairy sectors. The studies also agree that ruminant meat prices would increase substantially and that nonruminant meat prices would change only slightly. The studies also generally agree that world grain and sugar prices would rise with liberalization, but the predicted price increases are considerably different.

Appendix figure 1 indicates that much of the variation in world price increases predicted by the studies can be explained by differences in support levels.[5] When support is high, the world price increases that would be expected from trade liberalization are high, and vice versa. The predictions for ruminant meat, dairy products, and wheat most clearly illustrate that relationship. The predictions for nonruminant meat and rice also fit that general pattern. However, there are a few exceptions. The sugar support level used by Tyers and Anderson for 1995 is considerably higher than that used by ERS, but the Tyers and Anderson model predicts a much lower increase in world sugar prices. Tyers and Anderson 1995 also use a somewhat higher support level for coarse grains than IIASA, but predict that coarse grains prices will increase by much less than IIASA.

[5]Aggregate agricultural support is the total value of producer and consumer transfers as a percentage of domestic production plus consumption valued at domestic prices.

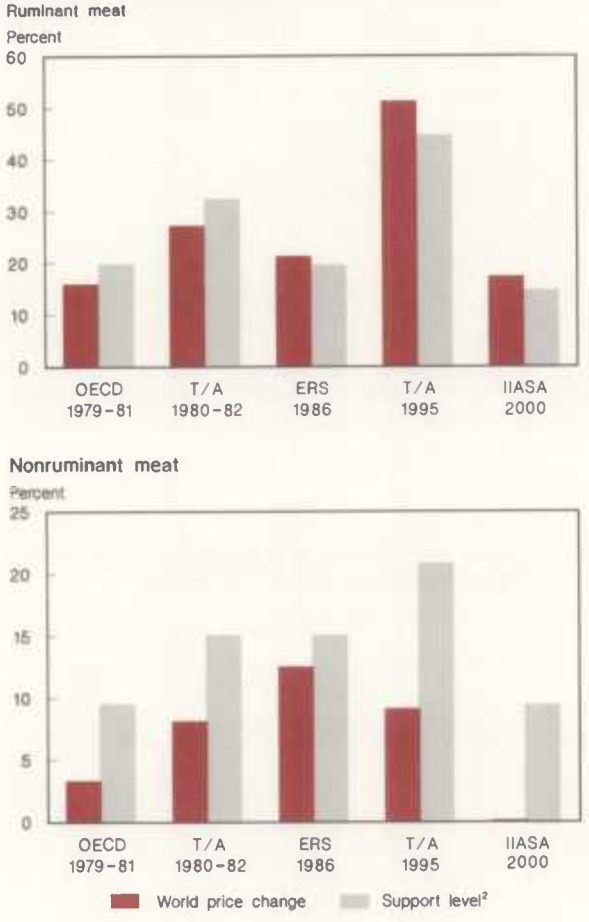
Appendix table 1—World price effects of agricultural trade liberalization by the industrial market economies

Agricultural products	Change in world prices projected by—				
	OECD 1979-81	Tyers/ Anderson 1980-82	ERS 1986	Tyers/ Anderson 1995	IIASA 2000
			Percent		
Ruminant meat	15.7	27.0	21.0	51.0	17.0
Nonruminant meat	3.2	8.0	12.4	9.0	0 [1]
Dairy products	48.3	61.0	65.3	95.0	31.0
Wheat	-1.1	10.0	36.7	25.0	18.0
Coarse grains	-3.1	3.0	26.3	3.0	11.0
Rice	.5	11.0	26.2	18.0	21.0
Sugar	9.9	11.0	52.7	22.0	n.a.

n.a. = not available.
[1] A very small negative number.
Source: (3).

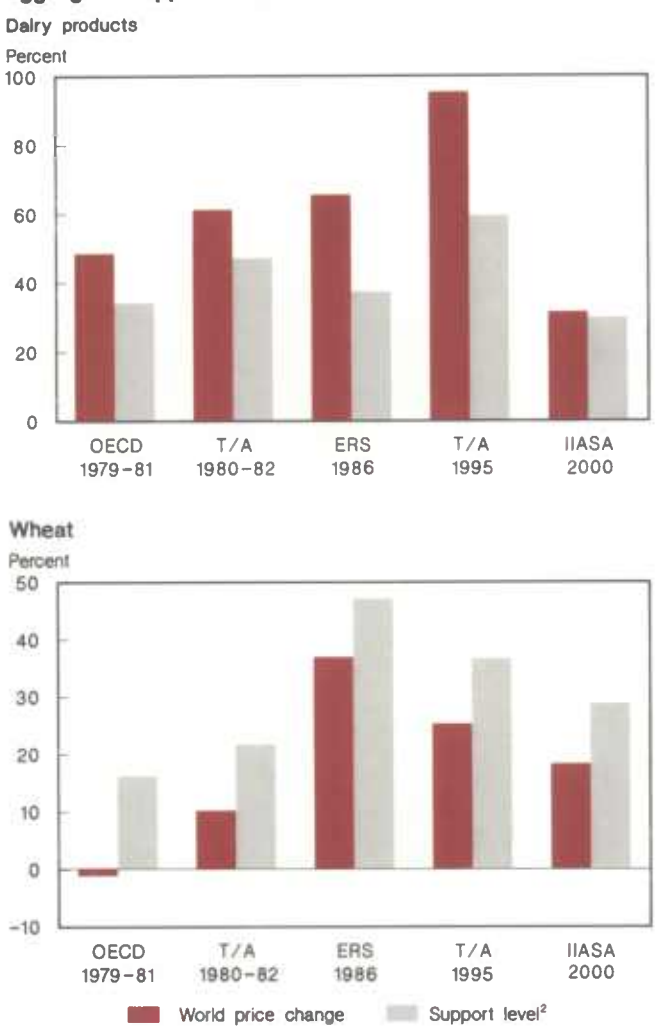
Appendix figure 1

Estimated world agricultural price changes and aggregate support levels[1]



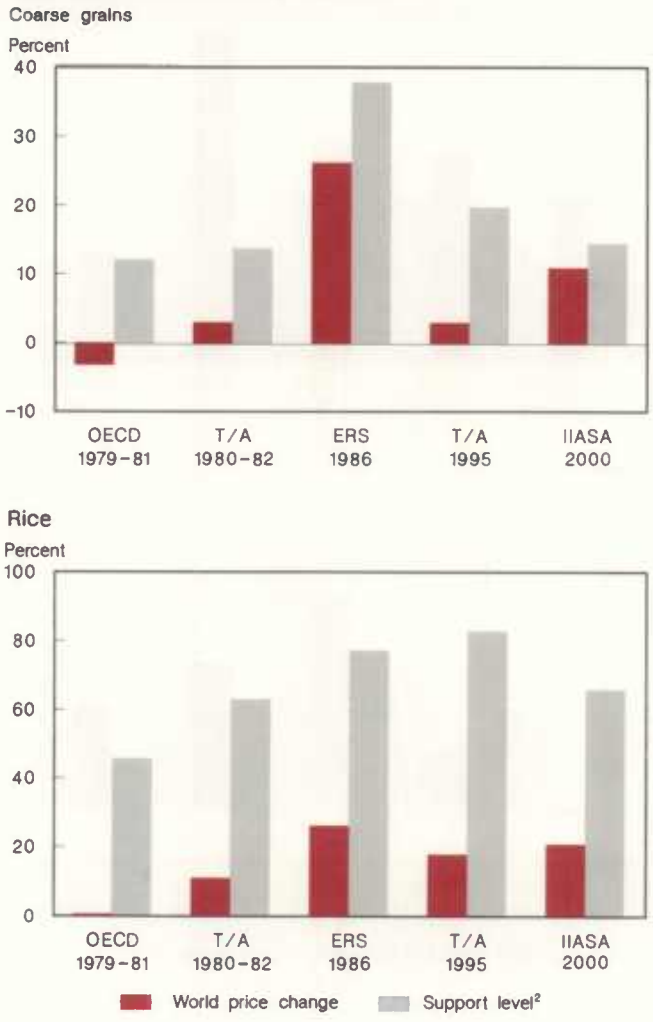
Appendix figure 1

Estimated world agricultural price changes and aggregate support levels--continued[1]



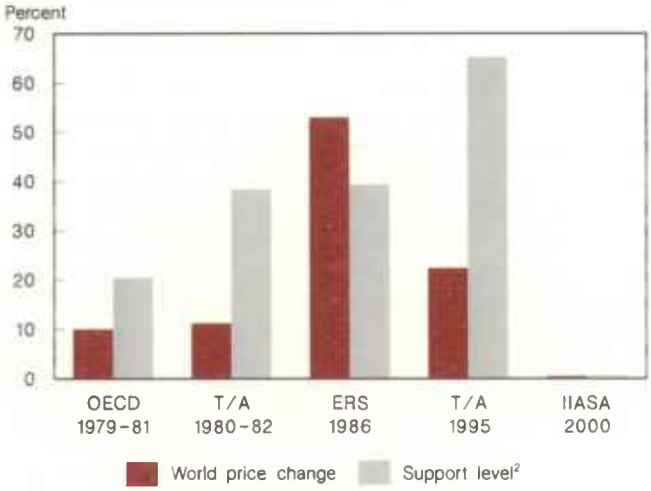
Appendix figure 1

Estimated world agricultural price changes and aggregate support levels--continued[1]



Appendix figure 1

Estimated world agricultural price changes and aggregate support levels--continued[1]



1/ OECD = Organization for Economic Cooperation and Development; T/A = Tyers and Anderson; ERS = Economic Research Service; IIASA = International Institute for Applied Systems Analysis.

2/ Total value of producer and consumer transfers as a percentage of domestic production plus consumption valued at domestic prices.

Source: (3).

Trade Liberalization: Past or Future?

Only the Tyers and Anderson and IIASA studies project the implications of trade liberalization. The other studies examine the implications based on past market conditions. Both types of analysis are relevant. Studies based on past market conditions are useful for the very reason that these past conditions are known. But policymakers will probably be concerned with the implications for the future, raising additional uncertainty concerning the model results.

First, the results depend very much on the studies' underlying assumptions concerning technological change and the growth in food demand. If technological growth outpaces the growth in demand, real agricultural prices will decline and protectionism will tend to rise, and vice versa. IIASA, for example, projects a decline in wheat prices and a corresponding increase in protection (app. table 2). Real agricultural prices for ruminant meat, nonruminant meat, and dairy products, on the other hand, are projected to increase as protection falls. This relationship is complex and, as appendix table 2 indicates, it may not hold for all commodities.

A second source of uncertainty concerns the policy response of governments to conditions in world markets and the resulting change in protectionism when world prices change. Many policies, such as variable levies and export refunds, insulate producers from conditions in world markets. In this case and if world prices decline, agricultural support will automatically rise unless policymakers face some constraint. For example, a subsidizing exporter might

Appendix table 2—Projected change in real prices and protection rates in the industrial market economies, IIASA, 1980-2000

Agricultural products	Change in real prices	Change in protection
	Percent	
Ruminant meat	53	-48
Nonruminant meat	6	-29
Dairy products	37	-28
Wheat	-8	12
Coarse grains	-10	-19
Rice	1	2

Source: (5).

have difficulty increasing export subsidies to offset any decline in world prices if that country faces tight fiscal constraints.

The Tyers and Anderson 1995 study projects real agricultural prices will fall at the beginning of their projection period. They apparently assume that all countries except the United States will insulate their producers from these price declines. Thus, they project protection rates to increase in all countries except the United States. The study assumes the United States will lower its protection as a result of the Food Security Act of 1985. Because of these policy assumptions, the Tyers and Anderson 1995 study projects much greater world price changes from trade liberalization than IIASA or the models based on historical data.

The implications of trade liberalization clearly depend very much on future world market conditions. A comprehensive assessment completed by the Food and Agriculture Organization (FAO) of the United Nations in 1988 indicates that global food supplies will probably continue to increase faster than the increase in world demand (1). If one accepts this view, the gains from trade liberalization in the future could be even higher than indicated by ERS for 1986, a year of very high protection.

FAO's assessment is based on a projected slowing in the expansion of global demand for farm products and a continuation of recent trends in agricultural production. Total demand for food and other agricultural products in the developing countries is expected to grow 3.1 percent annually for the rest of the century, a significant drop from the 3.7-percent growth rate during 1970-85. Unfavorable overall economic conditions facing developing countries, a lower projected population growth rate, and the heavy debt burden of many Latin American countries are all expected to dampen demand through the year 2000. The economic outlook is brighter for the industrial market economies, but per capita food consumption in these countries is approaching the saturation level. With population growth projected to be only 0.6 percent per year, the industrial market economies cannot make up for the sluggish growth in developing countries.

Recent increases in production capacity, on the other hand, will probably continue. Emerging biological and information technologies have the potential to revolutionize livestock and crop production by the end of this century (6). U.S. milk yields could double from an average 12,000 pounds per cow in 1982 to over 24,000 pounds per cow by the year 2000. New technologies could increase U.S. wheat yields by 25 percent and corn and soybean yields by 23 percent over the same period. The effects of new plant technologies on crop production will be even greater after 2000 (6).

FAO projections indicate that the quantity of cereals available for export in the year 2000 could exceed import requirements by close to 130 million metric tons (1). The annual surplus of meats could reach almost 10 million tons. Unless the industrial market economies reduce their agricultural production growth rates or increase effective demand in developing countries, the export availabilities of key agricultural commodities in the years ahead may significantly exceed import requirements. If governments maintain their current policies, their spending on agriculture and protection would rise. The benefits of trade liberalization and the adjustment costs faced by the farmers would then be even higher.

Presenting economic arguments for agricultural policy reform when markets are expected to continue to suffer from surpluses is easy. But, equally valid arguments could be made if shortages are expected. In the latter case, a detailed analysis of the reasons for the shortages is needed. If, for example, the problem is a loss of productive capacity due to soil erosion and other forms of environmental degradation, the industrial market economies may find that their current commodity programs are counter productive. Current commodity programs generally rely on price mechanisms for expanding agricultural output but can seriously harm a nation's longrun productive capacity. Thus, policy reform is justifiable even when shortages are probable.

Chapter 17

Domestic Implications of Trade Policy Liberalization

Thomas W. Hertel*

Unilateral trade policy liberalization of U.S. agriculture will lead to substantial economywide benefits. Agricultural producers will lose, but they can be more than compensated for these losses from the surplus generated through policy reform. For example, for each farm job lost by eliminating the current set of domestic and border distortions, real domestic income will increase by $28,700, Treasury outlays will decline by $80,500, and nonfood output will rise by $107,000. Because similar economywide gains can be realized from agricultural liberalization in other industrialized nations, including agriculture in the negotiations of the General Agreement on Tariffs and Trade is well justified. Furthermore, multilateral liberalization would considerably lessen the necessary adjustment in industrialized nation's agricultural sectors.

Unlike earlier GATT rounds, the Uruguay Round will address domestic farm policies and border measures because many agricultural quotas, tariffs, and export subsidies exist primarily to support domestic farm policies. The budgetary costs and the magnitude of the adverse trade effects associated with current farm programs are significant enough to warrant examining the effects of their removal on nonfarm sectors of the economy. These effects include changes in the demand for farm inputs and food processing, changes in consumers' budget allocation decisions, and changes in international trade and the U.S. balance of payments. This chapter presents estimates of these economywide implications following unilateral U.S. trade and policy liberalization in agriculture.

Conceptual Framework

Individual households must ultimately bear the burden or reap the gains of any change in agricultural support policies. Private domestic households may be

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affected by trade policy liberalization in three fundamentally different ways. First, they are consumers. In this dimension, they respond to changes in commodity prices and disposable income by changing the mix of goods they demand. These responses to prices and income are very important in analyzing the effects of trade liberalization. The assumed responses used here are based on economic theory and the best available econometric evidence. For example, if the prices of red meat products rise, consumers will shift their consumption to other less expensive food products, such as poultry. Also, as food prices rise, they will have less disposable income to spend on nonfood items.[1]

Private households generate and use disposable income. In this second role, they own land, capital, and labor services. Farm household income depends on the returns to these factors of production in agricultural uses. Thus, when a particular set of policies lowers returns to land (holding other payments constant), disposable income falls, affecting both the pattern and level of U.S. consumption.

The third role played by private households in an economywide framework is that of taxpayers. When Government expenditures on farm programs fall, the net position of the Treasury improves. These additional funds could be disbursed in several ways, including lowering taxes, reducing the Federal deficit, or increasing Government purchases or transfer payments. Each of these will generate different economywide effects.

The final piece of this conceptual puzzle stems from the fact that the United States is not a closed economy. We import goods and services, paying for these imports through exports and foreign borrowing. This international dimension, and its necessity to balance imports and exports, has become increasingly important in the last decade. Increased foreign borrowing in the first half of the 1980's drove the price of the dollar up and severely hampered U.S. exports. To repay this foreign debt, the United States will eventually have to increase exports sufficiently to run a trade surplus. These swings in net capital flows, exports, and the value of the dollar are related to Government spending and trade policies. Hence, trade policy liberalization in U.S. agriculture can have significant

[1]For a more detailed discussion of this research, see (4). Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

economywide effects through our balance of payments with the rest of the world.

Policies that GATT Negotiations Might Affect

The specific policies to be included in any GATT agreement are as yet unknown. However, the April 1989 Mid-term Review did result in agreement on the long-term objective of establishing a "fair and market-oriented agricultural trading system." Both the Organization for Economic Cooperation and Development (OECD) and USDA have summarized the cumulative effect of all government expenditures on agriculture using the producer subsidy equivalent (PSE) concept (9, 14). This type of aggregate measure of support may or may not be a part of the final agreement; however, it offers a useful starting point for economic analysis of policy liberalization. Because the only policies that will have an important economywide effect in the near term distort price signals to producers or consumers, I have focused on that particular subset of the policies included in the U.S. PSE estimates. (For a more detailed discussion of how these policies are treated, see (3).

Grains and Cotton

Eliminating existing price and income supports for grains and cotton will have two important effects with opposing implications for crop output. First, producers would no longer have an incentive to idle land. Land values would fall, and planted acreage would probably rise. Second, in the absence of deficiency payments and a variety of implicit output subsidies (such as disaster payments, crop insurance subsidies, Government inventory accumulation, and interest rate subsidies implicit in the crop loan program), the incentive price facing program crop producers would fall, and yields would drop. With planted acreage increasing and yields falling, the overall output change is unclear.

Dairy and Sugar Programs

The dairy and sugar programs seek to maintain domestic commodity prices above prevailing world prices. The programs use a combination of quotas and, in the case of dairy products, Commodity Credit Corporation (CCC) purchases. Both domestic producer and consumer prices would fall in the absence of these programs. Thus, consumption would increase, and domestic production would fall. The resulting gap would be filled by increased imports.

Because the U.S. market for dairy and sugar products is large enough to affect world prices, predicting how much imports would increase if these programs were removed is difficult.

Tariffs

General tariff levels are one object of the GATT negotiations. For this analysis, I will remove only the tariff on beef because the results focus solely on the economywide effects of agricultural policy changes.

Input Subsidies

The Federal Government assists farmers by subsidizing selected inputs. These subsidies are included in the aggregate PSE's for U.S. agriculture and are relevant for this analysis because they tend to alter the mix of inputs used by farmers (14). I have included implicit subsidies in Farmers Home Administration and Farm Credit System loans and subsidies for land and structural improvement. Fees for grazing on Federal lands that are lower than commercial rental rates are an implicit input subsidy for livestock producers.

Other Distorting Policies

Many other types of Government intervention affect agriculture and nonfarm sectors of the economy. This chapter focuses on those which have both an important effect on the U.S. economy and which are candidates for GATT negotiation. The general system of Federal, State, and local taxes in the United States implicitly subsidizes agricultural output (5). However, this tax structure is hardly a serious candidate for the GATT negotiations and so its removal will not be considered here. Nevertheless, these underlying distortions can significantly influence the economywide effects resulting from agricultural trade liberalization. Thus, I have accounted for their presence in this analysis.

The Results

I analyzed both shortrun and longrun effects of trade liberalization. I assumed that within 1-2 years labor and capital would not leave agriculture. Thus, farm labor and capital earn a less-than-competitive return in the short run. For the short run, I assumed that farmers would adjust their operations by shifting their farm land, labor, and capital into the production of commodities not covered by Federal programs.

In the long run, possibly 4 years or more, labor and capital would probably leave agriculture in sufficient quantities to generate more competitive returns to the remaining farmers. In the absence of further shocks, the U.S. economy would eventually stabilize so that farm wages could be expected to become comparable with nonfarm wages for individuals with comparable abilities. In practice, the agricultural sector is continually changing because of frequent policy changes, rapid technological progress, and uncertain foreign demands. Thus, such an equilibrium never exists, and my projections must be viewed as hypothetical simulations to help us understand the nature and magnitude of the complex interactions arising between the farm and nonfarm economies.

Effects on Agricultural Inputs

When Government support to agriculture declines, two types of input adjustment can occur. To the extent that input quantities can be easily reduced, supply will contract and farm prices will fall slightly. Shortrun adjustment for land, labor, and capital can be very slow, and the payment to these inputs, rather than their quantity, falls. This situation reflects an increase in agricultural excess capacity. Table 1 shows the initial drop in annual after-tax payments to owners of these inputs. In the short run, before any labor leaves agriculture, farmworkers would lose more in annual returns than would landowners. Shortrun returns to farm capital would also fall, and some land, labor, and crop capital would shift into nonprogram commodities. Farm

Table 1—Shortrun losses to the farm sector caused by unilateral trade liberalization [1]

Production factor	Annual loss
	Billion 1987 dollars
Farm labor	4.78
Land	4.68
Livestock capital	2.35
Crop capital	1.02
Total	12.83

[1] 1984 subsidy levels.
Source: (4).

operators would also purchase fewer inputs. For example, shortrun fertilizer use in agriculture would drop by 9 percent.

In the long run, the farm sector must adjust the quantity of labor and capital employed to offset reduced Government support. Table 2 reports longrun percentage changes in labor, capital, and farm land employed in various sectors of the economy. All farm sectors would invest capital elsewhere because of the combined effects of lower output levels and higher rental rates. The total capital invested in agriculture would be about 14 percent lower than under current trade policies. The agricultural labor force would decline in about the same proportion as the declines in individual commodity outputs. For agriculture to achieve equilibrium, about 5.5 percent of the labor force must leave farming. If trade liberalization were phased in over a 10-year period, this loss of jobs would represent a very small annual adjustment (0.55 percent/year), particularly when compared with the 4.3-percent average annual rate of job loss due to technical and structural change in U.S. agriculture (6).

When the Government removes incentives for setting aside program cropland, I assume that all of this acreage would go back into some agricultural use. However, food grain, feed grain, and cotton set-aside acreage will not necessarily be planted to those crops. With deficiency payments and other production incentives eliminated, some of this acreage would shift into nonprogram crops, with the poorest land reverting to grazing. When more land is in production, its value falls and the average annual rental rate on farm land is estimated to drop by 18 percent.[2] Over the long run, this adjustment would result in less intensive agriculture and considerably lower yields than would otherwise have prevailed.

Food and agricultural input manufacturing sectors would also reduce their work forces and investments following unilateral agricultural policy and trade liberalization. These newly released resources would become available to the rest of the economy for other uses, and, partly as a result of this, the nonfood economy would expand.

Longrun Changes in Demand and Supply

If U.S. trade restrictions were unilaterally eliminated, the sugar crops sector would be hardest hit (table 3). Removing the quota on sugar imports would result in an influx of imported sugar that would displace about 70 percent of the demand for domestic raw sugar. The dairy sector would experience the

[2]Because this study is based on 1984 policies, it ignores the effect of the Conservation Reserve Program (CRP). However, the CRP could bolster land values by growing larger to offset the effects of eliminating set-aside acreage if it is excluded from GATT negotiations.

Table 2—Longrun changes in factor use [1]

Sector	Capital	Labor	Land
		Percent change	
Farm sectors	-13.9	-5.5	[2]
Dairy	-23.5	-21.4	-17.1
Poultry	-5.1	-.8	1.3
Red meats	-4.4	-2.3	.9
Cotton	-13.7	-10.4	9.1
Food grains	-20.4	-12.2	21.1
Feed grains	-27.5	-10.6	3.7
Sugar crops	-97.9	-70.6	[3]
Oilseeds	-22.0	1.0	2.3
Other crops	-14.8	-.1	5.7
Processed food sectors	-13.1	-4.4	0
Dairy	-24.9	-25.5	0
Poultry	.2	-.1	0
Red meats	-1.7	-1.9	0
Other food	1.0	.6	0
Prepared feeds:			
Dairy	-13.8	-13.8	0
Poultry	2.1	2.1	0
Red meats	3.8	3.8	0
Wet corn milling	-.9	-1.3	0
Feed and flour milling	.5	-.1	0
Sugar	-79.4	-80.4	0
Fats and oils	.9	.7	0
Other	1.1	1.0	0
Other sectors:			
Agricultural inputs	[4]	-1.5	0
Other services	.7	[4]	0
Other manufacturing	1.7	.8	0

[1] Percentages are expressed in terms of sector's base quantity employed.

[2] All set-aside acreage enters production. Ninety percent of food grain set-aside land enters food grain production; the figures for feed grain and cotton set-aside land are 87 percent and 40 percent.

[3] Sugar cropland is treated as fixed.

[4] Less than 0.05 percent in absolute value.

Source: (6).

Table 3—Changes in longrun commodity supply and demand

Commodity	Change in domestic production	Domestic production	Inter-mediate use	Consumption by domestic households	Exports	Imports
	Percent	Billion 1987 dollars				
Raw agricultural commodities:						
Dairy	-21.38	-4.6	-4.6	[1]	[1]	[1]
Poultry	-.84	-.1	-.1	[1]	[1]	[1]
Red meats	-2.34	-1.1	-1.1	[1]	[1]	[1]
Cotton	-10.39	-.7	[1]	[1]	-.7	[1]
Food grains	-12.17	-1.1	-.1	[1]	-1.0	[1]
Feed grains	-10.57	-4.5	-4.1	[1]	-.4	[1]
Sugar crops	-70.63	-1.3	-1.3	[1]	[1]	[1]
Oilseeds	1.04	.2	[1]	[1]	.2	[1]
Other crops	-.02	[1]	-.2	.1	.1	[1]
Processed food commodities:						
Red meats	-1.71	-.9	[1]	-.2	[1]	.7
Poultry	[2]	[1]	[1]	[1]	[1]	[1]
Dairy	-24.98	-8.6	[1]	[1]	[1]	8.7
Other food	.69	.3	[1]	.1	.1	-.1
Wet corn milling	-1.23	[1]	[1]	[1]	[1]	[1]
Feed and flour milling	.11	.1	[1]	[1]	[1]	[1]
Prepared feeds:						
Dairy	-13.82	-.6	-.6	[1]	[1]	[1]
Poultry	2.11	.1	.1	[1]	[1]	[1]
Red meats	3.76	.3	.3	[1] [1] [1]		
Sugar	-79.45	-3.8	.1	.1	[1]	3.9
Fats and oils	.77	.1	[1]	[1]	.2	[1]
Other agricultural commodities	1.06	.5	[1]	.1	.1	-.4
Agricultural inputs	-.69	-1.2	-1.7	.1	.1	-.3
Other services	.24	6.5	.4	2.7	3.4	[1]
Other manufactures	.87	13.1	-1.8	.8	7.5	-6.6

[1] Less than $50 million in absolute value.

[2] Less than 0.005 percent in absolute value.

Source: (6).

second largest proportional decline in output. It would face increased imports of processed dairy products, and its production costs would rise as input subsidies are eliminated and feed prices increase. These effects are dampened when all countries simultaneously liberalize their sugar and dairy policies (see Dixit, Herlihy, and Magiera, page 253).

Outputs of grains and cotton would be lower in the long run than in the absence of unilateral liberalization, because removing output and input subsidies would probably have a stronger effect on longrun production than on the reemployment of set-aside acreage. The resulting increase in feed grain prices stimulates the demand for soybean meal in both domestic and foreign feed mixes. Thus, U.S. oilseed production would increase slightly (table 3).

The general decline in farm sector output lowers activity in food manufacturing. Lower food output would mean higher consumer prices. (Only sugar prices would fall in the long run.) Domestic consumers of food would spend an additional $2.4 billion because of agricultural trade liberalization. If other prices and income remain constant, higher food prices would lower demand for nonfood products. (See (2) and (7) for a more detailed discussion of this relationship.) However, nonfood prices would fall slightly because those sectors would have additional labor and capital at their disposal. Also, consumers' disposable incomes would increase because of policy liberalization. The combined effect of these forces is to increase domestic consumption of nonfood goods and services.

Budgetary Effects

When domestic agricultural policies and border restrictions are eliminated, net Treasury revenues increase because Government expenditures for support programs drop. In this analysis, net longrun revenues (receipts less disbursements) would increase by $13.8 billion annually. Budget savings from policy liberalization may be used in a variety of ways, and each of these alternatives will have different economywide implications. If the surplus is returned to private households as an across-the-board tax credit, real disposable income would rise by $4.9 billion. Alternatively, lower marginal tax rates could lead to further gains, especially if the cuts are targeted at the most distorting taxes (8). This increased disposable income would probably be spent on consumer goods, mostly nonfood items.

Yet another use for the Treasury's surplus would be to reduce the Government's deficit. This strategy would also reduce the U.S. trade deficit as

every dollar reduction in the budget deficit yields more than a dollar decline in the trade deficit (1).

Balance of Payments Effects

The budgetary implications of trade and policy liberalization in agriculture are closely linked to net foreign borrowing and the current account (goods and services) deficit. Reducing farm program expenditures and cutting the Government deficit devalues the dollar, stimulating exports (10). However, even when foreign borrowing is held constant, as assumed in this analysis, there are important economywide effects transmitted through the balance of payments (4). The logic of these effects is as follows. Eliminating the dairy and sugar programs would increase imports of these products. At the same time, cotton and grain exports would fall because of the reduced incentive prices facing producers of these products. Thus, to achieve a trade balance, with foreign borrowing fixed, the price of imports must rise in relation to domestic products. This change makes domestic manufacturing products more competitive, and imports of foreign manufactured goods would fall by $6.6 billion (table 3). Meanwhile, manufactured exports would increase, partly because labor and capital, which would move out of the food sectors, would be more available. The net effect of all of these economywide forces is to increase nonfood output by $18.4 billion.

Gainers, Losers, and Compensation

A convenient method of summarizing these results is to collect the individual gains and losses resulting from unilateral agricultural policy liberalization (table 4). For example, domestic households would be better off by an amount equal to $3,105 million annually because of lower shortrun food prices. However, longrun food prices would rise, as farm workers change to nonfarm jobs, less land is used for farming, and capital is invested elsewhere. Thus, after this adjustment, consumers would need $2,402 million annually to cover higher longrun food prices. For foreign households, as consumers of U.S. food exports, both shortrun and longrun prices would increase, they would lose $1,115 million as a result of the elimination of dairy and sugar quotas, because the prices they receive for sales to the United States would fall to the world price level. However, these producers would sell more of these products to U.S. consumers. The resulting terms-of-trade effect would benefit the rest of the world at the expense of U.S. consumers who would pay more for all imports.

Most of the shortrun domestic burden caused by removing Government support to agriculture falls on the relatively immobile farm factors of

production (land, labor, and capital). From the viewpoint of domestic households, this burden is offset by the $12,884-million increase in Treasury revenues resulting from reduced Government costs. In the long run, as labor and capital move into higher tax, nonfarm uses, this change in net revenue increases slightly to $13,838 million. Thus, the United States is unambiguously better off as a result of agricultural policy liberalization. This improvement could fully compensate farmers for their losses with some money left over to share (through tax credits) among the U.S. population.

The main longrun losers in the farm sector are the landowners. At a real interest rate of 5 percent, the net present value of their losses amounts to $113.8 billion. This magnitude of loss would be devastating for a sector that already has severe financial problems due to high debt/asset ratios. Some form of severance payments to these landowners will probably be necessary to make such a policy feasible. This economywide analysis shows that such funds

Table 4—Gains and losses from unilateral liberalization of U.S. agricultural policies

Item	Shortrun household changes		Longrun household changes	
	Domestic	Foreign	Domestic	Foreign
	Million 1987 dollars			
Food	3,105	-1,280	-2,402	-2,051
Nonfood	6,634	117	9,347	418
Imports	-186	5,447	-149	4,351
Nonfarm capital services	-7,595	674	-9,821	861
Subtotal	1,958	5,018	-3,025	3,579
Farm labor	-4,776	0	0	0
Crop capital services	-1,019	0	-74	0
Livestock capital services	-2,347	0	-121	0
Land services	-4,682	0	-5,690	0
Subtotal	-12,824	0	-5,885	0
Transfer	12,884	-1,155 [1]	13,838	-1,155 [1]
Total	2,018	3,863	4,928	2,424

[1] Lost earnings associated with elimination of the sugar and dairy quotas.
Source: (4).

would indeed be available because the present value of Treasury savings (at a 5-percent real interest rate) equals $276.8 billion.

In the shorter run, adjustment assistance for labor and some compensation to owners of nonland capital would probably be necessary following agricultural trade and policy liberalization. The proper amount for such annual payments would be about $4.8 billion for farm labor and $3.4 billion for owners of capital (table 4, column 1). These payments should be temporary, lasting only long enough to redeploy these labor and capital resources in the nonfarm economy. All of these agricultural losses would be reduced by as much as 50 percent if other countries simultaneously liberalized their farm policies, because U.S. export prices would increase significantly if excess resources left agricultural production worldwide (11).

Conclusions

The economywide effects of unilaterally liberalizing agricultural trade and domestic farm programs would be costly to the U.S. economy. For example, the average annual cost of protecting one farm job with the current policies is $107,000 in terms of reduced nonfood output, $80,500 in increased Treasury outlays, and $28,700 in lower real domestic income (4). However, to realize the potential benefits associated with agricultural trade liberalization, the U.S. economy must adjust to conditions in the world marketplace, which seems to entail some shrinking of the agricultural sector. This adjustment can be greatly eased by compensating the losers, and the economywide gains would be more than sufficient to do so.

Adjusting the U.S. economy to a liberalized agricultural policy environment would also be easier if other countries removed their barriers to agricultural trade. Analyses of unilateral agricultural liberalization conducted for the European Community, the Federal Republic of Germany, Japan, and the Republic of Korea estimate similar, generally larger, economywide gains (13). Because all of these countries benefit from proceeding unilaterally, and because multilateral liberalization would considerably lessen the shock to the agricultural sectors in these countries, there is a strong case for bringing agriculture into the GATT negotiations, moving ahead jointly towards reform in both domestic and international agricultural markets. This type of global reform would increase world prices for U.S. agricultural exports and create a more efficient, economically stronger farm sector over the long run.

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Chapter 18

Market Orientation versus Government Intervention

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Recent debate over farm policy has included criticism of and suggested alternatives to the programs of the Food Security Act of 1985. But, none of the alternatives will address all problems or be fault free. Mandatory supply controls, at one end of the spectrum, can increase farm income and reduce excess stocks, but can also increase consumer costs and boost Government spending to retain export markets. Free markets, at the other end, would cut the budget burden, increase efficiency, and unleash domestic producers to compete in world markets at lower prices. However, free markets might reduce the level and stability of farm income. Congress and the executive branch could design programs that would help farmers deal more successfully with the risks associated with free markets or that would raise farm income without reducing free market efficiency.

Policymakers and the public are again evaluating agricultural policy as the expiration of the current farm legislation approaches. Many of those who design, implement, or evaluate commodity programs argue that such programs deserve some of the credit for American agriculture's success in providing an adequate supply of reasonably priced food for consumers. But others point out shortcomings and related problems and insist that policies need to be changed. Government costs are high, the distribution of benefits is criticized as inequitable, many farmers continue to face financial difficulty, stock surpluses are a recurring burden, and global competition has led to costly increases in agricultural subsidies. Commodity programs deserve some of the blame for these problems.

What policy will address the problems facing the United States in the 1990's? This chapter reviews the range of policy alternatives, focusing on the program

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tools that could be used to implement each, and their strengths and weaknesses (tables 1 and 2).

The Range of Policy Choices

One view holds that specifying workable policies is straightforward:

> Two basic approaches to commercial farm policy are workable: one is to adequately control production and support prices, the other is to leave production uncontrolled and let prices fall to levels that will clear the market (17).[1]

U.S. farm policy has historically occupied the middle ground between the extremes of mandatory supply controls and free markets. Over the last 50 years we have rejected these extremes, but should we continue to do so? What other choices exist? Are these choices workable? We explore these issues by splitting the policy spectrum into the following range of alternatives:

Less intervention ← → **More intervention**

Free markets	Free markets with risk management	Free markets with decoupled payments	Current programs	Mandatory controls

Tables 1 and 2 summarize the strengths and weaknesses of each of these five alternatives.

Current Programs

Commodity programs change with each successive farm act, and the Food Security Act of 1985 was no exception (18).[2] It made modest changes in earlier legislation to make programs more adaptable to current market conditions.

Features of Current Programs

Current commodity programs combine basic tools used for many years and refinements introduced in the 1985 Act. The basic program tools include price

[1] Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

[2] A concise description of the Food Security Act of 1985 may be found in (6, 16).

and income support and supply control.[3] Nonrecourse loans and supply management support commodity prices. The target price-deficiency payment program and nonrecourse loans support farm incomes.

Refinements of Basic Tools

The 1985 Act made notable changes in the operation of the basic programs. It departed from the Agriculture and Food Act of 1981 by lowering minimum target prices each year. Minimum target prices for wheat and corn, for example, decline an average of 2 percent annually over the life of the 1985 Act. Loan rates may decline 5 percent per year.

The 1985 Act computes deficiency payments as the product of a producer's eligible crop acreage, fixed program yield, and deficiency payment rate. The Act defines a producer's eligible crop acreage base as the average of the past 5 years' plantings. The program yield is set at a producer's 1981-85 average yield (excluding the high and low).

New Features

The 1985 Act contains new features aimed primarily at increasing U.S. world market share: the Export Enhancement Program (EEP), Targeted Export Assistance (TEA), and marketing loans. With EEP and TEA, exporters essentially receive inkind commodity bonuses that allow them to export at less than the market price. The EEP can be used for all commodities, but it has been used primarily for wheat. The marketing loan program has been applied thus far only to cotton and rice. When world prices fall below loan rates, producers may repay commodity loans at a "marketing loan" rate that is less than the original loan rate. Producers can then market commodities at prices competitive on the world market, and their incomes are supported by deficiency payments that expand by the difference between the original loan rate and the world market price.

With generic certificates, the 1985 Act created a means of using program commodities in lieu of cash to make some portion of deficiency, export enhancement bonus, and certain other payments. Certificate holders can then use them to repay Commodity Credit Corporation (CCC) loan obligations or to purchase commodities from the CCC.

The 50/92 and 0/92 programs give producers the option of planting only 50 to 92 percent or 0 to 92 percent of permitted acreage, and receiving 92 percent of allowable deficiency payments for feed grains, wheat, rice, and cotton.

[3]This chapter concentrates only on programs for major field crops.

Table 1—Policy alternatives, strengths

Free markets	Free markets with risk management	Free markets with decoupled payments	Current programs	Mandatory supply controls
	Possibly support farmer incomes	Support farmer incomes	Support farmer incomes	Support farmer incomes
No market distorting Government intervention	Possibly no market distorting Government intervention	No market distorting Government intervention		
No budget expense		Efficient income transfer		

Continued--

Table 1—Policy alternatives, strengths—Continued

Free markets	Free markets with risk management	Free markets with decoupled payments	Current programs	Mandatory supply controls
	Improve farmers' ability to cope with risk		Provide some Government funded risk management capability	
			May guarantee minimum prices	Guarantee high prices
			Stocks available for emergencies	May limit excess stocks
Farmers gain additional decision-making power	Farmers gain additional decision-making power	Farmers gain additional decision-making power		

Table 2—Policy alternatives, weaknesses

	Free markets	Free markets with risk management	Free markets with decoupled payments	Current programs	Mandatory supply controls
	No Government funded opportunities for farmers to cope with risks [1]		No Government funded opportunities for farmers to manage price risks [1]		
		Potentially high budget costs	Potentially high budget costs	Unpredictable and often high budget costs	High budget costs, mostly for export subsidies
			Obvious transfer a political problem		
				Intervention distorts markets	Potentially severe market distortions

See note at end of table.

Continued–

Table 2—Policy alternatives, weaknesses—Continued

	Free markets	Free markets with risk management	Free markets with decoupled payments	Current programs	Mandatory supply controls
				Excessive stocks	
					Farmers lose additional decision-making power
		No experience with how this works	No experience with how this works		
					Higher consumer costs disproportionately burden low and fixed income consumers
					Enforcement difficulties

[1] Some would view this aspect as a strength because farmers, not the Government, would bear the full cost of risks. This aspect is described in table 1 as "No market distorting Government intervention."

The 1985 Act increased the discretion of the Secretary of Agriculture in setting program prices and in identifying which program tools to use for various purposes. The intent was to increase market influence on production decisions and to ensure that the programs more quickly reflected current market conditions.

Strengths

The current program approach has been favored over the years because it has performed reasonably well with respect to many of the diverse goals of those concerned with agricultural policy.

Consumer Benefits

U.S. agriculture provides an abundant supply of reasonably priced food. Crop and dairy subsidy and stabilization programs stimulate production by keeping prices from falling below the loan rate for program crops or the support price of manufacturing grade milk. By increasing feed production, grain programs contribute to the abundance of reasonably priced meat products for U.S. consumers. Supporting the price of manufacturing grade milk increases the production of dairy products and lowers their prices.

Producer Benefits

Current programs support farm prices and income above free market levels through the combination of nonrecourse loans and deficiency payments. Additional income assistance is usually provided in case of severe weather disasters or unusually unfavorable market conditions. The voluntary nature of commodity program participation for most commodities is viewed favorably.[4]

Buffer Stocks

Government stocks have provided a buffer for times of production shortfall, and food aid for developing nations. Such stocks have also helped to maintain the U.S. share of world exports, a crucial market for American farmers, by being used as payment-in-kind for export enhancement.

[4]Once in a program, a participating producer must adhere to the program's provisions. Voluntary participation does not apply to tobacco producers who are subject to mandatory supply controls (3). Compliance with the dairy and peanut programs is also largely mandatory.

Increasing Market Orientation

The combination of declining target prices and fixed farm base acreages and program yields in the 1985 Act reduces producer incentives that were present in earlier acts to boost acreage and yield merely to qualify for higher program payments. For at least some producers, deficiency payments limited to a fixed quantity of production makes such payments decoupled to the extent that they do not affect those farmers' shortrun marginal production decisions (7, 8). Lowering program prices also permits farmers to adapt to changing market conditions and has moved commodity programs toward market orientation.

Weaknesses

Current programs are not without faults. Substantial program expenditures, excessive stocks, program inconsistencies, and reduced competitiveness are chief among these.

Program Costs

Current program costs are hard to control and difficult to predict because they depend on weather and market uncertainties. Between 1972 and 1986, for instance, commodity programs cost $110.7 billion, $46.9 billion more than had been estimated (26).

Promoting exports to increase market share has been costly. From May 1985 to December 1988, stocks valued at $2.3 billion (acquired at a cost of $3.1 billion) were given to exporters as EEP bonuses (24).

Government Stock Accumulation

Often the expansive force of current programs has resulted in accumulation of sizable Government stocks. Acquiring and storing excess stocks is costly, and disposing of excess stocks without disrupting markets is difficult. For instance, releasing CCC or farmer-owned reserve (FOR) stocks when market prices reach "trigger" levels keeps market prices lower than they would otherwise be. Stock release through commodity certificate redemption can drive market prices even lower than trigger levels.

Inconsistency

U.S. farm programs combine contradictory features, making program administration complex. Price and income supports that expand production must be carefully balanced against supply controls (acreage reduction) that

restrict production. The effectiveness of acreage reduction programs is reduced by "slippage" on the land remaining in production; that is, producers increase inputs and boost yields, expanding per acre production. When supply is not adequately controlled, prices fall and costs of deficiency payment and CCC loan programs can rise dramatically. In times of excess stocks, current programs increase profits from crop production, raising land values and rental rates and, in turn, the price the Government must pay to retire land from production under the Conservation Reserve Program (CRP).

Low prices during the 1980's have prevented stocks from being released with the trigger mechanism. The excess stock problem became so acute that the 1983 Payment-in-Kind (PIK) program and the 1985 Act's commodity certificate program were instituted. Both have helped to reduce appropriations for commodity program payments and to get commodities out of Government storage, but they have also rendered trigger prices ineffective.

Competitiveness

U.S. commodity programs have often supported prices above the free market level for program participants. The stock and loan programs, aided by the acreage reduction program, may establish a price floor if enough farmers participate in commodity programs. A minimum price benefits all domestic crop producers, even those who do not participate. However, holding prices above the free market level reduces export market share by making the United States a higher priced supplier, encouraging foreign competitors who can produce and sell at a price below the loan rate. The additional program returns available to producers that stimulate output-enhancing technological changes may have retarded cost-saving technological advances. Because of this, lower program prices and export enhancement were major features of the 1985 Act.

Free Markets

One alternative to current programs is to rely on free markets with no government intervention at all. Government programs that directly affect supply—the CCC loan program, acreage reduction requirements, and deficiency payments—would be eliminated. Other forms of Government intervention indirectly affect commodity markets. Programs such as

investment in new seed varieties, extension services, pollution abatement, and conservation would be allowed in the free market scenario that we describe.

Performance of Free Markets

Analyzing free market effects on agriculture depends on what reference period is used for comparison and on whether free markets are adopted unilaterally or multilaterally. If the reference (base) period when free markets are assumed to begin is a year when direct Government support and participation are high, the implications are markedly different than if the opposite is true. For instance, the fall of U.S. support prices over the life of the 1985 Act, the rising strength of the dollar, and the changes in support in other countries could mean that medium-run changes in farm income and wealth would be markedly different if the reference period is 1990 rather than 1986, when direct Government payments to agriculture were at a record high. Despite this qualification, some general conclusions may be drawn.

Strengths

The free markets approach has many benefits. Government spending on commodity programs would cease, saving billions of taxpayer dollars annually for direct payments and in forgone administrative costs. Farmers' decisions would be much less affected by Government regulations, giving farmers more flexibility to adjust to changing market conditions. A more efficient allocation of resources could be attained; output could be maximized for a given endowment of resources. Farmers would be rewarded only for their efficiency in production and marketing, not their responsiveness to Government programs. Farming would become more like other business sectors of the economy; businesses that excel prosper, less efficient operations earn less.

Weaknesses

The agricultural sector effects of moving from current policy to free markets would depend on how prices and income change. If income per acre falls, current landowners would see their land values decline. Values of other fixed factors of production would also fall. The potential gain in efficiency would offer little comfort to an individual farmer whose income or wealth falls because of such changes.

Unilateral versus multilateral liberalization. In an interdependent world, the fate of domestic farm income depends on what other countries do. If the United States unilaterally eliminated support, the economy might gain but U.S. farmers would probably lose.[5] The small increase in export opportunities would probably be insufficient to overcome the domestic decline in producer incentive prices. Farmers would lose direct income transfers. To avoid some of the negative effects of unilateral liberalization, the United States could seek an agreement with other major producing nations to simultaneously reduce or eliminate market-distorting programs. Multilateral reform, however, presents a difficult challenge as demonstrated by the contentious nature of the GATT negotiations in the Uruguay Round.

Free markets do not guarantee efficiency. Free markets are the most efficient market organization only if certain conditions hold. Efficient markets must be competitive, free of externalities, and "complete," and traders must have "perfect information."[6] (For a discussion of externalities such as environmental issues, see Baum, Young, and Crutchfield, p. 37.) When these free market conditions do not exist, the Government may intervene to correct the markets and possibly move them towards greater efficiency.

Government intervention, however, does not guarantee that net efficiency will increase. The cost of the correction may exceed the realized increase in efficiency (27). Correcting only one of several unsatisfied conditions for market efficiency may reduce, not improve, efficiency. Government programs aimed at improving on free market effects may emphasize some other goal more than improving efficiency. Even when efficiency is the stated goal, agricultural programs are often used instead to transfer income (14). Finally, inaccurate forecasts of future conditions have led to inappropriate agricultural policies in the past and may continue to do so in a free market environment (9).

Satisfying all conditions for free market efficiency is unlikely, but many economists nevertheless believe that the free market would be more efficient than current programs.

[5]The experience of New Zealand serves as an example. New Zealand eliminated most market-distorting policies while the rest of the world maintained interventionist policies, leaving their farmers unprotected from the vagaries of world market prices and in a position to have to compete against subsidized production in other countries.

[6]Competitive markets prevent an individual consumer or producer from affecting the market price and therefore prevent anyone from having an unfair advantage in the marketplace. Perfect information implies that all individuals have all information regarding market conditions, quality of inputs, and other factors and therefore can correctly predict expected market price and make appropriate decisions.

One of the important conditions for free market efficiency is that all markets be complete. Most nonagricultural industries have complete opportunities to share or trade their greatest business risks. Such industries can share business risks by insuring themselves against warehouse or plant loss, untimely arrival of inputs, or other losses. Business risks can also be traded on the stock market. Agricultural risk markets, however, provide only limited risk-sharing or risk-trading opportunities and prevent farmers from transferring all risks. Some arguments contend that the lack of such markets may be the most important justification for intervening in agriculture (13). Certain forms of current intervention, such as price supports, serve as risk management tools, but they are inconsistent with free markets and may have hindered the development of more complete, private risk markets.

Free markets do not guarantee equity. Free markets can allocate resources most efficiently for a given distribution of resource ownership. Efficiency, though, guarantees neither a certain level nor an acceptable distribution of resources and income. U.S. commodity programs were introduced in response to the precipitous fall in agricultural income in the years preceding the Depression. Widespread rural poverty has since been socially and politically unacceptable in this country, but efforts to eliminate poverty have not been fully successful. The problems of income level and distribution can be addressed with direct, decoupled payments that would not interfere with the benefits of free markets.

Free Markets with Risk Management or Price Stabilization

When yields vary, prices and income vary, making agricultural production and marketing unusually risky. Providing farmers the opportunity to share or trade at least a portion of such risks with other groups in society can improve efficiency and farmers' welfare. Risk management or price stabilization strategies that might be improved with limited Government intervention include insurance (risk sharing), forward markets (risk trading), and stock management (risk reduction).

Farmers have several public and private means of managing their risks. Commodity programs serve as publicly provided tools for risk management. Participating farmers, in a sense, pay a premium by idling acreage and the Government absorbs the risk of low prices and incomes with nonrecourse loans and deficiency payments. Farmers are also protected from low yields with subsidized crop insurance and disaster payments. On their own, farmers can diversify into several crops or seek off-farm employment, giving them alternative sources of income and thereby reducing their total income risk.

Farmers can share some types of yield risk by buying private insurance. Forward markets allow some price risks to be traded directly. Predicting farmers' use of these institutions or others if the current commodity programs are eliminated is difficult.

Existing private risk management institutions and strategies may not suffice in a free market environment. If not, the Government could make the current set more attractive to farmers or introduce new risk management tools.

Insurance

Insurance is a means of sharing risk. The premiums collected from a large group of people facing independent risks must cover the losses of a predictable percentage of that group. Price and many yield losses are not independent in agriculture. For instance, if price falls for one farmer, it falls for many, if not all, farmers. If price is low in 1 year, large CCC stocks may depress prices in the following year. Many yield losses also lack independence. Drought affecting one farmer will likely affect many. Thus, agricultural insurance is expensive to provide.

Revenue Insurance

A revenue insurance program would offer farmers a chance to insure a percentage of their expected farm revenues. Farmers would evaluate their attitudes toward risk and the perceived net benefits of reducing risk, and select the appropriate amount of insurance.

The first revenue insurance was offered by the Hartford Fire Insurance Company in 1920. A sharp decline in crop prices led the company to abandon the venture after losing $1.7 million (10). Such insurance has not been offered since then because it is unprofitable to offer or too expensive to buy.

Other factors besides the dependence of price and yield losses also work against revenue insurance. The farmers most likely to suffer losses (perhaps those least adept at managing risk with other strategies) would be those most likely to participate, thereby increasing the potential costs of the insurer. Also, eliminating current commodity programs would change the distributions of price and yield and compound the difficulties of offering actuarially sound insurance. Tracking each farmer's effort at maintaining historic yields would also be expensive. For example, some portion of expected revenue (calculated as the product of expected price, expected yield, and acres planted) would be insured. Once such insurance has been secured, farmers might not maintain historic yields (on which expected yield is based). Thus, making the program attractive for private insurers to offer and farmers to buy

would probably require substantial subsidies for either private company expenses or farmer premiums. Such subsidies could impair free market efficiency.

Yield Insurance

Commercial yield insurance is available only for hail and fire losses. Providing insurance for these losses is commercially feasible because both types of losses are unlikely and usually affect only a limited number of individual farms over a wide geographic area. However, hail and fire insurance cover only a small portion of yield risk. Hail damage accounted for less than 10 percent of yield losses during 1948-86, and fire damage was negligible (22).

The Government offers subsidized all-peril yield insurance through the Federal Crop Insurance Corporation (FCIC). The FCIC first introduced insurance in 1938 and later subsidized it to increase its attractiveness. Despite this, participation is not high. The FCIC offered insurance on nearly all corn acreage in 1987, but less than 20 percent was enrolled (23).

Enrollment is low partly because other Federal disaster aid substitutes for insurance. Farmers need not buy FCIC insurance and absorb the cost of reducing risk if the Government consistently provides special disaster assistance when large losses occur. Recognizing this, the FCIC advised Congress as early as 1956 to make crop insurance the only form of farm disaster assistance (10). However, the 1988 disaster relief package reveals that this advice has gone unheeded.

The 1981 and 1985 Acts restricted disaster payments to those who participated in commodity programs and purchased crop insurance (except when insurance was not available or inadequate to cope with the emergency). After the magnitude of the 1988 drought became apparent, the Disaster Assistance Act (P.L. 100-387) made disaster payments available to all crop farmers with losses exceeding a specific amount, regardless of their initial participation and insurance choice, although nonparticipants received lower payments (11). The cost of the disaster payments may pique more interest in encouraging farmers to take more responsibility for yield insurance (4).

Forward Markets

Forward markets, which include futures, forward contracts, and options, provide opportunities to trade price risk by locking in a price for delivery or receipt of a commodity at some future date. Unlike insurance, forward markets involve many individuals trading risk on both sides. Both buyers and sellers of commodities may want to trade in forward markets to reduce price

risk. Speculators, who are willing to accept more risk, increase the volume of trading and make entering and exiting the market easier.

Forward markets are not perfect substitutes for insurance. Futures contracts allow farmers to lock in a future price, but farmers do not benefit if the actual market price is higher than the contract price. Insurance permits farmers to benefit from higher prices, but premiums are not refunded if no losses occur. Futures also involve the unpredictable cost of margin calls. Options act more like true insurance from the individual farmer's perspective. A farmer buys the right to sell at a certain price. If price is higher, the farmer sells on the market and ignores the option. Because production may vary, however, farmers do not usually want to hedge (insure a minimum price for) their entire crop with either futures or options.

Only 5-13 percent of farmers use futures or options to cope with variable prices (25). The low response may reflect an unfamiliarity with futures markets institutions, perceptions that participation is not worth the effort, or the general attractiveness of participating in Government commodity programs instead. Government programs that place a floor on market prices and also raise producer incentive prices above those determined by market conditions reduce the incentive to participate in forward markets.

The U.S. Department of Agriculture currently runs an experimental program to encourage farmers to use futures and options (21). More farmers are involved in cash forward markets. A local agent, an elevator operator for example, guarantees a farmer a certain price for delivering a crop and then the agent hedges with futures or options. This arrangement reduces the individual farmer's cost of gathering market information.

The United States has no recent experience with the unfettered operation of agricultural risk-trading institutions. As with yield insurance, how well forward markets would perform in the absence of current Government programs is unclear. The Government could act in several ways to stimulate farmers' use of forward markets. For instance, the use of options to increase farmers' ability to cope with risk could be subsidized. Increased emphasis on farmer education programs may reduce the information costs of using forward markets. More research is needed to compare the benefits farmers would receive against the Government costs of making these institutions more attractive to farmers.

Stock Management

Stock management programs have traditionally been advocated to stabilize prices, but they have usually been operated to keep prices from falling. A stock program that would stabilize but not raise prices could reduce price risk

under free market agriculture. Such a stock program would also allow the United States to pursue other goals such as food security, food aid, and provision of a buffer against food price inflation.

Stabilizing price, however, may not stabilize revenue, which may be a more important objective from a farmer's point of view. But, managing price risk in the absence of feasible revenue insurance is the only alternative besides yield risk management. Nevertheless, a more efficient approach to managing price risk may be to improve the operation of forward markets because they permit farmers to personally select their level of risk trading.

Unilateral stock management benefits producers worldwide but forces the United States to absorb the cost of price stabilization. Multilateral stock management could reduce the U.S. burden, but rules governing which countries should stock what and when could easily lead to resource misallocation. Relying on the private marketplace to manage stocks for price stabilization and food security could be more efficient.

In any case, the efficiency benefits of stabilization, like Government intervention to improve risk management institutions, may be smaller than their expense (13, 28).

Free Markets with Decoupled Payments

Decoupled payments to support farm income neither depend on nor affect production or consumption decisions. Such payments could be used with the free market approach to redistribute income from other sectors to the agricultural sector or, more specifically, to raise the income of selected farmers. Current programs are coupled because they depend on the level of production and affect the price on which producers base their decisions.

Like other farm subsidy programs, decoupled payment programs require rules on payment levels, eligibility criteria, and program time frame. These three factors determine whether a program is coupled or decoupled, that is, whether the payments will or will not affect production, consumption, and trade. A subsidy program will generally have less effect on production, the lower the payment level, the less eligibility and payment level are related to production, and the shorter the payment time frame.

Decoupling Proposals

One U.S. decoupling proposal is the "Family Farm Protection Act" (S. 1725) introduced by Senators Rudy Boschwitz (R-MN) and David L. Boren (D-OK)

in 1987 (20). Payments would be based on individual farms' historic crop acreages, not current production levels. Eligible recipients could grow nothing and still receive payments. Initial payment levels would approximate annual deficiency payments received by farmers under the 1985 Act but would decline by 50 percent over 5 years.

The "Producer Entitlement Guarantee" (PEG) scheme is proposed as a component of international trade liberalization (2). Each country could pay its farmers only on a limited level of production, the PEG quantity. The quantity would be restricted to some amount below traditional production levels for each country and for producers in each country. Each government would select payment levels consistent with their national economic and political goals, and would determine whether payments would remain constant or be phased out over time.

If the PEG quantity for individual farmers is set low enough, many if not all farmers would find it profitable to produce more than the PEG quantity. Such farmers would therefore base their shortrun resource allocation and production decisions on market-determined prices, not artificial Government signals, but would still receive income assistance.

Performance of Decoupled Programs

The primary benefit of decoupled payments is that they would not affect production and consumption decisions in the year given and would therefore be essentially nondistorting. A perfectly decoupled payment would be the most efficient method of transferring income since there would be no disruption of production or consumption decisions to introduce efficiency losses (5). However, the only completely distortion-free decoupled payment would be an unexpected lump-sum payment, potentially available to anyone, not just farmers. Since such a payment would not promote any agricultural policy goals, the design of a practical decoupled payment program would probably allow for minor distortions.

The primary drawback to decoupled payments is that they would be a clear transfer to farmers, unrelated to any service they perform. The welfare-like nature of such transfers would attract attention and political controversy. Making such payments to one business sector would raise fears that payments to other sectors would inevitably follow.

The Government could base payments on need by making transfers to farmers with certain characteristics such as financially troubled, midsized farms (13). Lack of consensus on what characteristics to use could lead to a broad

compromise including many characteristics, defeating the concept and possibly making payments more distortive and costlier. Alternatively, making payments based on a single characteristic could also be troublesome. For example, paying those most in need could perpetuate inefficiency and distortion by possibly sustaining chronically unprofitable farms. In any case, policymakers would need to take steps to ensure that eligibility criteria are not an incentive for farmers to reorganize their operations to remain eligible for income transfers.

Mandatory Supply Controls

Mandatory supply controls on selected crops have been proposed in the United States as a means of raising farm income while possibly reducing Government cost. Limiting supply will increase prices. If the price of a commodity only minimally affects its demand, a higher price can increase producer revenue and possibly income.

Mandatory supply controls would strictly limit domestic production or marketings and imports of the relevant commodities. Some combination of export subsidies and stock management may also be needed to ensure high prices. Because farmers generally oppose yielding decisionmaking power to the Government, mandatory control programs typically depend on at least majority approval of producers in a referendum (19). Only with a Government guarantee of relatively high prices would producers be likely to approve the policy in a referendum. Following approval, the Government must estimate domestic and excess demand at the guaranteed price. A national supply quota equal to total demand at the guaranteed price would be allocated to individual producers to discourage overproduction. Penalties would be charged for unregulated sale or use of output beyond the authorized quota.

Performance of Mandatory Controls

Our analysis of mandatory controls assumes that guaranteed prices would be higher than current or recent target prices. Current target prices are not high enough to induce total participation. Moreover, current acreage reduction program (ARP) requirements for idling acreage do not prevent CCC stock accumulations. Thus, idled acreage requirements would need to be greater under a mandatory control scheme to prevent CCC stock accumulations. The higher the idled acreage requirement, the higher the guaranteed price must be to compensate program participants.

Government Outlays on Commodity Programs

Government outlays for price support, administration, and enforcement could be substantially higher than with strictly free markets. But, whether such costs would be more than those of current programs, or of free markets with subsidized risk management or decoupled payments, is unclear.

Price support costs. The Government would have to accumulate stocks or subsidize exports if supply exceeded demand at the guaranteed price. Without specifying particular levels for mandated supply, guaranteed price, and estimated demands, we cannot estimate total price support costs. However, we can draw some conclusions about two components of price support costs, the per bushel cost and the quantity that must be supported. The greater the differential between the guaranteed price and the prevailing market price, the greater the Government's per bushel cost for accumulating stocks or subsidizing exports. For a given level of controlled supply, the higher the guaranteed price, the greater the Government's potential obligation to accumulate stocks or subsidize exports to support that price.

Compared with current programs, the Government's per bushel costs would be greater. The price the Government pays for stocks would be the much higher guaranteed price, not current loan rates. Per bushel export subsidies would also exceed those under the current EEP because the Government would have to subsidize the difference between the guaranteed price, not domestic market price, and the world market price.

Stock accumulations, on the other hand, could well be lower with supply more constrained than now. Stock accumulations would be lower yet if the Government chose to support a guaranteed price by relying primarily on export subsidies.[7] But, the higher the guaranteed price for a given national supply quota, the lower the quantity demanded for domestic or export use. In the absence of subsidies on domestic use, the greater the quantity of exports requiring subsidies, the higher the guaranteed price for a given level of production.

Administrative and enforcement costs. The Government would have to continue to regularly analyze supply and use around the world. However, estimates of demands must be much more accurate because of the added importance of aligning demand and supply to avoid stock or export

[7]To avoid export subsidies, the Government could seek a cartel-like arrangement with other exporters to maintain or enhance precontrol market shares at an above-market price. Besides being difficult to attain, such an agreement would be unlikely to succeed. The cartel price would induce noncartel countries to increase their domestic production to avoid costly imports or to reap export benefits on the world market.

management costs. Close monitoring of imports would be necessary to ensure that less expensive foreign substitutes for domestically protected commodities would not be used in value-added goods and then imported into the United States, undermining the guaranteed price.

The implementing Government agency would need to determine individual farm acreage allotments or marketing quotas and notify producers. Onfarm use would be included in a marketing quota. To ensure that individual marketing quotas were not exceeded, monitoring onfarm use would be necessary but difficult, and enforcing compliance would be costly.

Farm Income and Wealth

Government program benefits currently raise rents and values of land and possibly other fixed factors. The effect of program benefits on land rents and values may change as program provisions change. Farm-level supply controls that will affect such values can take the form of acreage allotments or marketing quotas (29).

Which form of control is used will affect how such program rents change. For instance, a transferable acreage allotment assigned to a specific plot of land would increase that land's earning potential because of the higher, guaranteed crop prices. Thus, the land's rental rates and values will increase. The wealth (from higher land values) and income (from higher rents) of the owners of this land would rise, but producer incomes may not. If a producer owns the land, higher returns on the land would go to the producer as landowner. If a producer rents the land, much of the benefit of higher prices would simply be paid to the owner as higher rent. If the land and the associated allotment change ownership, the new owner will pay a higher price for the land and allotment and will therefore receive only a nominal return on the investment for subsequent use of the land.

A quota on acreage, production, or marketings assigned to a producer, rather than to specific acreage, would entitle the holder to production rights and program benefits. Program rents would shift away from land and other capital to quota holders. Quota holders' wealth and income would rise, but cropland owners who do not presently farm the land under current programs would lose wealth and income.

Farmer Decisionmaking

The mandatory nature of controls would make for a more manageable program in some respects. Production or marketing quotas would eliminate the problem of participant yield slippage. Free riders would no longer benefit

from higher prices without complying with program requirements. However, farmers who voted against mandatory controls would still have to participate. For these farmers in particular and for all farmers in general, the substantial loss of individual choice in their farming operations would be unpopular.

Economic Efficiency

The more that resources are controlled, the less freely they flow to their most highly valued uses. Hence, resource misallocation within and among sectors would be greater than with other policy options because of the greater number of barriers required under mandatory controls. For instance, strict acreage allotments could prevent farmers from shifting their cropland from one program crop to another as relative world prices change. Acreage allotments and marketing quotas together would also prevent rising world crop prices from encouraging farmers to bring more domestic land into production without Government permission. Farmers in other countries, then, might decide to plant on less productive and possibly more highly erodible land because of the higher prices. Over time, mandatory controls would increasingly isolate production decisions from market forces so that any future policy reversal toward market orientation would be even more disruptive.

Other Considerations

Subsidized exports, already known to cause international frictions, would be politically costly. The livestock sector would face herd adjustment problems and higher costs as feed prices rise. The agricultural and food transportation, processing, and input industries would suffer if crop production declines dramatically. Higher food prices would disproportionately burden low and fixed income consumers and increase Government outlays tied to the cost of living. Nominal interest rates could rise as lenders attempt to preserve real rates of return in the face of higher inflation.

Conclusion

Congress and the executive branch have historically chosen gradual over extreme farm program changes so switching to mandatory controls or free markets is unlikely. Significant, but less extreme, changes might transpire. Agricultural subsidies might be reduced multilaterally. Or, the United States might unilaterally cut commodity programs while either strengthening institutions which permit farmers to economically bear risk or making payments to farmers that are not tied to production. Budget pressures and the tendency to make gradual changes suggests farm policymakers might embrace

some mix of the less extreme alternatives. However, doing so could mean that inconsistencies between policy objectives and program effects will persist.

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Chapter 19

Effects of New Scientific Knowledge on Food Safety Policy

Tanya Roberts and Eileen van Ravenswaay*

Throughout history, new scientific developments have profoundly altered knowledge about risks in the food supply and revolutionized procedures for controlling those risks. The result is that we have the safest food supply in the world, but knowledge continues to improve. Today, epidemiological studies reveal that micro-organisms are a more common cause of foodborne disease than previously suspected. New data on natural and synthetic chemicals indicate that some may have the potential to cause cancer. Because very low levels of chemicals are now detectable with new technologies, legal restrictions could be triggered. Rapid tests may improve monitoring of critical control points in food production and distribution. The challenge is to incorporate this new knowledge into food safety policies.

Food safety regulations are being scrutinized domestically, while multilateral trade negotiations seek to harmonize food safety standards under the auspices of the General Agreement on Tariffs and Trade (GATT). Domestic concern with food safety is a result of some relatively recent changes in biochemistry and toxicology that have improved our procedures for detecting potential food hazards and assessing their long-term health consequences. As these procedures are being applied to more food substances and constituents, our ability to identify and control food risks improves. This chapter describes how this scientific knowledge is altering choices for policymakers, food producers, and consumers in the case of microbial contaminants, pesticides, and animal drug residues.

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Food Safety Problems and Policies

The health effects from exposure to microbial and chemical contaminants in the food supply can range from diarrhea to cancer. How often does such illness happen? Researchers estimate from 6.5 million to 33 million Americans become ill each year from micro-organisms in their food (4, 19).[1] Thus, roughly 3-14 percent of all Americans become ill each year. An estimated 9,000 of these illnesses result in death, or 4 in 100,000 people. In contrast, the Environmental Protection Agency's worst case estimates are that pesticides in food could potentially cause 6,000 cases of cancer each year, or 2 in every 100,000 people (27). Most toxicologists and food scientists believe that microbial pathogens are a more serious hazard than chemical residues in the food supply.

Health risks from food arise from a number of sources. Some possibly hazardous substances, such as pesticides and animal drugs, may enter the food chain in part because they lower the costs of producing food and, thus, reduce the cost and improve the quality of food for consumers. Others, such as pathogenic micro-organisms and environmental contaminants, enter the food chain because reducing or eliminating them entirely from food may be technologically infeasible or greatly increases the cost of producing that food. Still others impart desirable qualities to food, such as food additives that enhance taste, texture, visual appeal, and shelf life. The human health risks depend on the toxic potency of the substance or the virulence of the microbe, how much of the substance or microbe is in particular foods, and how much of those particular foods an individual consumes. Many common and useful substances in food can become harmful if consumed in large enough quantities.

Food Safety In an Unregulated Market

Producers in an unregulated food market may not provide sufficient information for consumers to consider the safety choices they face. Examining the safety outcomes from unregulated food markets where only general liability and negligence laws prevail will illustrate the influence of information on consumers' choices.

Consumers may become exposed to potentially risky substances in food when they choose among available products. For consumers to make informed decisions about tradeoffs among price, safety, and other dimensions of quality of their food, they must know what is in particular foods and how those substances may affect their health. Consumers must also be able to weigh any

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

benefits, such as a lower food price, greater variety, or desirable food qualities, against the risk.

Acquiring and understanding food safety information can be difficult work for a trained professional, let alone for an individual consumer. In an unregulated market, sellers may have less incentive to provide information to buyers on the amounts or potential adverse effects of substances in their products for two reasons: sellers may not want to alert consumers to risks because sales are likely to fall, and consumers may be reluctant to pay a higher price for "safer" food because they cannot easily verify safety claims. If sellers cannot recoup the extra costs of developing and producing a safer product, they are less likely to develop the product.

Liability rules that enable injured parties to sue and recover damages may not be an adequate means for remedying the information problem in most food safety cases. A consumer may not know whether an illness is due to a particular food because ill effects are substantially delayed in many cases. Even if a consumer can trace the cause, proof may not exist because the food has been eaten or thrown out. In other cases, damages suffered by individuals may not be large enough to justify the enormous time and expense of litigation. In such instances, class action suits may be very difficult to organize unless there is a single, identifiable source of the contamination. If recourse for false safety claims is lacking, there would be little incentive for producers to provide reliable information about food safety.

Regulatory Remedies

Government regulations attempt to enhance the supply of food safety information. Since there are many different types of food safety problems, different methods of regulating may be used. One possible method of regulating is to require labeling of the amount of substances contained in food. However, a complete listing of all possible microbial and chemical contaminants would necessitate testing each food item for literally hundreds of substances at several points in the production process, including the site of final preparation. Moreover, although test methods are improving, adequate and timely testing methods do not exist for all contaminants. Even if affordable consumer tests were available and reliable, safe levels of each of the substances must be determined and somehow communicated to consumers. The safety decisions confronting consumers would be enormous.

Because of these problems with labeling, the Federal Government directly controls how much and what substances are allowed in foods (8). The regulatory tools most often used by the Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), and the U.S. Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) are

"tolerances" and food manufacturing process standards. "Tolerances" are legal limits on the amount of a substance allowed in a commercially sold food. Food manufacturing process standards include sanitation and construction requirements for packing plants and food processing establishments.

Enforcing compliance with tolerances and food processing standards requires inspecting and testing foods and production or processing facilities. All raw meat and poultry is visually inspected. Foods are also inspected for compliance with tolerances on a sampling basis with some kind of penalty (such as a fine, product seizure, or legal prosecution) for noncompliance. The sampling rate determines the probability of being tested. This probability, coupled with the penalty imposed for noncompliance, creates an expected cost for violating the law. The higher the expected cost of a violation, the more violations that may be deterred.

Other public policy tools are occasionally used to enhance food safety. One example is public education programs and public health warnings, such as telling consumers to cook raw pork thoroughly rather than testing every pork product for the parasite that causes trichinosis (28). Another example is label identification of substances known to be added to foods, which is done for colors, flavors, preservatives, artificial sweeteners, and other "food additives." Although consumers have some choice about consuming products with identified additives, government plays an important role in ensuring that what is added is safe or poses insignificant health risks and that the label is informative (29).

Microbial Contamination

Foodborne disease is increasingly being traced to specific micro-organisms. Reported cases have increased for some common diseases, such as salmonellosis (14). Improved tests identify more pathogenic organisms and trace them back to foods and feedlots. Animal and seafood products are the major vehicles for foodborne disease (25). Changing food production and handling practices all along the food chain have the potential to change foodborne disease risks (12). New knowledge has increased our understanding of the vulnerability of certain population subgroups to foodborne disease.

Dimensions of the Problem

Bacterial contamination of food is the primary cause of the estimated 6.5-33 million annual cases of foodborne disease (4, 19). Foodborne disease can also be caused by parasites, viruses, fungi, and protozoa. Pathogens typically

contaminate raw food, and inadequate cooking or other food preservation techniques allow the pathogen to survive or perhaps multiply.

The conventional wisdom used to be that foodborne disease would only cause mild, brief illness (primarily diarrhea and vomiting for 1 or 2 days). But foodborne disease severity is enormously variable. Parameters affecting the infective dose and disease severity include:

- virulence of the organism,
- food composition and use of antacids, and
- host susceptibility which varies with age, underlying disease, pregnancy, medications, nutritional status, and immune status.

Chronic diseases can occasionally result from common bacterial and parasitic diseases (2). Central nervous system disorders, heart complications, colitis or chronic intestinal disturbance, or kidney disease are possible outcomes for some bacterial and parasitic infections transmitted by foods (11). Some parasitic and viral diseases of foodborne origin can suppress the immune system. An estimated 2-3 percent of foodborne disease cases have some kind of short-term or long-term recurring aftereffects (10).

Food processors have typically relied on multiple techniques to control foodborne micro-organisms. These techniques include higher acidity, high sugar content, low water content, or high salt or nitrite content and control of food temperature. Not even these traditional barriers will correct all product abuses or be compatible with a particular food's tastes.

New convenience foods such as precooked entrees for reheating at home or in restaurants pose new potential food safety problems. Vacuum packaging hinders the growth of spoilage micro-organisms but may permit the growth of *Clostridium botulinum* and toxin production (causing botulism) at temperatures found in many commercial and home refrigerators. Also, precooked foods may be minimally heated, eliminating the traditional last line of defense which is thorough cooking immediately before eating. The widespread use of microwave ovens may exacerbate this problem because the ovens can have cold spots where bacterial pathogens and parasites may not be killed. The increasing diversity of the American diet also adds to the potential for microbial contamination, with Americans consuming imported foods, for example, not previously available.

Consumers tend to underestimate the risk of foodborne disease from micro-organisms. USDA surveys of chicken over two decades have consistently shown that 35 percent are contaminated with *Salmonella* when

they leave the slaughterhouse (7). However, 16 percent of homemakers surveyed in 1974 indicated that they thought contamination was not at all likely, 47 percent said not too likely, 24 percent said somewhat likely, and only 12 percent said very likely (9). Recent media attention and legislative activity may be increasing awareness of microbial foodborne disease risks.

Costs of Foodborne Diseases

The costs of foodborne disease fall upon individuals who become ill, their families and coworkers, their employers, food industries, and the public health sector. Individuals' costs include medical bills, time lost from work, pain and inconvenience, time lost during illness, and increased health insurance premiums. Food industry costs include the possibility of product recalls, plant closing and cleanup, product liability insurance, and reduced product demand in a highly publicized foodborne disease outbreak (18, 20, 21). Public costs also include the public health sector's costs of maintaining a disease surveillance system, investigating outbreaks, and helping to clean up outbreaks.

Medical costs and time lost from work for individuals are estimated at around $1 billion annually for salmonellosis, a common intestinal disease with flu-like symptoms (16). Campylobacteriosis, a similar intestinal disease, also has medical and productivity costs of around $1 billion annually (17). A third disease, congenital toxoplasmosis, causes mental retardation in fetuses and is conservatively estimated to have costs of $215-$323 million annually (17). These partial estimates omit many foodborne diseases (4). Individuals' medical costs and productivity losses for foodborne disease are several billion dollars annually.

Studies by the National Academy of Sciences (NAS) have concluded that current methods do not detect the most important foodborne pathogens (12, 14). Micro-organisms are invisible to the naked eye, tests are not available, and most micro-organisms found in food are not pathogenic. Even the available tests may not be able to differentiate pathogenic strains from harmless strains of the same micro-organism. Testing all foods for all pathogens would dramatically raise the cost of producing food. NAS recommended that a risk assessment approach be used to identify hazards, determine their importance, and set inspection priorities.

Economic theory tells us that too much regulation (or the wrong sort of regulation) can be as costly to society as too little regulation. The key to optimal regulation is determining when the benefits to human health of additional testing and regulation are no greater than the extra cost.

Pesticide Residues

All pesticides require Federal Government approval before entering the market. The Federal Government approved many widely used pesticides when little was known about their chronic toxicity, such as their potential to cause cancer. Beginning in 1978, amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) imposed new requirements on what must be known about the chronic toxicity of pesticides before EPA can approve their use on specific crops. Consequently, pesticides introduced in the last decade have faced tougher scrutiny.

Tougher scrutiny has not always resulted in a safer food supply, according to a 1987 NAS report (13). This paradox arises because even though some new pesticides are significantly less carcinogenic and pose substantially fewer health risks than some pesticides already on the market, EPA has not always been able to register them under current law. Thus, older, potentially riskier pesticides continue to be used in some cases even though better ones could be available.

The Delaney Clause

The reason for this outcome is the Delaney Clause in section 409 of the Federal Food, Drug, and Cosmetic Act (FFDCA). The Delaney Clause prohibits establishing a food additive tolerance for a pesticide residue if the pesticide has been shown to induce cancer in humans or laboratory animals. However, the clause only applies to residues which concentrate when the food is processed or residues from pesticides added directly to the food or feed during or after processing. The clause does not apply to pesticide residues on raw commodities. For example, if the residue of a pesticide used in apple production is greater in apple juice than in raw apples, the tolerance for the residue in apple juice is set under the Delaney Clause. If the residue of a pesticide used in apple production does not concentrate during processing, the clause does not apply. Tolerances for these residues are still subject to section 408 of the act, which directs EPA to set tolerances at the level necessary to protect public health while considering the need for an adequate, wholesome, and economical food supply, sometimes known as a "risk-benefit" standard.

The Delaney Clause was seldom applicable in the past because little scientific data existed on the ability of pesticides to induce tumors or on the degree to which pesticide residues concentrated during food processing. However, scientific developments since the Delaney Clause was enacted enable estimating even very small oncogenic (tending to cause benign or malignant tumors) risks and detecting of minor degrees of concentration (13).

This new scientific ability makes the Delaney Clause far more applicable, creating a paradox of two different standards for treating pesticide residues in food. These standards are the "zero cancer risk" standard of the Delaney Clause and the "risk-benefit" standard of section 408. Whether the residue concentrates during food processing and at what point in the food system pesticide treatment occurs determine which standard applies. The NAS study concluded that there is no apparent public health reason for making this distinction (13). Either oncogenic risks from pesticides should not be tolerated in food no matter how small the risk, or oncogenic risks from pesticides should be judged according to some criterion of acceptability.

In the short run, the clause has prevented EPA from approving new pesticides that are significantly less oncogenic and have fewer other types of health risks than the currently registered pesticides that they would replace. For example, in 1983, EPA denied tolerances for the fungicide Fosetyl Al in hops because EPA estimated that Fosetyl Al would pose an oncogenic risk of 1 in 100 million lifetimes. However, the EBDC fungicide that Fosetyl Al would have competed with in the market is estimated to pose oncogenic risks of 1 in 10,000, or many times that of Fosetyl Al (13).

The NAS study concluded that the double standard of applying the Delaney Clause only to pesticide residues in processed foods has resulted in greater cancer risks than applying the clause to pesticide residues in both raw and processed foods. The study further concluded that, while applying the Delaney Clause to pesticide residues in both processed and raw foods would eliminate 100 percent of the risk, a policy of allowing a negligible risk of cancer from pesticide residues in food would eliminate 98 percent of the risk and would be significantly less restrictive on the availability of pesticides and hence on food prices (13).

The costs of living with the Delaney Clause as it is currently written could be very large. FIFRA requires EPA to reregister old pesticides as new data become available about their health effects, and the 1988 FIFRA amendments (P.L. 100-532) speed up the process. In 1981, EPA put out the call for these new data. At the time of the NAS study, oncogenicity data were complete or partially complete for 74 of the 289 pesticides currently registered for use on food crops, and 53 of them were classified as potential oncogens. According to the NAS study, these 53 compounds account for 90 percent of all fungicide use, 38 percent of all herbicide use, and 40 percent of all insecticide use. The situation is particularly acute for fungicides, because few good substitutes are being researched and developed (13). Because fungicides are widely used on fruits and vegetables that are often processed, these are the crops most likely to be affected by the Delaney Clause.

Alternatives to the Delaney Clause

In October 1988, EPA announced it would begin to apply a negligible-risk criterion in setting tolerances for residues of carcinogenic pesticides in processed foods (26). While the new policy responds to the problems created by applying stricter safety standards to new versus old pesticides, the policy does not completely address the paradox of different safety standards for pesticide residues in processed versus raw foods as discussed in the NAS study. Interest groups opposed to pesticides have criticized this new policy.

Animal Drug Residues

All animal drugs must have FDA approval before they can be sold in the United States. To ensure that residues of these drugs in meat are within the tolerances set by FDA, FSIS randomly tests for drug residues as part of its meat and poultry inspection program.

Like pesticides, many approved animal drugs were registered for use on the basis of safety evaluations now considered obsolete. As new data become available, the toxic potency of many drugs widely used to promote weight gain and prevent disease in livestock may be questioned. For example, the safety of some sulfa drugs, which are widely used in swine and veal production, is being questioned. Even though sulfa drugs have long been recognized as causing allergic reactions in some sensitive individuals, recent studies by FDA's National Center for Toxicological Research indicate that sulfamethazine may be a potential carcinogen. Based on preliminary risk assessments, FDA has warned that it may lower the tolerance for sulfamethazine in swine or ban its use (3). FDA has since determined that such action is not required.

Adequate, timely detection methods do not exist for about 70 percent of the animal drug residues in meat, milk, and eggs that USDA monitors, according to a congressional report (23). Both public and private researchers are developing tests to detect more animal drugs in food. FSIS has made considerable progress in developing tests for detecting the most widely used antibiotic and sulfa drug residues.

Residue Detection

Continuing problems with illegal residues of antibiotics and sulfa drugs in meat reflect some major constraints FSIS has faced in making the expected costs of violating the law greater than the costs of complying with the law.

The expected cost of violating the law depends on the probability that violations are detected and the size of the penalty. The expected cost can be increased by increasing one or both of these variables.

Increasing the expected cost of violating the law by increasing the rate of detection of some residue violations can be extremely costly and difficult. Not every one of the millions of animals slaughtered each year can be individually tested. Instead, FSIS samples animals on a statistical basis to estimate residues of different types of drugs and other chemicals. If the violation rate is very low and risks to human health are insignificant, no further action is taken. If the violation rate exceeds 1 percent, FSIS takes rigorous action and searches for the likely source of the violations. This effort requires costly and time-consuming research to identify the producers who are violating and why. If the producers can be pinpointed, FSIS, in conjunction with FDA, monitors them until the problem is eliminated.

But problems can be eliminated only if FSIS is able to make sure that violating the law costs more than complying with it. That is a problem because FSIS cannot simply fine violators. The agency can condemn and seize carcasses. FSIS can also initiate criminal procedures, but these actions based on detecting residues may be hampered by the complexity and slowness of tests requiring tissue samples. In some cases, by the time a violation of Federal drug residue standards is found, the carcass may have already been sold at retail and consumed.

Thus, FSIS has devoted substantial resources to developing rapid testing procedures for detecting residues of widely used sulfa and antibiotic drugs, and some rapid tests are now being used at slaughter plants across the Nation.

FSIS also faces a marketing system that currently makes determining who produced the animal often difficult. A corrective market mechanism of shifting liability to the problem-causing producer is consequently not easy. Except in the case of swine, there is currently no mandatory animal identification system. Thus, in some cases, neither slaughterhouses nor FSIS are able to inform producers that they have violated the law or to subject their future marketings to follow up testing. To help overcome this problem, FSIS, in cooperation with the Animal and Plant Health Inspection Service, proposed and adopted a mandatory swine identification system (24). Furthermore, USDA's Packers and Stockyards Administration proposed and then withdrew the proposal for a procedure that would enable slaughterers to charge sellers of animals condemned for violative residues (5).

New Science Raises New Issues

Changes in what is known about toxic potency and microbial virulence, the presence of substances in foods, and the amount of those foods that people eat have raised important questions about food safety policies. New technologies have helped pinpoint where in the food production process a problem occurs, thus enabling analysts to focus on control procedures at that part of the process. These new technologies are becoming the new tools for domestic and foreign industries and regulators.

Several U.S. legislative initiatives could speed up development of tests to monitor microorganisms and chemicals in foods. Important areas for funding are research to establish a statistical framework for measuring significant risks to human health from foodborne disease, identifying microbial or chemical agents that pose a significant human health risk, and reducing risks by identifying them more rapidly and determining where intervention in the food chain could lower human health risk. If food has been consumed before test results are available from the laboratory, regulatory possibilities are limited. Tests completed in hours or in 1-2 days increase the likelihood of recalling a product before it leaves the plant and increase the amount of product likely to be recovered.

Assessing the Risks of Traditional and New Foods

Recent research indicates that natural carcinogens and anti-carcinogens may be widespread in food and that many raw foods contain microbial contaminants that may cause disease (1, 4, 25). The risks illuminated by new testing methods will require consumers to face the fact that their food supply is not totally risk free (28).

The continued development of pest-resistant plants may increase the quantities of natural toxic substances in foods. The use of biotechnology to develop disease-resistant and insect-resistant plants may increase the levels in plants of these naturally occurring toxic substances (1). Several biotechnology companies are also experimenting with other techniques of engineering pest-resistant plants.

Regulatory programs are built on estimates of the toxic potency of substances, virulence of micro-organisms, and their presence in food, and the amount of those foods that people consume. Estimates of the long-term chronic toxicity of both natural and synthetic substances in food are still extremely uncertain and, hence, will continue to be debated for decades to come. Data on the presence of such substances in food is limited by the practicality of available testing methods and public dollars. Moreover, as consumption patterns

change, old estimates of exposure become outdated. Knowledge of food consumption patterns must be continually updated to ensure that regulations are based on reasonably accurate information.

Legislative Initiatives

Congress, in its 1988 appropriations report, recommended that USDA, FDA, and the National Marine Fisheries Service jointly investigate the possibility of determining microbial criteria for various foods, and a committee has been meeting (22). Congress also recommended that FSIS change its rules and regulations to prevent the sale of poultry contaminated with fecal material.

Bills introduced in the 100th Congress dealt with food safety in various ways. Some focused on developing rapid tests to monitor microbes and chemicals in foods and establishing a statistical framework to measure significant risks to human health from foodborne disease. (Congress included $2 million in a miscellaneous appropriation act for this.) Others considered setting standards for pesticide residues and microbial contamination levels. Extending USDA's inspection programs to all commercial seafood destined for human consumption in the United States was also proposed.

Food safety continues to be an important issue in the 101st Congress. For example, bills by Senator Edward Kennedy (D-MA, S. 722) and Representative Henry Waxman (D-CA, H.R. 1725) would eliminate the Delaney paradox by requiring that pesticide residues in both fresh and processed fruits and vegetables meet the same negligible risk standards. However, the proposed risk standard is very tough, may be impractical, and will increase the cost of producing food. The bills would also expand pesticide regulations to include examining the health effects of inert ingredients and metabolites in pesticides, would require that identifiable population groups with special food consumption patterns be considered in calculating health effects which must meet a negligible risk standard, and would expedite revoking tolerances for pesticides if the negligible risk standard is violated. Public access to data in support of pesticide petitions would be required, and EPA would be permitted to charge fees to carry out its regulation of pesticides.

In response to the controversy about the use of Alar (daminozide) on apples, Representative Gerry Sikorski (D-MN) sponsored a bill (H.R. 1508) that would terminate the tolerance for the substance under the Federal Food, Drug, and Cosmetic Act.

H.R. 1387, proposed by Representative Byron Dorgan (D-ND), would extend USDA's inspection programs to all commercial seafood for U.S. consumption. Representative Neal Smith's (D-IA) bill, H.R. 604, would reestablish

minimum inspection and processing standards for poultry by revoking all rules and regulations implemented after July 1, 1977.

Efforts to make food labeling more accurate and informative are reflected in bills sponsored by Representatives Joe Kolter (D-PA) and Joe Moakley (D-MA). Representative Kolter's H.R. 240 would require manufacturers of foods with nutritional claims or special dietary uses to maintain a toll-free telephone line for inquiries. Representative Moakley's bill, H.R. 2051, would amend the Federal Food, Drug, and Cosmetic Act to require labeling for fat, cholesterol, and sodium content.

Inspection and Enforcement

New rules have been considered that may improve the deterrent effects of inspection programs. Whether the recently adopted swine identification system will be extended to cattle and other species remains to be seen. Also at issue is whether slaughterers should be allowed to charge sellers for animals condemned for violative residues. Sen. Patrick Leahy (D-VT) sponsored a bill (S. 1813) that would strengthen current FSIS enforcement by adding penalties when violations of standards are found in meat, poultry, and seafood plants.

Labeling and Education

Improved testing procedures have fostered both private and public labeling initiatives. For example, NutriClean, a company based in Oakland, California, offers programs to test for chemical residues in food and certify the food as meeting Federal safety standards (6 ,30). Several supermarkets in California and a few in the East have contracted with NutriClean to certify their produce. These private testing and labeling efforts raise issues of reliability and standardization of laboratory testing methods.

The development of detection methodology may also be the impetus behind laws like Proposition 65 in California. This law, the Safe Drinking Water and Toxic Enforcement Act of 1986, requires that any persons exposed to a natural or synthetic chemical that the Governor has determined to be a carcinogen or reproductive toxicant must be warned of that exposure. Thus, the law requires many consumer goods to be labeled if they contain any amount of one of these chemicals. Federally inspected meat and poultry products and some other food products are exempt from the California law. Although the practical California regulations are still being worked out, this State law represents a new movement in consumer desire for labeling and increase concern for food safety.

Labeling is being recommended in various situations. NAS recommends labeling of retail poultry products "to inform consumers how to handle the

poultry to prevent diseases originating from microbial contaminants" (12). FSIS has proposed that packages of poultry produced under superior hygienic conditions be labeled to encourage consumers to purchase such packages and to enable firms to recover the extra production costs. The Leahy bill would provide for follow up research on the effect of labeling fresh meats and poultry with cooking instructions.

Risk communication is still an art, and more research is needed on the best way to communicate risk information to consumers. Because inspection and labeling alone do not eliminate bacterial contamination of food, the Leahy bill would also expand consumer education programs on proper cooking and storage methods with similar programs for restaurants and institutions.

New Technologies

New technologies in food processing include the time/temperature integration monitors and irradiation. Both are potential aids for improving product safety and extending shelf-life.

Some frozen food packages already have a time/temperature integrator to tell when food is heated sufficiently in a microwave oven. Similar devices can be placed on other consumer packages to indicate whether proper temperature control and storage times were observed for refrigerated or frozen foods. These integrators cost 2-5 cents apiece or more and could be useful on high-risk foods such as ready-to-eat foods in airtight packages that need strict temperature and shelf-life control to avoid botulism. Use of an integrator could be voluntary or mandated by regulators for specific high-risk foods.

Irradiation permits the possibility of effectively pasteurizing raw meat, seafood, and poultry to reduce pathogen load. Several international scientific groups have advocated irradiation as the major way to reduce foodborne illness in developed and developing countries. FDA has approved irradiation of pork to kill *Trichinae* in pork. Higher doses to reduce *Salmonella* levels in poultry are under consideration. Aside from cost, the primary obstacle to the use of this technology is consumer acceptance.

Policy Research Needs

Changes in knowledge of the toxic potency and presence of substances in foods and the amount of those foods that people eat raise important questions about food safety policies.

- Should greater public efforts be made to reduce foodborne pathogens? Answering this question requires knowledge about technological capabilities, the benefits, and costs of controlling foodborne pathogens.

- Does the ability to detect increasingly minute amounts of substances in foods mean that we should seek more flexible laws than the Delaney Clause? This question would be better answered if we know how the Delaney Clause contributes to reducing cancer risks and how it affects food production costs compared with other alternatives.

- If the use of labeling is expanded, how should labels communicate risk information to the public? Such communication will depend on what we know about how people develop beliefs about food risk and how that affects precautionary behavior.

- What can be done about public confusion in the face of rapidly increasing and sometimes conflicting information about the safety of specific foods? We need research on the effects of various ways of communicating risk on human understanding of risk and its relationship to the benefits that food-producing technologies provide.

Changes in science, technology, and lifestyles will continue to challenge policymakers and the food system in dealing with the problems of food safety. In responding to these challenges, they need the best scientific information possible to identify and evaluate available options.

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Chapter 20

The Evolving Biotechnology Industry and Its Effects on Farming

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The weak financial position of small agricultural biotechnology companies, litigation over patent rights, unavailability of liability insurance, and Government regulation will shape the structure of the agricultural biotechnology industry over the next 20 years. A few large firms will probably dominate that industry. Once technological hurdles are overcome, industry structure, patent protection, and regulatory climate will affect characteristics and prices of products. These decisions will, in turn, determine the rate at which technical advances in biotechnology are realized as gains in agricultural productivity and are passed on to consumers through lower food prices.

During the next 20 years, the effects of biotechnology on farming (both livestock and crops) will be felt through both the technically feasible increases in production from, and the price farmers must pay for, biotechnologically derived agricultural inputs. The structure of the industry, the breadth of patent protection offered, and pricing of substitute inputs for agricultural production will determine the price of products from the biotechnology industry. Monopoly pricing opportunities garnered through patent protection will slow diffusion of biotechnologically derived products and limit agricultural output's response to introduction of new technologies. The output response will increase as patent protection expires, first-generation biotechnology products are made obsolete by new and better products, or traditional input manufacturers engage in protective price cutting to maintain their markets. More rapid diffusion would benefit both farmers and consumers. Without the promise of profits from patent protection, however, the private sector would have little incentive to invest in research and

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development and incur the costs of regulatory approval to commercialize biotechnologically derived products.

Successful biotechnology will change the mix of purchased inputs used in agriculture. Regulation and other economic factors will determine whether biotechnology enhances farmers' ability to respond to concerns about the environment and health and safety brought about by existing patterns of input use.

Economists studying biotechnology have focused primarily on the changes in input/output relationships that can be caused by specific products. Biotechnology clearly has potential to evoke major changes in agriculture. But, the potential for increased productivity is only part of the picture. Biotechnology's effects and the structure of the agricultural biotechnology industry will also be determined by the products that are actually developed and their selling prices.

Today's financial and market position of agricultural input manufacturers will influence the industry over the next 20 years. Developments in intellectual property law, particularly patent and trade secret law, will also affect the structure of the agricultural biotechnology industry, the products developed, and the prices at which they are sold. Product liability and the availability of liability insurance will affect both the financial position of firms and the recourse available to those who may be harmed by biotechnologically derived products. Finally, regulatory agencies have the potential to shape the structure of the industry and the types of biotechnology products that are developed.

Many of the factors that will affect the development of the agricultural biotechnology industry have themselves been the subject of debate over the past decade. Patentability; environmental, health, and safety regulation; and liability and insurability have grown in importance in many sectors of the economy, including agriculture. The role of these factors in discussions on biotechnology reflects increasing awareness of the influence of law on technology, of technology on society, and of increasing pressure for policies that anticipate rather than react to future developments.

Biotechnology: A Process, Not a Product

Biotechnology is the use of technology based on living systems to develop other processes and products. Biotechnology thus encompasses many

activities that harness the fundamental abilities of living organisms. These activities include the specific techniques of gene manipulation and transfer also known as recombinant deoxyribonucleic acid (rDNA); plant regeneration, cell culture, and cloning; creating monoclonal antibodies; and bioprocess engineering. (See "The Technology of Biotechnology," pages 336-337.)

Many products for agriculture are being developed using biotechnology, including bacteria that fix nitrogen and bacteria that inhibit the development of ice on plants. Other micro-organisms are being developed that will carry DNA segments to produce substances toxic to specific plant pests. Cell culture and plant regeneration technologies are being used in conjunction with rDNA to develop and select plant varieties that are higher in protein, lower in water content, and resistant to specific herbicides, pests, and diseases. Bioprocess and rDNA technology are being used to develop vaccines against animal diseases and to produce hormones that may increase the productivity of existing animals. Genetic engineering is being used to develop new types of animals.

Although biotechnology defines a range of processes, not products, the Federal Government regulates biotechnology according to its end products, theoretically without regard to their means of production. In the case of bioprocess-derived end products that are identical to those developed in existing systems (for example, bovine growth hormone, or bGH), this difference between process and end product is easily distinguished. However, in the case of novel organisms, those that have not, to our knowledge, ever appeared in nature or could not naturally occur, this distinction is more difficult.

The end-products approach to examining biotechnology has been justified because it fits within the traditional scope of regulatory concern with health and safety and satisfaction of claims about product performance. But, some interested persons have argued that this focus is too narrow and that biotechnology raises broader policy issues, including the effect of the quantity of new organisms, and speed at which they can be developed. For example, a unit of bGH developed using the techniques of biotechnology may be virtually identical to a unit of bGH produced by a cow. However, the ability of biotechnology to produce massive quantities of bGH at one time may affect the structure of the dairy industry. New plant varieties derived using the techniques of somaclonal variation and cell culture may result in a variety similar to that which could be developed using traditional cross-breeding methods. Proponents of a broader approach to regulation maintain that the speed at which new varieties can be developed and introduced, and the sources

of these new varieties, may affect the size of and production practices used by agricultural firms.

The Agricultural Biotechnology Input Industry Today

Since the 1970's, some 600 biotechnology companies have been founded. The promise of profitable new products that initially contributed to the influx of capital into the industry has not yet been realized in agriculture. Recent trade and popular press articles report that almost all of the small and midsized biotechnology companies have reported financial losses since their formation

The Technology of Biotechnology

Recombinant DNA (rDNA): Cells produce many different substances, including proteins, necessary for organisms to function. Deoxyribonucleic acid (DNA), a large molecule housed in the cells of most plants and animals, carries the instructions for building and maintaining organisms. Using proteins known as restriction enzymes, scientists can cut DNA segments responsible for specific functions or for producing specific substances from the cell of one organism, and insert those segments into the cells of a similar or unrelated organism. Thus, a cell or organism can be made to produce either new substances or more of a substance it already produces. So far, genetic engineers are largely limited to transferring single genes into microbes, plants, and animals, or taking single genes out of bacteria and viruses. Alterations involving more than one gene, such as crops that produce their own insecticides and fertilizer or cows that produce medications rather than milk in their udders, are further into the future.

Plant Regeneration, Cell Culture, and Cloning: Each cell in an organism contains the genetic information necessary to regenerate that entire organism, enabling scientists to explore the range of genetic compositions of that organism or to develop exact clones of existing organisms. In a process known as somaclonal variation, scientists expose cells from one plant to a variety of conditions and shocks. Each differently exposed cell is then cultivated into a complete plant, creating a crop of genetically diverse plants stemming from mutations and changes creating a crop of genetically diverse plants stemming from mutations and changes caused by the shocks.

with no company showing profits strictly from selling products derived from rDNA technology (2, 16).[1] Industry analysts now predict a major reduction in the number of agricultural biotechnology firms as products near the testing and commercialization stages (6, 14).

The agricultural input industry spends about 10 percent of its research and development funds on biotechnology. About 10 percent of all industries' spending on biotechnology is for agricultural products (7, 11, 13). However,

[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

Breeders can then select from this diverse group the plants with the most desirable attributes. In the process of cloning, scientists can take cells from the embryo of a plant or animal with desired characteristics and insert them into embryos of the same species from which the nuclei had been removed. By allowing these embryos to develop under carefully controlled conditions, numerous genetically identical crops or animals can be produced.

Monoclonal Antibodies: When a foreign substance enters an animal, white blood cells produce proteins called antibodies. These antibodies attach themselves to the foreign substance, inactivating it so that it cannot cause harm. Animals normally produce a mixed group of antibodies, each highly specific to the kind of site where it will attach. An animal cell that produces one type of antibody can be made to incessantly produce identical, or monoclonal, antibodies. The antibodies, if produced in large enough quantities and then isolated, can be used to quickly detect, measure, and target foreign substances, chemical compounds, or micro-organisms in other living systems.

Bioprocess Technology: The products of living cells or enzymes that have been altered or isolated using rDNA or monoclonal antibody technology can be harvested using bioprocess technology. The cells or enzymes are cultivated in large quantities in specially prepared cultures under carefully regulated conditions. When the process is complete, the desired protein is extracted from the cell culture. The challenge is to take a biological process that successfully produces microscopic quantities of a product in a test tube and apply it to the much larger batch processes necessary to produce marketable products.

this figure underestimates the effect of industry spending on the development of agriculturally related biotechnology products because discoveries made in the pursuit of other biotechnology products are often applicable to agricultural research, particularly animal agriculture.

The financial and market position of firms whose primary line of business is agricultural biotechnology can be contrasted with those firms that are expanding into biotechnology from established positions in the agrichemical market. The aggressiveness of the larger agricultural input firms in biotechnology demonstrates the long-term market potential for the products of biotechnology in agriculture. For example, *The Economist* has reported that Monsanto, a major agrichemical firm, has already invested over $1 billion in research on agricultural biotechnology products (2).

The financial position of agricultural biotechnology firms is reflected in the ratio of their market valuation from public offerings, including stocks, to their liquidation value (their value if their existing facilities and products were sold). For all firms whose primary or sole line of business is biotechnology, total offerings were valued at about seven times the firms' liquidation value in 1988. For agricultural biotechnology firms, the average value of public offerings was less than the firms' liquidation value (7). The greater financial resources, regulatory expertise, and marketing knowledge that lend a competitive advantage to large agrichemical firms is often blamed for the lack of investor confidence in smaller biotechnology companies whose primary focus is products intended to compete in the agricultural marketplace (7).

Many biotechnology firms have licensed their first products to large pharmaceutical or agrichemical firms who have regulatory and marketing expertise and established sales networks. Firms engaged solely in biotechnology have concentrated their efforts on research and development. These firms are only now moving into product marketing and sales.

Proprietary Rights and Research and Development

Patent law and trade secret law are particularly relevant to the agricultural biotechnology industry. About 65 percent of all agricultural research and development expenditures are accounted for by the private sector (17, 18). That private investment depends on establishing exclusive private rights in the products of research and development to recover research investment. Three areas of proprietary rights are especially important for agricultural biotechnology: the breadth of protection offered by patents and trade secrets, defensibility of proprietary rights against challenges from other firms, and protection against proprietary rights infringement by agricultural producers.

A patent theoretically confers exclusive rights to its holder by granting a legal monopoly on an invention for 17 years. Patent laws grant an inventor the right to exclude others from making, using, or selling the invention or its products. In return, the patent application must provide enough information about the invention so that someone skilled in the area could duplicate it. Thus, society can immediately begin to build upon the new knowledge embodied in the patent. If, by law, only one firm is allowed to use or produce the patented technology, that firm will be able to charge a higher price for that product than if many firms could produce the same product. The effective monopoly granted by a patent allows the firm to earn higher returns on production of the product to recoup development costs and serve as a general incentive for developing new products and processes.

The Patent Act of 1870 requires that for an item to be patentable, it must be novel, useful, and nonobvious. The 1870 Act did not cover plants and animals because they were considered products of nature and thus not subject to ownership. Congress extended patents to living things in 1930 with the passage of the Plant Patent Act. The act enabled breeders of tree crops, roses, and other plants that reproduced through cuttings to protect their development. In 1970, Congress passed a similar measure, the Plant Variety Protection Act, to extend patent rights for wheat, corn, and other crops that reproduce through seeds. In 1980, the Supreme Court's decision in *Diamond* v. *Chakrabarty* further extended the scope of patent law to include organisms. The Court held that patentable subject matter includes "anything under the sun made by man" as long as it meets the standards of invention set forth in the original Patent Act, namely, that the invention is novel, useful, and nonobvious (5).

Trade secret law is antithetical to patent law. A trade secret is legally defined as any information that has potential or actual economic value by virtue of not being generally known to one's competitors as long as reasonable efforts are made to keep the information secret (15). Patent law requires dissemination of an innovation's inner workings to the public while trade secret law bars protection if the process or information is voluntarily disclosed or capable of ascertainment by reverse engineering. Therefore, by applying for a patent, firms lose the protection of proprietary rights offered by trade secret law.

The issue of proprietary rights is particularly sensitive in the biotechnology industry. Because of the influence of close substitutes on what a firm can charge for its product, how broadly or narrowly property rights for biotechnology processes and end-products are defined will affect their profitability and incentives for product development. Because of uncertainty about patent breadth and defensibility, firms are faced with a dilemma about when to apply for patent protection. By disclosing information in the patent process, firms lose rights conferred through trade secret protection. The problem is common in rapidly developing industries and is particularly acute

in biotechnology where many companies are working on a limited number of products using the same scientific methods (14).

The process of determining proprietary rights is further complicated by the fact that often 4-10 companies are involved in bringing any one new biotechnology product to the testing or marketing stage (14). Many biotechnology companies are not vertically integrated but concentrate on highly specific types of research. By strategic alliances, this research expertise can join with other corporations' regulation, production, and marketing expertise (15). Disputes may arise, however, about misuse of confidential technical or business information that must be shared.

Firms are often forced to take out patents of uncertain validity and fight off challenges to them in the courts. A company will follow this strategy because it knows its competitors are doing the same. The legal costs of defending court challenges provides a competitive edge to larger companies with greater financial resources. "Patents tend to favor the big battalions," according to *The Economist* (2).

The likelihood of litigation and the uncertainty about biotechnology firms' ability to enforce proprietary rights has added to the uncertainty faced by investors, making the biotechnology industry less attractive, at least in the short run. Industry analysts expect the patent scramble to contribute to a trend over the next few years of increased consolidation in the biotechnology industry (6, 14).

Legal challenges from other agricultural biotechnology input firms is only one of the threats to proprietary rights for biotechnology firms. The firms are also concerned about their ability to enforce proprietary rights once products are released into the marketplace. Although the Patent and Trademark Office has indicated support for royalties on offspring of patented animals, this issue has not yet been raised in the courts. Even if these rights are granted, policing costs could prohibit their actual implementation. Neither the Plant Patent Act nor the Plant Variety Protection Act gives producers the right to charge royalties on succeeding generations of patented plants.

The high cost of policing for proprietary rights infringement will lead to larger investments in those micro-organisms or plants that can be used within the confines of a factory and are more amenable to being kept as trade secrets than those which must be released into the environment to be used (22). Investment in organisms that are not reproductively stable will increase, eliminating the farmer as a source of competition. The ability to exclude agricultural producers from infringing on proprietary rights will be an important consideration in how new biotechnologies are packaged. For example, much

of the work on improving plant agriculture is being devoted to the development of artificial seed embryos that contain several packages of genetic material. In combination, they will create plants with more desirable attributes. But the seeds developed by the plants wil not transmit these characteristics to the next generation, requiring producers to repurchase seed embryos for each planting, as is currently the case with hybrid seeds.

Product Liability and Liability Insurance

Although liability insurance is not required for testing, manufacturing, or commercializing biotechnologically derived products, operating without insurance exposes both manufacturers and users of the technology to potential financial devastation. Biotechnology products are so new that many of the small companies that pioneered them cannot get product liability insurance. According to Bruce Mackler, of the Association of Biotechnology Companies, many firms will be forced to abandon promising new technology as a result (1). Others will have to test products without coverage and run the risk of suits for amounts larger than their total assets should a product have unintended effects. The lack of insurance for many small firms raises questions about their ability or obligation to offer compensation for unintended side effects of their operations.

Larger companies involved in agricultural biotechnology have not been affected as much because they have the size and safety record to give them clout with insurers, offer a diversified set of products across which premiums and potential claim risks can be spread, and can often afford to insure themselves, if necessary.

The dearth of product liability insurance for biotechnology firms arises from three related phenomena: how the insurance industry sets rates, uncertainty about the risks associated with biotechnology, and changes in liability concepts in the courts. Insurers' willingness to invest in a particular line of insurance such as biotechnology products is determined by comparing the profits that can be made in various lines.

Insurers are in the business of diversifying risk so that the law of averages applies. Until recently, the insurance companies' experience has been primarily with circumstances for which they have a large historical database and can easily calculate the likelihood of occurrence. Even a catastrophe to any one insured individual represents only a small portion of the total annual cash-flow of the insurer. Health insurance, automobile insurance, and property insurance are types of insurance that neatly conform to the conditions preferred by insurance companies.

Biotechnology conforms to almost none of the conditions required for insurability. The lack of experience with the technology means that the insurance industry, which is fundamentally driven by statistics, has no historical information upon which to base premiums. The lack of consensus among experts on the probable risks or adverse effects of biotechnology compounds the problems raised by lack of historical data. The most likely risk profile that does emerge gives little comfort to those who might be interested in providing insurance. Biotechnology can be characterized as a "low probability/high consequence" risk, which means that adverse events are very unlikely, but if they do occur, the effects are likely to be grave. The events are also unlikely to be isolated or independent. Instead, such events will probably affect many individuals, such as all users of a particular micro-organism, resulting in large indemnity payments in a very short period of time. In other industries with this risk profile, such as the nuclear power, space, and maritime industries, the Federal Government has augmented the coverage offered by the private insurance market by providing caps on liability or by assuming the risk of indemnities above a certain level. The Government's willingness to provide this protection has been motivated by the decision that development of these industries is vital to the national interest.

Changes in liability concepts in the courts have also affected the insurance industry's willingness to offer product liability insurance to biotechnology firms. Insurers are concerned about the proliferation of punitive damages awarded and the trend toward shared liability in cases where any maker of a product deemed hazardous may be sued when an injured party does not know which one made the actual product that caused the injury. Some companies have been held responsible for making a product even though the product met state-of-the-art standards at the time it was made (8).

These changes have made assessing risk a new game for insurers. The actuarial risk that an adverse event will occur is becoming less important. Insurers are interested in knowing what the likelihood of suit will be and the amount that has been awarded by jury or out-of-court settlements for certain types of products. What insurance executives say concerns them the most is the lack of predictability; that is, the inability to project with reasonable certainty the relations between losses and premiums paid (12).

Although biotechnology firms are not required to have product liability insurance, its unavailability to small firms will probably affect their role in the evolving biotechnology industry. Alliance with major agrichemical firms through licensing agreements may, in the short run, be the only feasible route toward protection from suit for many small agricultural biotechnology firms. However, this alliance will come with costs to the smaller firms. In return for protection from possible liability claims, major agrichemical firms are likely to require lower licensing fees or other concessions.

Regulatory Approval

Despite the major effort being made to ensure the safety of products through testing prior to regulatory approval, Government regulatory agencies do not have a clear mandate to work toward ensuring that biotechnologically derived products will actually reduce the total risk to society from agricultural production practices. The time and expense involved in conducting tests required for regulatory approval can strain the finances of smaller biotechnology firms. Extensive field testing increases the amount of investment required and the time between when the investment is made and returns are seen.

USDA, the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA) have published policy statements announcing their intentions to regulate the products of biotechnology (5). All three agencies require submission of extensive data as one condition for approval of certain types of testing and use of biotechnologically derived products. The scope of safety that must be shown by these tests varies according to the statute under which a product is regulated (10).

The developing regulatory framework will require firms to shoulder the expense of providing needed data and test results and may delay large-scale testing and marketing of products. Although the regulatory requirements are the same for all firms producing similar products, the cost of meeting these requirements has a proportionately larger claim on the resources of smaller firms. Therefore, smaller agricultural biotechnology firms may need to form alliances with larger or better capitalized firms once products reach the development phase where they require regulatory approval.

Before reaching the stage where field testing can be conducted, companies must incur two other types of costs beyond those required for product development or field testing of products that are not derived from biotechnology. One additional cost is the assembly of the paperwork and laboratory results necessary to submit to the appropriate regulatory agency for approval of the initial field test (21). The second cost is the time and other resources required to gain approval from local government bodies and citizens' groups to conduct the test at the selected site (9).

These costs may not be unduly burdensome to an adequately financed firm. But any decision to test a product must weigh both the costs and possible benefits of the undertaking. At the initial field testing stage, the benefits are unknown; the test is experimental, both with regard to the product's safety and its efficacy.

Before proving the efficacy of a new technology, the decision to proceed with field testing is strongly influenced by the relationship between costs and expected benefits. The decision can be easily influenced by regulatory requirements or delays that increase costs in relation to anticipated benefits, particularly if a firm's resources are scarce.

Existing regulatory legislation does not attempt to ensure socially beneficial uses of technology. Most legislation attempts only to ensure that products are safe, not that they are the best possible (10). Regulation of biotechnology follows that pattern. Nevertheless, policies not directly related to technology can and do affect the technologies brought onto the market, which will also be the case for biotechnology for agriculture.

Regulation of existing agricultural inputs will affect the types of biotechnologies developed for agriculture. The withdrawal of key pesticides may encourage development of specific types of pest-resistant crops. Similarly, regulation of nitrogen runoff and ground water contamination may encourage more rapid development of nitrogen-fixing soil microbes.

Such events will be unplanned within the current regulatory framework. Under current procedures, one agency, acting within its mandate, might take actions that precipitate changes in agronomic practices that would complicate the activities of another agency. For example, at the same time that USDA evaluates and approves testing of genetically engineered herbicide-resistant plants, which could lead to increased herbicide use, EPA struggles with regulating ground water contamination by some of these same herbicides.

The potential of biotechnology to provide substitutes for existing products with undesirable effects provides an opportunity to use existing regulations to shape the types of technology that will be used in agriculture. Using this opportunity, however, requires a vision of what types of production systems might be most desirable. This vision must be combined with the willingness to develop regulatory initiatives and make regulatory decisions based on minimum safety requirements and the relative risks presented by existing, new, and potential technologies.

The Effect of Biotechnology on Farming

The effect of biotechnology on farming over the next 20 years depends on the changes that the technology makes in the physical production process and the economic costs and benefits associated with the new technology. The economic costs of new biotechnologically derived agricultural inputs will be a function of the structure of the input industry and the prices that are charged for its products. Costly patent litigation, the unavailability of liability

insurance for small biotechnology firms, the cost of meeting testing requirements for regulatory approval, and the dearth of financing for small agricultural biotechnology firms will act together to shape an input industry with a fairly small number of large firms, each with significant market power.

Financing is the weak link that may rapidly reduce the number of successful small agricultural biotechnology firms. The current weak financial position of these small firms is unlikely to improve soon because of investors' concern about small firms' ability to overcome the hurdles between research and development of new products and their commercial release. Small firms' ability to gain and enforce exclusive proprietary rights over their products, the unavailability of liability insurance, and the considerable cost involved in testing new products before regulatory approval are particularly troublesome issues. Uncertainty about the defensibility of patents leads to investor uncertainty about the ability to recoup investment in small firms. The possibility of liability suits in the absence of adequate insurance leads to the specter of damage awards greater than a firm's total assets. The employees of the firm could reorganize and start anew, but their investors would be left without any return. And, the time and cost involved in meeting product testing requirements for regulatory approval increases the amount of investment required and the time between when the investment is made and returns are seen.

Because of the difficulty in generating external financing and concerns about liability, many small biotechnology firms will need to move towards joint ventures with, or absorption by, larger agricultural input firms. Although joint venture agreements may allow smaller firms to continue to engage in research and development, the larger agricultural input manufacturers are likely to be the ones bringing the finished product to market. Through these agreements, a few large firms will be the gatekeepers to the final marketplace for biotechnologically derived products for agriculture. Thus, from the farmer's perspective as the purchaser of biotechnologically derived inputs, the market will be dominated by a few large firms.

In a perfectly competitive market, producers of agricultural inputs would price inputs at the marginal cost of production. Farmers would purchase enough of the inputs so that the additional benefits gained from using the last unit purchased would exactly equal its additional cost. However, in an input market dominated by a few firms, each of which holds monopoly rights to its products, input firms are not constrained to pricing their output at its marginal cost of production. The upper limit on the price they can charge is determined by the production possibilities offered by their input and the existence and pricing of products that are, if not identical, at least close substitutes. The existence of close substitutes for the products of biotechnology will prevent

agricultural biotechnology firms from capturing all of the returns from the increased productivity that their products may offer farmers.

The price that agricultural biotechnology firms will be able to charge for their products will depend on the existence of substitutes for those products. Patent rights ensure that competing firms cannot sell identical products. However, similar, although not identical, products can be made. Biotechnologically derived products must also compete with existing inputs used in production activities. The true market power of the biotechnology firms will depend upon the extent to which these similar products may be used in the farmers' production activities. In the short run, the development of multiple similar, though not identical, biotechnologically derived agricultural products will be determined by the breadth of patent protection granted, research and development costs, the size of the market for the products, and the pricing strategies followed by producers of existing inputs for which biotechnologically derived products can substitute.

The breadth of patent production granted by current law differs among biotechnologically derived products for agriculture. For example, the Plant Patent Act allows only a very narrow product space because the patented plant need only be "distinct" from other plants. This means that very close substitutes are legal. The Plant Variety Protection Act under whose purview feed grains and other major crops fall, on the other hand, grants broader protection, requiring that the plant be a new or novel variety (19). The question of breadth of patent protection is further complicated by the fact that biotechnology firms can also patent the processes that are instrumental in developing biotechnology products for agriculture. Firms holding process patents are often willing to license or sell these patent rights. Although this enables other firms to use patented processes, the purchase of patent rights or licenses substantially increases product development costs.

Before firms invest in developing new products for agriculture, they want some assurance that they will be able to recoup their investment in research, development, testing, and marketing. Thus, agriculture biotechnology firms must consider both the cost of product development and patentability and the size of the market for their products. Competition for a share of the market for major crops will be greater than for minor crops. However, this competition will be limited by the broader scope of property rights granted under the Plant Variety Protection Act and the nature of the products themselves. With the trend toward developing seed embryos which "bundle" a set of inputs or attributes, product markets will be limited by the physical characteristics of the environment in which they will be used. In contrast to existing seed varieties, where farmers can vary complementary input use, such as fertilizer or pesticides, to meet the requirements of their own physical production system, a

seed embryo with fixed proportions of various characteristics, such as nitrogen-fixation or pest resistance, will apply to a smaller set of physical environments and, hence, sell to a smaller market segment. Thus, while several companies may engage in developing seed embryos for a major crop, such as corn, each company will probably develop a product for which it has monopoly rights for one segment of the market.

When viewed from an aggregate perspective, markets for biotechnologically derived seed embryos for corn may appear to be competitive, but from individual producers' perspectives only one supplier of a biotechnologically derived product may be able to meet their needs. Biotechnology firms' monopolistic position in any one market segment may be limited by the rapid pace of development of the new technology where product life is limited by introduction of new processes and products. As in the computer industry, this year's pathbreaking product may be obsolete next year.

Although biotechnology firms may have monopoly rights over biotechnologically derived products for a particular market segment, two additional forces will act to reduce their profits: the cost advantage that must be offered to induce farmers to change and reactive price competition from conventional input manufacturers. To induce farmers to change current practices which often have significant investment, biotechnology firms must price their products to offer significant economic advantages. A few farmers may adopt a new input for only a small economic advantage, but others will wait. Thus, biotechnology firms may seek to increase total profits by lowering their prices and expanding their sales volume. The prices charged by biotechnology firms may also be driven lower by reaction from the manufacturers of conventional agricultural inputs. To maintain their market share, input firms producing chemicals and fertilizers, service industries such as aerial sprayers, and used machinery and equipment dealers may drop their prices. Biotechnology firms would then face a lower price for substitute products that they must compete with to capture a share of the market.

Biotechnology firms' pricing strategies in individual markets may also be indirectly affected by competition among commodities in the total market for agricultural products. Lowering production costs and, thus, the cost of agricultural commodities increases the demand for those commodities. This increases the demand for inputs into agricultural production, including the new technology. Even though individual biotechnology firms may focus on products for a specific commodity, all agricultural producers compete for agricultural products. The success of a biotechnology firm is, thus, indirectly tied to the success of the farm market niche it has established. Lowering the cost of production for farmers in a firm's market niche will expand their share of the market for agricultural commodities at the expense of other farmers and increase the biotechnology firm's market in the process.

Biotechnology will probably change the proportion of farmers' input expenditures going to individual purchased inputs. The major shift in crop production budgets is expected to be from chemical inputs to seed, where the seed embryos contain biopesticides or nitrogen-fixing micro-organisms. The major agrichemical firms have foreseen this trend and have reportedly invested over $10 billion in the purchase of seed companies over the past decade (2). This shift toward a group of inputs "bundled" into seed embryos will give producers less flexibility to change the proportions of inputs they use in response to attributes of their own physical production system or changes in the relative prices of different inputs.

The manufacturer of a pest-resistant alfalfa seed embryo, for example, can charge farmers what they would have paid for the traditional input "bundle" of alfalfa seed, pesticides, and the labor and machinery complement needed to apply the pesticides. Such a seed already is being developed. The developer estimates that it can sell its alfalfa seed to the farmer at $12.30 per pound, a premium of $10 per pound over the cost of ordinary alfalfa seed. According to the input firm, the farmer will still realize some cost savings. The seed manufacturer will make an 88-percent gross margin on the sale of the genetically engineered alfalfa seed, nearly double the 46-percent gross margin on the sale of ordinary alfalfa seed (2).

How biotechnology will affect the distribution of returns among agricultural producers is unclear. The effect of bovine growth hormone (bGH) has been extensively examined, but predictions about its effect on the structure of the dairy industry depend on assumptions made about the technology's effect on the input/output relationships in dairying. These effects remain uncertain. An Office of Technology Assessment (OTA) evaluation assumed that the introduction of bGH would increase milk production 25.6 percent and dramatically accelerate the trend towards fewer, larger dairy farms (23). In contrast, another study assumed that introducing bGH would result in an annual increase in milk production of 1,800 pounds per cow (3). The study concluded that although the concentration trend in the dairy industry would continue, its rate would not dramatically increase. Thus, the assumption of a percentage versus an absolute amount of increase in production due to the introduction of bGH led to different conclusions about the technology's effect on the dairy industry. Estimating potential effects of other types of biotechnology products on farming will also be hampered by uncertainty about their exact effects on the input/output relationships in agriculture.

Biotechnology's primary shortrun effect could be to reduce the adverse side effects stemming from the agricultural production process. For example, biotechnology could be used to develop production systems that have less nitrogen runoff and yield products with fewer pesticide residues. But, before

this glowing future can be claimed, numerous questions about possible risks from using biotechnology must be answered. Those concerned about possible adverse effects of biotechnology have argued that equating "natural" with "harmless" makes no more sense than equating "artificial" with "harmful" (21).

The debate over the safety of biotechnology will take time and experience to resolve. But biotechnology's potential to reduce the negative environmental and health effects of existing patterns of input use should not be ignored. Development of biotechnologically derived products that substitute for existing inputs can be fostered by targeted research grants or regulations to shape research priorities of private firms.

Exploiting biotechnology's potential benefits will require a broader approach to evaluating and regulating agricultural inputs. Anticipating developments in technology and weighing their relative risks, costs, and benefits will be necessary. As such products are developed, the benefits of the new technology will accrue both to agricultural producers and to society as a whole.

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Chapter 21

Agricultural Policy and Rural Development

J. Norman Reid*

Farm programs ineffectively address most rural economic problems. Nonetheless, farm programs have dominated Federal policy for rural areas, although farming has become less important in the economies of most rural areas. Manufacturing, mining, and service industries account for more rural employment and income than farming. Future policy decisions should be based on strengthening all rural economic sectors, not just farming.

During the 1980's, the rural economy performed poorly, after showing so much promise in the preceding decade.[1] In the early 1980's, rural areas shared in the Nation's most severe economic recession since the Great Depression. The recession bottomed out in 1982, but rural areas have not participated fully in the vigorous and sustained recovery that has stimulated rapid urban employment growth and brought national unemployment rates to their lowest level in over a decade. Nonmetro employment growth has been only 45 percent of metro growth since 1979. The nonmetro unemployment rate of 6.9 percent in 1988 remained nearly 2 percentage points above the metro level. This poor economic performance has led hundreds of thousands of rural residents to leave their communities to seek jobs in metro areas.

Widespread rural economic problems came at roughly the same time as the financial crisis in the farm sector. However, despite the coincidence in timing, the rural economic problems of the 1980's do not stem primarily from the farm sector problems. Most rural residents do not depend principally on farming income, and most rural employment is in other industries. Instead, poor performance of other important rural industries, such as mining, manufacturing, and producer services, is responsible for the recent sluggishness in rural job creation.

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[1]Throughout this chapter, the terms "rural" and "nonmetro" are used interchangeably.

Federal policies toward rural areas have not given a balanced treatment to rural conditions. Spending has focused mainly on the farm sector. Once dominant, that sector has declined in importance in most rural areas during recent decades. Federal policies have overlooked the problems of other rural sectors and workers, for the most part. This chapter addresses the role of the farm sector in rural economies and the role of Federal policies in addressing the problems of those economies.

Income transfers through farm programs benefit participating farmers, some closely linked businesses, and even some local farming-dependent economies. However, farm programs are not designed to address the broad economic adjustment problems facing rural areas. Even in farming-dependent counties, farm programs probably do little to promote long-term job-generating economic development.

What Is Rural?

The misperceptions about agriculture's current role stem partly from confusion about the term "rural." Among many definitions, none is commonly accepted. The Census Bureau defines rural as areas outside of places with populations of 2,500 or more. The difficulty of obtaining statistics makes this definition unhelpful, however. The Swiss cheese-like nature of this definition complicates Government agencies' ability to administer programs as well.

A more practical definition defines rural as "nonmetro America." Metropolitan Statistical Areas (MSA's) are often used for statistical analyses and for many public programs. MSA's are groups of contiguous counties with a population center of 50,000 or more and that are economically and socially linked by significant levels of commuting. The rest of the United States is nonmetro. Of the 3,100 U.S. counties, about 2,400 are nonmetro.

Nonmetro counties vary considerably. At one extreme are areas in the West and Great Plains with wide-open spaces, low population densities, and few settlements of significant size. The Midwest and South have nonmetro counties with much land in agriculture and timber but shorter distances between neighboring communities and higher rural population densities. At the other extreme are nonmetro areas with large towns and small cities containing almost 50,000 persons. These areas are found in every region, but they are most common in the eastern United States.

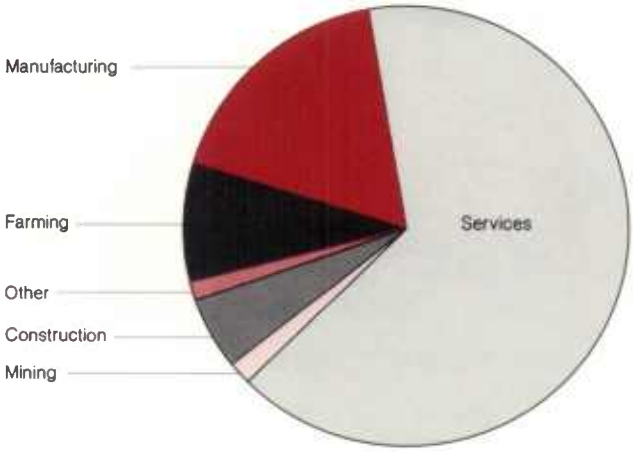
The rural economic base is similarly diverse. One may typically think of rural areas as principally agricultural, but other industries—especially manufacturing, mining, and government—are more significant in most nonmetro counties. Services industries make up 65 percent of the national

employment base and are the leading source of nonmetro employment growth, even in areas highly dependent on farming (fig. 1). Manufacturing, about 17 percent of the nonmetro employment base, is the second largest industry. Farming accounts for less than 10 percent, down 5 percentage points since 1969.

The importance of industries varies among regions. Some counties depend heavily on farming as a source of income (fig. 2). These counties are mainly located in the Midwest, especially the Great Plains, with lesser concentrations in the Mississippi River Delta, the Southeast, and the Northwest. Farming is a part of most rural county economies, but it is the predominant industry in fewer than 25 percent. Elsewhere, other industries surpass farming in economic importance. About 700 nonmetro counties, concentrated in the Eastern United States, rely chiefly on manufacturing. Still others depend on mining and oil production or large public institutions such as universities, parks, and military bases.

Our usual images of rural America are much narrower than the reality. Many people think all rural America resembles midwestern farming country. But despite its lack of intuitive appeal, the nonmetro definition makes much sense for economic development policymaking. In fact, the economic links between

Figure 1
Nonmetro employment by industry, 1987



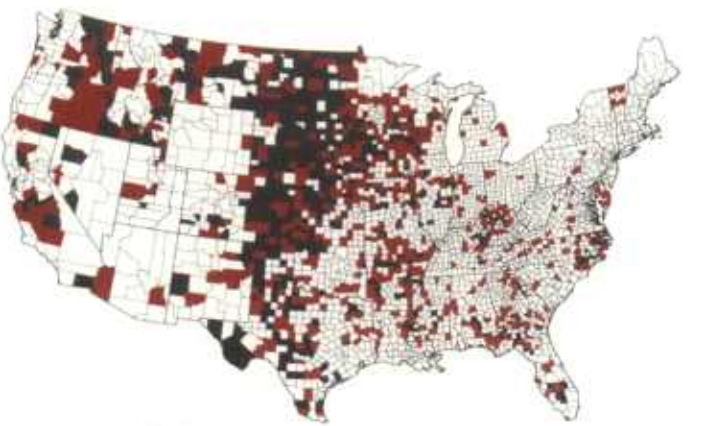
rural towns and the surrounding countryside require development policies that address both if they are to be effective and practical to administer.

The Rural Economy in the 1980's

Several trends converged to produce severe economic conditions in rural America during the 1980's. In 18 States, the 1986 level of employment in nonmetro areas was below the 1979 level. Manufacturing, a major source of rural employment growth in the 1970's, was hard hit by the severe recession of the early 1980's. Manufacturing employment has rebounded very slowly from those depressed conditions and in many areas has not recovered to prerecession levels. Mining, oil, and timber industries, which follow boom and bust cycles, faced low prices that produced major employment losses in areas depending on these industries. The services sector, the leading source of job growth both nationally and in nonmetro areas, performed much worse in nonmetro areas than in metro areas in the 1980's. The fastest growing services industries—innovative, production-oriented services—tend to shun rural locations for cities. Slowdowns in other basic sectors also reduced demand for consumer-oriented services (8).[2]

[2]Underscored numbers in parentheses identify literature listed in the References at the end of this chapter.

Figure 2
Local dependence on farming, 1980-84



The farm financial problem occurred at roughly the same time as other rural problems, partly in response to unfavorable international trade conditions, especially the high value of the dollar, that also adversely affected other rural industries. In some areas, especially the Midwest, farm problems exacerbated problems in rural manufacturing and services industries. However, although the farm problem received the bulk of public attention and spending, it is neither the sole nor necessarily the most significant rural problem in terms of the number of workers and communities affected.

Rural economic problems are geographically widespread, affecting much broader areas than those that depend principally on farming. Much of nonmetro America lost population in the early 1980's, reversing the growth trends of the 1970's. By 1986-87, over half a million more people a year were leaving rural areas than moving in. Population losses hit farming counties especially hard, but 54 percent of nonmetro counties are growing more slowly than the U.S. average or losing population, and many rural counties now face a net loss of residents through migration (fig. 3) (2).

Unemployment and underemployment are also widespread in nonmetro America. In 1987, about 30 percent of nonmetro counties had unemployment rates exceeding 9 percent, almost 50 percent above the national unemployment rate of 6.2 percent. Underemployment—working less than desired or not earning sufficient wages—affects nearly three times as many rural workers as unemployment. Underemployment cost rural workers about $31 billion in lost wages during 1986, more than twice the amount of wages lost by unemployed rural workers in that year (14).[3]

Farming-dependent counties appear among the highly stressed nonmetro counties, but they are not alone. Farming-dependent counties continue to lose population because they have few nonfarm job alternatives. The long-term decline in the number of farms and farmworkers will probably not be reversed. Thus, persons living in isolated farming-dependent counties often must migrate to distant towns and cities to find work. However, population and employment losses are also serious in other counties. Many of these counties were growing in the 1970's, unlike most farm-dependent counties. For them, the 1980's decline provided a major shock to their economies by sending entirely new signals about future economic prospects.

[3]Underemployment results from several causes: part-time workers who desire but cannot find full-time jobs; persons working in jobs that pay less than occupations their educations qualify them for; the unemployed who have become discouraged and stopped looking for work; and persons working full-time, but at wages that provide less than a poverty-level income (14).

The rural economic slowdown of the 1980's reflects fundamental weaknesses in the rural economy: a long-term decline in the relative importance of resource industries as employers, the pressures of technology and foreign competition on employment in low-wage rural manufacturing industries, the endemic liabilities of small population concentrations and distance from major urban centers, and chronic weaknesses in the rural labor force due to lower educations and poorer skills. Unique circumstances created the rural prosperity of the 1970's. The period of industrial decentralization that saw thousands of manufacturing plants move to low-cost rural sites ended in the 1970's. Pacific Rim nations have increased their industrial capacity and have become even more attractive as low-cost environments. American urban areas are increasingly perceived as more attractive living and working environments than they were in the 1960's and early 1970's. Thus, rural areas have now resumed their historic struggle to maintain an acceptable quality of life against difficult odds.

Bright Spots in the Rural Economy

The rural economic picture in the 1980's is not totally gloomy. Retirement and recreation areas continued to experience population and job growth during the recession and recovery, although more slowly than in the 1970's. Passive income sources, especially income transfers such as social security, have

Figure 3
Nonmetro counties with population decline, 1983-87

Source: Bureau of the Census.

become very important to individuals, providing urban and rural residents the flexibility to seek second homes or retirement in attractive rural settings and buffering the effects of slowdowns in other industries. Rural counties within commuting range of large metro areas performed better economically than outlying counties, as effects of expanding metro economies spilled over into surrounding rural areas.

In each of these cases, however, relative economic success runs counter to the overall rural trend of the 1980's. These successful rural areas are doing well because their locations, near large cities or in natural settings that are scenic and offer recreational possibilities, are attractive to outside populations. That success does not offset the basic difficulties other rural areas face. The fundamental fact about the rural economy in the 1980's remains its vulnerability to competition, economic shocks, and the continual process of national economic modernization.

Agriculture's Role In the Rural Economy

Agriculture remains highly important to both the rural and national economies. By one estimate, the food and fiber system, including farming and farm input and food processing industries, employed 17 percent of all U.S. workers and contributed 16 percent of the gross national product (GNP) in 1987 (12). However, farming contributed only 1 percent of GNP and less than 2 percent of employment.

In nonmetro areas, the food and fiber system makes up a larger share of the economy than in metro areas (6). But farming is not synonymous with the rural economy. Most rural land remains in farms, but the rural economic base has greatly diversified, and farming accounts for only 9 percent of nonmetro employment.

Agriculture's role has diminished significantly in recent years. Since the mid-1970's, the food and fiber system's share of GNP has declined from 20.4 percent to 15.6 percent. As new industries have sprung up, the food and fiber industry's importance as an employer has continued to shrink, falling from 21.5 percent in 1975 to 16.7 percent in 1987. Farming as a share of national employment dropped from 3.2 percent in 1975 to 1.6 percent in 1987.

The share of the U.S. population living on farms has also declined dramatically. By 1987, only 2 percent of the U.S. population lived on farms (13).

Continuing technological advances point to further declines in the number of farms and farmworkers over the next several decades, even as farm production continues to grow. Between 1977 and 1987, labor productivity in the farm

sector grew by 42 percent, exceeding the growth in demand for agricultural products (10, 11). Productivity growth will probably not slacken in coming years.

These changes have brought about a gradual shift in the structure of the farm economy. The trend is toward a farm sector of extremes, with both large and small farms but fewer "family-sized" operations in the middle. Net cash farm income reached record levels in 1986 and 1987, but it is shared by fewer persons and is distributed more unevenly now than ever (10). In those years, record incomes came at the expense of record Government payments, over $12 billion in 1987 alone.

Agriculture remains dominant in some highly concentrated areas, but these areas are declining in number. The number of nonmetro counties with 20 percent or more of earned income from farming fell sharply from about 2,000 in the early 1950's to 700 in the late 1970's and to fewer than 500 by 1986 (1). Earned farm income is most important in counties whose farming structure is oriented toward large farms, where it contributes 21 percent of the total. Among counties where most farms are small in scale, earned farm income contributed only 4 percent of the total. Small-farm counties are concentrated in the South, the East, and in parts of the West. In those counties, services (29 percent) and manufacturing (24 percent) contribute much more to total income than farming (4 percent). In large-farm counties, mainly in the Great Plains and Corn Belt, services industries contribute more (31 percent) income than farming (21 percent) and manufacturing is a significant share of the total (15 percent) (4).

In other rural areas, different industries overshadow agriculture in economic importance, even though farming and forestry are often the predominant uses of land and may be the most visible forms of economic activity. In 1979, nonmetro counties that depended on manufacturing and those that depended on farming were about equal in number. But the manufacturing counties contained 39 percent of the nonmetro population in 1980, while farm counties contained only 13 percent.

Even within counties that are highly farm dependent, agriculture's role is easily overstated. Nonfarm industries are increasingly necessary to sustaining life on the farm, and most farm families rely on off-farm employment to supplement their farm incomes. In 1986, 60 percent of all farm households had income from some nonfarm job or business, and 60 percent of farm household income came from nonfarm sources. Even in farming-dependent counties, most farm households derived some income from nonfarm jobs. That nonfarm income averaged more than 30 percent of the total income for those farm households (1).

Farming's importance to farm families is also shifting. In much of nonmetro America, farming is increasingly a lifestyle choice that must be sustained by work off the farm.

Farm Policy as Rural Policy

Rural policy must evolve separately from farm policy now that farming has become less important to the rural economy. Several facts bear on that conclusion. First, the rural economy depends on a variety of industries, not just farming, as sources of jobs and incomes for rural citizens. Second, the rural economy's structure is continuing to change. Third, labor productivity growth and increased competition in the international marketplace are reducing the demand for labor in traditionally important rural industries, including farming. Finally, at the same time that change challenges old industries, it creates opportunities in other industries.

The challenge for the rural economy is not necessarily to preserve its existing industries in their current economic roles. The essence of a competitive free market economy is its openness to change that leads to improved efficiencies and expanded output. Change not only disrupts familiar relationships, but it also opens up new opportunities for profitable economic activity. If rural areas are to thrive in the changing economy, they must take advantage of these new opportunities. The overall economic future of rural America may depend less on the performance of any single industry than on the ability of rural areas to successfully shift both human and financial resources from slower growing industries to those with greater promise. In a time of significant change, the most effective policies will probably be those that promote successful economic adjustments. For example, worker training could ease the shifting of human and capital resources among industries and areas.

Single-sector policies tend to inhibit, rather than encourage, economic flexibility. Such policies encourage increased output in a sector by subsidizing various factors of production or by guaranteeing output prices. Those policies discourage transferring labor, land, or capital to more efficient uses in other sectors. As a result, sectoral policies tend to be protectionist, freezing economic resources in their current uses and inhibiting them from moving to others. Most rural U.S. economies need to adjust to changed economic conditions. Any sectoral policy, such as farm policy, has little chance of aiding that transition by itself.

Since the 1930's, farm programs have been the predominant Federal policy response to rural problems. But as rural economies changed, farm programs have become less relevant to rural economic problems. Farm programs

generally support only the farming component of the local economic structure and do little to ease economic adjustments. Federal programs (such as business development loans and planning grants) that emphasized other sectors were largely cut in the early 1980's, while farm program outlays increased. As a result of several factors, the mix of Federal programs going into rural areas does not favor the development of independent, innovative, adaptable economic activity. The current mix of Federal programs includes relatively little investment in worker skills and local infrastructure, a pattern of Federal investments that tends to perpetuate rural dependency on external investments and income transfers (9).

In 1985, nonmetro areas received 22 percent less in Federal funds per resident than metro areas received. Farming-dependent counties received more per resident than the nonmetro average, but still well below the U.S. average. Manufacturing-dependent counties, mining-dependent counties, and the approximately 200 nonmetro counties characterized by persistently high levels of poverty—arguably the neediest class of rural counties—all received at least 10 percent less than the nonmetro average.

Nonmetro areas rely much more on income redistribution programs, including farm programs, than metro areas. They are less likely than metro areas to participate in procurement and other programs that may lead to enhanced productive capacity (9). Thus, the pattern of Federal funding does little to address the underlying fragility of nonmetro economies, which depend heavily on outside economic forces and institutions.

Although the emphasis of most farm policies is not on easing economic adjustment in the sector, several programs, including some authorized by the Food Security Act of 1985, do help farmers adjust to economic changes. The Conservation Reserve Program provides financial inducements to farmers to withhold marginal lands from production. While intended as an environmental protection measure, the CRP also has the effect of reducing the land in production, thus easing somewhat the recent downward pressure on farm prices due to an oversupply of commodities (5). The whole-herd dairy buyout program provides an opportunity to trim the dairy industry by paying producers for their livestock. Cooperative Extension Service programs provide financial and personal counseling to financially pressured farmers and farm families facing a decision of whether or not to leave farming.

Other programs also provide adjustment assistance to rural workers, but farmers are often ineligible for them. The Job Training Partnership Act provides counseling and retraining for displaced workers, and many States operate special programs for displaced farmers (7). However, farmers usually do not qualify for some social safety net programs, such as unemployment compensation, that are available to other workers, and they are sometimes

excluded from others, such as Aid to Families with Dependent Children and housing assistance payments, because of their relatively high asset levels.

Farm programs have helped develop the productivity of farming, yielding expanded outputs and higher profitability for some farmers. And in some farming-dependent counties, the flow of farm program dollars makes up an important source of demand within the local economy. But in most nonmetro counties, the economic role of farming is now so limited that no set of farm policies will contribute much to developing the overall local economy. Even in those farm-dependent counties that receive high levels of farm payments, current Federal programs do little to reduce the economy's dependence on a sector declining in ability to generate jobs—agriculture—by developing alternatives for farmers and their families.

Toward a New View of Farm and Rural Policy

Forecasting economic conditions accurately is not easy. Still, contemporary events provide some useful guidance for developing rural policies. Regardless of what happens to worldwide demand and supply conditions for farm commodities, technological advances in agriculture will probably continue to increase labor productivity in the sector, further reducing employment requirements in the farm sector. Technological and market changes will also transform production in other industries important to rural America, such as textile manufacturing, though in ways that are less foreseeable. In both farm and nonfarm sectors, future competitiveness will depend on how well rural people and rural industries can adjust to these altered conditions.

In response to fundamental changes in the rural economy, a need exists to rethink farm and rural policy objectives. The rural economy is having difficulty creating enough new employment to keep its workforce from migrating and to prevent further widening of the urban-rural spread in family incomes. Farm programs are unlikely to help much in resolving fundamental rural development problems. To provide better balance among policies for rural areas, much more attention should be given to the issues that concern the 91 percent of the rural workforce that is employed in nonfarm industries.

A less narrowly conceived approach to rural policy would also benefit those rural residents who, for both economic and lifestyle reasons, choose to remain in farming. The interests of farmers and their families are not limited to events on the farm. Overall well-being is greatly affected by the quality of life in rural communities and the vitality of local economies. A strong nonfarm economy will assist communities to retain those services vital to farming. Thus, farmers and farm families would be better served by a broader perspective on farm and rural policies.

Because farming is deeply associated with the quality of life, both real and perceived, of persons who live in rural America, farm policy decisions will continue to affect, though not dominate, local economies and farm and nonfarm residents alike. Although a new farm policy perspective could yield outcomes that are better balanced for rural America as a whole, one should not assume farm policy is the proper vehicle to address all rural needs. Attempts to use farm policy to cure all the ills in the rural economy would probably lead to bad farm policy and bad rural policy alike. More appropriate would be an effort to balance farm policy concerns with other policies that address rural issues.

Reconsidering farm and rural policies will require rethinking the proper goals of these programs. Among the issues that should be considered are the following.

The Functions of Farms in the Rural Economy

Over the years, farm policies have led to improved efficiency in the farm sector, in part by encouraging larger scale farming operations. Farm policies produced expanded stocks of commodities and lowered consumer prices, but they also reduced demand for farm labor that led to widespread population losses from farming communities. Outmigration of rural residents continues in most farm-dependent areas of the country. In some areas, these losses threaten the very existence of those communities. Thus, the goal of improving the efficiency of the farm sector has been achieved by trading off community size and economic health.

The frequent expressions of popular concern about the future of "family-sized" farms and rural population losses suggest that farms have other values besides serving as units of production. Some of these values are symbolic and social, and others relate to economic functions. In many rural areas, these values provide the structure around which rural community life is organized.

These values are also a part of what urban residents expect to see in rural areas when they visit or relocate there. As such, farms are important beyond their value as producers of goods. Farms are part of the scenic landscape that defines what is rural to visitors and prospective new residents who are a major source of economic development in many rural communities.

Farm programs have not proven successful at addressing these other values of farms. Programs that seek to regulate production levels and commodity prices do little to promote other goals for farms, even though these other goals may be equally valid. Thus, a more balanced treatment of farming needs to look to other policies to address farm goals that are not production-oriented.

Farm Policy and the Needs of Farm Households

Farm policy is properly concerned with farms as businesses. As such, farm policy has been concerned with the balance sheet and income statement of farm enterprises, through regulation of factors affecting the scale of production, the cost of farm inputs, and the level of prices received for goods produced.

The income position of farm families has historically been aided by assisting the farm enterprise; what was good for the farm was good for the farm family. Since World War II, however, there has been growing differentiation between the farm as enterprise and the farm as household. Farm family well-being depends more and more on off-farm income sources. Farm policy was never a very good means to address the broad range of rural policy concerns. Increasingly, farm policy is also inadequate for the needs of farm families. An altered balance between farm and nonfarm policies would better address the needs of farm families and other rural residents.

Farm Policy and the Rural Environment

A final concern is the relationship between farming and the quality of the rural environment, including its aesthetic features. Throughout American history, rural areas have been treated as limitless storehouses of natural riches. Now, however, we are beginning to find the limits to those resources. Growing concerns are expressed about farming practices that yield high levels of crop production at the cost of damaging the natural resource base. The future prosperity of some rural areas, especially those chiefly employed in farming, will be affected by how well we care for that natural resource base. A different balance between the need to produce agricultural commodities and the need to protect the environment may be warranted.

Concern about the environment is not limited to the quality of rural water, the protection of its soil, and the wise use of other natural resources. The appearance of rural places is increasingly viewed as a resource that merits the same protection and wise use. In the 1970's and 1980's, rural places that were attractive as sites for recreation or as residences for retirees, commuters, and workers in highly mobile industries showed the best growth record. Tourists and new residents are often drawn by the rural charm of the areas they choose. In many rural areas, that charm is due to the farm character of the landscape. Sustaining tourism and retirement growth may thus be enhanced by programs that help retain farming activity on a scale that is too small to contribute much to the Nation's food and fiber needs. In particular, as natural resource production becomes less important in supporting rural economies, the need

to preserve and enhance rural areas' aesthetic qualities becomes more important.

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Chapter 22

Agriculture's Effects on Water Quality

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U.S. agricultural production affects both onfarm and off-farm water resources. Surface waters (lakes, streams, and estuaries) and ground water supplies are subject to nonpoint-source contamination from residuals of chemicals used in farming. This contamination is difficult to measure, and its economic costs are difficult to estimate. Current environmental legislation responds to public concerns about protection of human health and the environment rather than farm policy. Federal policies stress voluntary compliance by farmers rather than strict regulation to prevent such pollution and protect water quality.

Rachel Carson's *Silent Spring* warned of the dangers of unrestricted pesticide use in the early 1960's (1).[1] In recent years, the issue of environmental contamination from agricultural chemicals and farmland runoff has received renewed attention. The Water Quality Act of 1987 was the first legislation to emphasize the control of agricultural nonpoint-source pollution, that is pollution for which no single source is easily identified (12). Numerous bills have been introduced in Congress to address the issue of ground water contamination from agricultural insecticides, herbicides, and nitrates. The U.S. Environmental Protection Agency (EPA) and USDA have issued major policy statements on protecting ground water and surface water supplies from agricultural contamination. The implications of these policy changes have yet to be fully determined, but U.S. agriculture can be expected to substantially change production practices as input choices, tillage practices, and chemical use patterns are restricted or controlled.

This chapter presents an overview of the scope, extent, and economic implications of the water quality problems related to agricultural production and the relationships between environmental policies and the agricultural sector. The chapter also discusses options for controlling the adverse effects

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[1]Underscored numbers in parentheses identify literature cited in the References at the end of this chapter.

agriculture can have on water quality and some of the pertinent issues that will determine the best choice of environmental policies to control and reduce this type of pollution.

Scope of Contamination from Agricultural Chemicals and Runoff

Agriculture generates byproducts that can affect the environment. The primary problem is contamination of surface water and ground water by agricultural chemicals or soil particles from leaching, rainwater runoff, or soil erosion. The presence of pesticides, herbicides, and other agricultural chemicals in ground and surface water exposes humans to potentially harmful substances in their drinking water. Pesticides can also damage commercial and recreational freshwater and marine fisheries. Runoff from rain and melting snow can detach soil particles from cropland and move them into streams and rivers. The sediment then can cloud the water and silt up lake beds and river channels, harming aquatic vegetation and disrupting the food chain. Sediment carrying attached nitrogen, phosphorus, and pesticides from cropland to surface water by soil erosion also contributes to nutrient enrichment (promoting algae blooms) and contamination from toxic chemicals.

Ground Water Contamination

Until relatively recently, little was known about the extent of ground water contamination from agricultural chemicals (pesticides and nutrients) and other sources, despite the documented and suspected risks to human health from contaminated drinking water. However, discoveries of contaminated ground water in the late 1970's and early 1980's dispelled the commonly held view that ground water was protected from chemical contamination by chemical degradation and impervious layers of rock, soil, and clay. By 1985, 17 pesticides had been detected in ground water in 23 States (14). A similar incidence of nitrate contamination has also been found.

Ground water is a difficult resource management issue. First, information about the quality of the resource is inadequate. No consistent and comprehensive database on the quality of U.S. ground water supplies is available. EPA is surveying private and public wells for pesticide and nitrate contamination, but full results will not be available until 1990 at the earliest. This lack of information makes either the extent of the human exposure to hazardous chemicals or the relationship between human activities (particularly agricultural practices) and ground water contamination difficult to assess. In

addition, once the ground water contamination has been identified, continued monitoring is expensive and time consuming.

Cleaning up ground water once it's contaminated is difficult or impossible. Ground water moves very slowly through an aquifer. Once nitrates or pesticides enter the water supplies, they will contaminate a given area for years. Leached chemicals may also take several years to reach the water supply. Thus, current contamination may be the consequence of farming activity undertaken decades ago. Any action taken today may not affect water supplies for many years. Treating contaminated water at the wellhead or providing alternative drinking water supplies are options for areas subject to ground water contamination, but both are very costly.

Although the problems of detection and monitoring are difficult, the costs of ground water contamination by agricultural chemicals are potentially great. The primary concern is human exposure to potentially harmful chemicals in drinking water, although contaminated ground water may affect agricultural users (toxicity to farm animals, for example) and may eventually affect surface water quality at the outflow of the aquifer. Ground water contamination may also arise from other sources, including nonagricultural use of pesticides and fertilizers, mosquito abatement, and leaking underground storage tanks. The extent of potential exposure is quite broad; over 117 million people rely on ground water for drinking water in the United States. Over 97 percent of rural Americans rely on ground water as a primary source of drinking water (6). The absence of a clear relationship between exposure to contaminants and subsequent health effects makes understanding the potential for exposure to agricultural chemicals in drinking water important.

A recent study estimated the extent and some of the costs associated with ground water contamination by nitrates and pesticides in the United States (6). The study described over 3,000 counties in the continental United States according to one or more of the following criteria:

- High vulnerability to ground water contamination (as measured by an EPA assessment process),
- High pesticide loss rates from cropland, and
- High nitrate levels in drinking water wells.

By these criteria, over 1,100 counties, more than 30 percent of the counties in the lower 48 States, had ground water supplies that were potentially contaminated by pesticides. Similarly, 623 counties had a potential for the presence of nitrate or nitrogen in ground water from agricultural fertilizer applications. All together, about 1,400 counties (about 46 percent of all U.S.

counties) showed the potential for ground water contamination from pesticides or fertilizer use. This study estimates that, in areas with the potential for ground water contamination, 19 million people drink water from private wells and 34.5 million people drink from public wells.

Some regional trends are also evident. Nitrates and pesticides together were sources of potential contamination in the Corn Belt and the Chesapeake Bay area. Nitrates alone were a problem in the Great Plains and California. Pesticides alone were potential contaminants along the Middle and South Atlantic seaboard.

Using data from the USDA's 1982 Natural Resources Inventory and other data sources, another study calculated measures of ground water vulnerability to contamination for over 620,000 sample points in the lower 48 States (5). The study estimated that nearly 25 percent of U.S. cropland is potentially vulnerable to ground water contamination from agricultural chemicals. The study also found that the regions with the greatest potential contamination problems were the Southeast, Appalachia, and Delta States.

Surface Water Contamination

Agricultural nonpoint-source pollution is a major problem for many of America's surface water systems. Like poliution of ground water, the off-farm effects of agricultural production on surface water present a difficult problem in resource management.

When runoff from cropland reaches lakes, streams, and estuaries, residues from nutrient applications, sediments, and pesticides can contribute to water quality problems. Nutrients, particularly nitrogen and phosphorus, promote algae growth and premature aging of lakes, streams, and estuaries (a process called eutrophication). Dissolved sediment harms aquatic life by reducing sunlight, smothering spawning grounds, and choking fish. Pesticide residues that reach surface water systems also harm freshwater and marine organisms.

Freshwater Systems

To assess the extent of agricultural nonpoint-source pollution in America's streams and lakes, a study calculated the degree to which agricultural runoff contributed to delivery of nutrients and sediments to freshwater systems (2). Of 99 watersheds examined in this study, 48 had excessive levels of nutrients or sediment. The study found agriculture to be a "significant source" (defined as contributing more than 50 percent of pollutant discharge) of nitrogen in nine watersheds. Agricultural sources of sediment were significant in 34

watersheds, and 31 watersheds had significant agricultural discharge of phosphorus.

These figures are only general indicators of pollution problems in a given region. A high proportion of total pollutants from agricultural activity in a given watershed does not necessarily have a corresponding effect on ambient water quality. Rather than focusing on total amounts of nutrients and sediments discharged into lakes and streams, measuring the extent to which reducing agricultural nonpoint-source pollution changes the concentrations of pollutants is more appropriate.

This study analyzed the extent to which reducing soil erosion would change concentrations of sediments and nutrients in lakes and streams. The study used the concept of threshold analysis. If controlling soil erosion dropped pollutant concentrations below threshold levels in a given watershed, then water users should see noticeably improved water quality. The study found that concentrations of pollutants would drop below threshold levels in 22 of the 68 watersheds with excessive levels of at least one pollutant if soil erosion were reduced 100 percent. If erosion were reduced 50 percent, concentrations would diminish below threshold levels in only 10 watersheds.

Marine and Coastal Systems

Agricultural pollution is also a problem in America's coastal waters. Water quality issues in coastal and marine waters are somewhat different from those of freshwater systems. In particular, nitrogen is a more important pollutant in marine and estuarine waters. Total nitrogen levels rather than phosphorus determine the rate of algae growth in marine or estuarine systems.

Although all coastal waters are subject to some form of pollution from human activity, estuaries are of primary concern because of their critical role in the ecosystem. An estuary is a semienclosed body of water where fresh water from rivers and streams mixes with marine salt water. For most types of water pollution, especially for chronic conditions like excessive levels of nutrients and high concentrations of pesticides and other farm chemicals, the most significant coastal effects are usually found in estuaries and bays. Estuaries serve as "pollutant sinks," where pollutants persist in water and sediment and are not completely flushed by water currents. Out in the open ocean, unlike in estuaries, wind and currents serve to dissipate most pollutants.

Estuaries serve several diverse biological and ecological functions. They provide nursery areas for many important recreational and commercial fish stocks; at least 65 percent of the commercial fish stocks harvested in the United States depend on estuarine waters at some point in their life cycles. Estuaries provide habitat for a wide variety of wildlife. Finally, estuaries

provide swimming, fishing, hunting, and other recreation opportunities, often near urban population centers.

Agricultural runoff and soil erosion from cropland are only one source of coastal water pollution. Others include urban runoff, municipal waste treatment plants, and industrial discharges. A recent study identified the scope and significance of agricultural contributions to coastal water pollution (3).

This study obtained data on quantities (loadings) of surface water pollutants from both point and nonpoint sources in 23 coastal States and 78 estuarine systems. The study examined data on coastal land use, agricultural activity, and pollutant loadings from point and nonpoint sources by estuarine drainage area, defined as the upland area that drains into a given estuary. Among the specific pollutants the study identified were nutrients (nitrogen and phosphorus), sediment, and agricultural pesticides. For the 78 estuarine systems considered, agricultural runoff supplied 24 percent of total nutrient loadings and 40 percent of total sediment, on average.

The study further analyzed the data to identify those estuarine systems where agricultural sources accounted for major proportions of total pollution. Agriculture contributed more than 25 percent of total nutrients in 22 of the 78 estuaries. High rates of pesticide losses to surface waters were found in 21 systems. Fifteen estuarine systems showed both significant agricultural nutrients and high pesticide losses.

The Economic Costs of Contamination

Contamination of water supplies from agricultural residuals has extensive environmental consequences. The wide variety of effects, from increasing costs of water treatment in municipal treatment plants to sublethal toxic effects on marine fisheries, makes the valuation of these effects difficult. Inadequate knowledge of the relationships between activities (fertilizer use, cropping practices) and outcomes (elevated contamination levels) and an inability to place economic values on environmental effects, especially where living resources (both human and nonhuman) are involved, further complicates such evaluation.

Three principal costs of ground water contamination can be identified:

- Human health costs—the costs of impaired or endangered human health, either lethal or sublethal, from exposure to pesticides and nitrates in ground water,

- Informational costs—the costs necessary to monitor ground water for pesticide or nitrate contamination, either as an initial screening procedure or on a continuing basis to assist consumers in avoiding contaminated drinking water, and

- Remedial costs—the costs of providing safe drinking water in contaminated areas, either by cleaning up and treating the existing water supply or by providing alternative (bottled) water.

The social costs of human exposure to chemicals in ground water are not yet known. One study analyzed the costs incurred by consumers to avoid consuming contaminated drinking water (6). The study used a "damage avoided" approach to estimate the costs society would have to pay to reduce the risk of exposure by measuring the avoidance costs, which were the costs of monitoring private and public wells for pesticide and nitrate contamination. The study estimated private monitoring costs to range from about $890 million to $2.2 billion, with a "best estimate" of $1.4 billion. The study placed the costs of monitoring public systems drawing on ground water at about $14 million per year. The monitoring costs for public wells were much smaller than those for private wells because one public system can serve many more people.

Several studies estimate the costs of agricultural nonpoint-source pollution of surface water. One study estimates the cost of soil erosion to be $4-$12 billion per year, with a "best guess" estimate of $7 billion per year (8). These annual costs consist primarily of damages to freshwater fishing, boating, and recreation ($1.9 billion per year), water storage facilities ($1.1 billion), navigable waterways (primarily from silting and requirements for dredging, $680 million), commercial fishing ($400 million), and municipal treatment plants ($350 million) (4).

Another study has analyzed the off-farm water quality effects of USDA's Conservation Reserve Program (CRP), under which highly erodible land is retired from production through rental payments to farmers (7). The analysis estimates that the CRP will generate $2-$5.5 billion in water quality benefits (present value over the 10-year life of the program) by reducing soil erosion and hence runoff of nitrates and sediments to surface water systems.

Controlling Contamination from Agricultural Residuals

Several options are available for controlling agricultural nonpoint-source pollution. However, the types of soil conservation programs promoted by

USDA have not always reduced off-farm environmental damages from soil erosion and agricultural chemical use. Federal soil erosion programs have traditionally emphasized protecting soil quality and farmland productivity, not reducing the off-farm consequences of transported sediment and chemicals. USDA studies indicate that targeting soil erosion control programs to control off-farm consequences and soil productivity could increase the economic efficiency of these programs (9, 10).

USDA's Soil Conservation Service (SCS) is increasingly emphasizing environmental protection and water quality enhancement as program goals. New training procedures for field personnel and extension programs are being developed to orient SCS field activities toward controlling water pollution from agricultural sources. Future application of soil and water conservation measures, including structural solutions (such as terraces and sod waterways) and "best management practices" (such as alternative tillage, crop rotation, and nutrient management schemes) may aim to control nonpoint-source pollution and protect both surface and ground water resources.

The CRP is another potential tool for controlling agricultural nonpoint-source runoff. Most of the lands taken out of production under the CRP have been west of the Mississippi River. However, the lands identified by EPA as having the greatest surface water quality problems lie east of the Mississippi, particularly in the Northeast. The eligibility rules for including land in the CRP have been extended beyond "highly erodible" land to include filter strips around lakes and streams. Further modifying the eligibility rules could expand the bid pools to include land which, if taken out of production, would reduce runoff to environmentally sensitive waters, and to provide setbacks around wellhead areas to protect ground water.

The management of pesticide registrations under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) also offers a tool at the Federal level for controlling surface water and ground water contamination from agricultural chemicals. The reregistration process of FIFRA (which requires EPA to approve the active ingredients used in agricultural insecticides and herbicides) could enhance ground water protection by controlling the use of highly leachable chemicals. Under its recently proposed strategy for controlling pesticides in ground water, EPA is encouraging the States to file "pesticide management plans," implying that reauthorization of certain agricultural chemicals under FIFRA may depend on implementing such plans.

Agricultural Pollution Policy

Several issues have emerged in the debate over environmental policy regarding the pollution of water from agricultural residuals:

- Prevention versus cleanup as national goals of environmental policy,
- The meaning and desirability of environmental quality standards,
- Voluntary versus mandatory controls, and
- The relative roles of Federal agencies and State and local governments.

Much of the controversy surrounding proposed ground water legislation centers on the appropriate goals of Federal policy. One sentiment holds that a broad policy statement similar to the Clean Water Act, which set a goal of restoring navigable waters to swimmable quality and eliminating pollutant discharges, is needed (11). Others argue that since the cleanup of contaminated ground water is extremely expensive, a more cost-effective approach would be to prevent further contamination to protect the resources.

The level of protection to be achieved is another issue. One view holds that all water resources should be protected from further pollution regardless of their current condition. This view conflicts with EPA's strategy of allocating protection and cleanup activities to preserve and enhance those ground water resources currently or potentially used for human consumption and providing less protection to contaminated waters that are not used for human or agricultural consumption.

The definition of resource quality standards is also unresolved. Environmental standards for surface waters have been primarily based on technology, particularly for point sources. The goal for controlling point source pollution has been to use best practical technology or, ultimately, best available technology to expand from primary treatment of wastewater to secondary and tertiary treatment. Rather than using only technology-based standards, the control of agricultural nonpoint-source pollution will probably involve input controls and alternative tillage and conservation practices. The economic analysis of management strategies used to control nonpoint-source pollution is difficult because the relationship between onfarm activity and off-farm environmental consequences is difficult to express mathematically and hard to measure, and because it depends significantly on location.

The choice of appropriate quality standards is even more complex for ground water contamination. The health effects of human exposure to toxic chemicals and nitrates causes the concern over ground water contamination. However, these health effects are poorly understood, and no consensus exists on the definition of "safe" exposure levels. Although models to predict health effects of such exposure are available, they are extraordinarily imprecise in dealing with low levels of exposure over the long term. They are also somewhat suspect to the general public, which prefers assurances of no exposure and no

adverse health effects from drinking water. Environmental groups favor limiting allowable pesticide concentrations in ground water to levels at which no adverse health effects are observed, instead of levels that are technologically or economically feasible. Current laws regulating pesticides are not uniform: drinking water legislation calls for "no unreasonable risk" of exposure to hazardous chemicals whereas FIFRA mandates a risk/benefit calculation. Despite the efforts of economists and others to push the philosophy of risk/benefit analysis as a tool for making resource allocation decisions, a large portion of the nontechnical audience simply will not accept "reasonable" exposure as an appropriate environmental goal, favoring instead more drastic measures to remove, rather than reduce, the risk of exposure.

Along with the controversy of defining standards for controlling environmental contamination from agriculture, debate centers on the appropriate type of regulation. The choice is between imposing mandatory regulations on agricultural activity to control pollution or relying upon voluntary action and compliance with guidelines reinforced by market incentives and the threat of future regulatory action. Because agricultural pollution is primarily a nonpoint-source problem, it is considered a local problem by some Federal officials who are reluctant to get involved in local decisionmaking when considering control strategies.

Because the vulnerability of water resources (both surface and ground water) to contamination from agricultural chemicals and sediment depends on local hydrogeological, cropping, and soil characteristics, uniform national regulatory standards may not be effective in controlling nonpoint-source pollution. The consensus is that the design and implementation of nonpoint-source surface water and ground water pollution control programs should be placed at the State and local levels, with only the most basic guidance from the Federal Government in the form of general standards and technical assistance. This feeling is buttressed by the view that controlling nonpoint-source pollution (particularly ground water contamination) implies making decisions on land use and zoning that traditionally have been handled at the local level.

Recent Federal policies regarding nonpoint-source pollution control emphasize voluntary controls instead of mandatory administered regulations to achieve nonpoint-source pollution goals. The policies emerging from USDA and EPA addressing the nonpoint-source pollution and ground water protection clearly stress the need for farmers' voluntary compliance, rather than a strict regulatory approach (13). In both the implementation of the 1987 Water Quality Act's nonpoint-source provisions and the recently announced pesticides-in-ground water strategy, the EPA regulatory approach has been to leave the design and implementation of pollution control and mitigation to State and local officials. The Federal Government will provide technical

expertise, information, and guidance and play a general oversight role in relation to local actions in enacting and monitoring nonpoint-source pollution controls. But, the Government will not establish uniform national standards or prescribe definitive control measures. This approach is combined with a general reference point strategy, where maximum contaminant levels (MCL's) are established and emergency actions may be triggered (for example, cancelling a particular pesticide) when ambient concentrations reach a particular level (for example, 50 percent of MCL). This idea is called the "yellow-light/red-light" approach (13).

The argument against this decentralized strategy is that it may result in a hodgepodge of conflicting policies among the various local, State, and Federal jurisdictions regarding agricultural chemical use, nutrient applications, and farming practices. For example, the pesticide industry is concerned that State-by-State regulation could result in 50 different standards on pesticide use in environmentally sensitive areas. A concern has also been raised that allowing States to set their own levels of allowable contamination and regulations regarding agricultural chemical use could result in less environmental protection than would be the case if strict Federal standards were imposed. Current EPA policy, even under the differential protection strategy regarding ground water, sets minimum standards for contamination and ambient water quality that the States may not relax, but individual jurisdictions may enact more stringent regulations.

Conclusions

Agriculture generates byproducts that may contribute to contamination of the Nation's water supply. This contamination is difficult to measure, and its economic costs are difficult to estimate.

The movement toward new public policy initiatives on agricultural pollution concerns the agricultural sector because much of the impetus is coming from outside the traditional agricultural community. Most of the recent environmental programs and policies arise from legislation enacted outside of farm policy, and the administrative role of USDA in these programs is secondary to other Federal agencies, such as EPA and the Interior Department. Unlike more traditional agricultural resource conservation issues (soil and water conservation, for example), these newer policy initiatives are directed not at maintaining agricultural productivity, controlling surpluses, or maintaining farm income but rather at preserving human health, the environment, and the quality of our natural resources. The emerging environmental legislation and policy can thus be viewed as external constraints on the production agriculture sector rather than an integral part of farm policy.

In an era of limited Federal resources available for pollution control, those resources must be carefully targeted toward the most cost-effective reduction of agricultural nonpoint-source pollution and ground water contamination. Those programs originating with the agricultural sector, particularly commodity and soil conservation programs, must be consistent with the goals of reducing the environmental effects of agricultural activity. The relationships between externally imposed environmental constraints and responses by the agricultural sector must be coordinated so that environmental programs and regulations imposed on the farm sector are consistent with, and supportive of, more traditional farm programs.

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Glossary of Food and Agricultural Terms

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Acreage allotment. An individual farm's share of the total national acreage that the Secretary of Agriculture determines is needed to produce sufficient supplies of a particular crop. The farm's allotted share is based on its production history.

Acreage reduction program (ARP). A voluntary land retirement system in which participating farmers idle a prescribed portion of their crop acreage base of wheat, feed grains, cotton, or rice. The base is the average of the acreage planted for harvest and considered to be planted for harvest. Acreage considered to be planted includes any acreage not planted because of acreage reduction and diversion programs during a period specified by law. Farmers are not given a direct payment for ARP participation, although they must participate to be eligible for benefits such as Commodity Credit Corporation loans and deficiency payments. Participating producers are sometimes offered the option of idling additional land under a paid land diversion program, which gives them a specific payment for each idled acre (see paid land diversion).

Acreage slippage. A measure of the effectiveness of acreage reduction programs. Slippage occurs when the reduction in harvested acres is less than the increase in idled acres. Slippage may refer to crop acreage, yields, or production.

Advance deficiency payments. Payments made to crop producers when they sign up for Federal commodity programs. The Secretary is required by law to make the payments when an acreage limitation program is in effect and deficiency payments are expected to be paid. Advance deficiency payments can range from 30 to 50 percent of expected payments, depending on the crop. Up to 50 percent of the advance payment may be made as generic commodity certificates. If total deficiency payments are less than the advance amount, producers must refund the excess portion.

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Advance recourse loans. Price-support loans made early in a marketing year to enable farmers to hold their crops for later sale. Farmers must repay the recourse loan with interest and reclaim the crops used as collateral. Advance recourse loans have been made to Upland and extra long staple (ELS) cottonseed producers only. However, the Secretary of Agriculture has authority to make advance recourse loans to producers of other commodities if such loans are necessary to provide adequate operating credit to producers.

Agricultural Conservation Program (ACP). A program to carry out conservation and environmental protection practices on agricultural land. ACP is a cost-sharing program between agricultural producers, Federal and State agencies, and other groups. Cost sharing is available under annual or long-term agreements (see cost-sharing program).

Aquifers. Subterranean water-bearing rock formations that can be tapped for wells. Aquifers supply water to about 97 percent of rural residents and almost 50 percent of the U.S. population.

Bilateral trade agreement. A trade agreement between any two nations. The agreement may be either preferential, applying only to the two countries involved, or most-favored-nation, negotiated between the two countries but extending to all or most other countries.

Biotechnology. The use of technology, based on living systems, to develop commercial processes and products. Includes specific techniques of plant regeneration and gene manipulation and transfer.

bovine growth hormone. See bovine Somatotropin (bST).

bovine Somatotropin (bST). A protein occurring naturally in cattle, bST has been genetically engineered as a synthetic to inject into cows to increase milk production. It is also referred to as bovine growth hormone. A similar product (porcine somatotropin) for use in pork production is in the experimental stage.

Cairns Group. An informal group formed in 1986 at Cairns, Australia. The group seeks the removal of access barriers and substantial reductions in subsidies affecting agricultural trade in response to depressed commodity prices and reduced export earnings stemming from subsidy wars between the United States and the European Community. The members account for a significant portion of the world's agricultural exports. The group includes major food exporters from both developed and developing nations: Argentina, Australia, Brazil, Canada, Chile, Colombia, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand, and Uruguay. The Cairns Group is a strong coalition in the Uruguay Round of multilateral trade negotiations held under the auspices of the General Agreement on Tariffs and Trade.

Cargo preference. A law that requires a certain portion of goods or commodities financed by the U.S. Government to be shipped on U.S. flag ships. The law has traditionally applied to P.L. 480 and other concessional financing or donation programs.

Cash-out option for generic certificates. The original holder of a generic commodity certificate has the option of redeeming the certificate at its face value for cash from the Commodity Credit Corporation instead of exchanging it for commodities. To encourage exchange of certificates for surplus commodities, generic certificates cannot be redeemed for cash until 5 months after the issue date. Those who purchase or trade the certificates from original holders are not permitted to cash out the certificates. Certificates issued under the Export Enhancement Program (see definition) also cannot be cashed out.

Commodity Credit Corporation (CCC). A federally owned and operated corporation within USDA. The CCC was created to stabilize, support, and protect farm income and prices through loans, purchases, payments, and other operations. The CCC functions as the financial institution through which all money transactions are handled for agricultural price and income support and related programs. The CCC also helps maintain balanced, adequate supplies of agricultural commodities and helps in their orderly distribution. The CCC does not have any operating personnel or facilities.

Common Agricultural Policy (CAP). A set of regulations by which member states of the European Community (EC) seek to merge their individual agricultural programs into a unified effort to promote regional agricultural development, fair and rising standards of living for the farm population, stable agricultural markets, increased agricultural productivity, and methods of dealing with food supply security. The variable levy and export subsidies are the two principal elements of the CAP.

Conservation compliance provision. A provision of the Food Security Act of 1985 that requires farmers with highly erodible cropland to implement an approved conservation plan by 1990. The plan must be completed by 1995 to maintain eligibility for Federal program benefits.

Conservation district. Any unit of local government formed to carry out a local soil and water conservation program.

Conservation plan. A combination of land uses and practices to protect and improve soil productivity and to prevent soil deterioration. A conservation plan must be approved by local conservation districts for acreage offered in the Conservation Reserve Program. The plan sets forth the conservation measures and maintenance that the owner or operator will carry out during the term of the contract.

Conservation Reserve Corn Bonus Program. A program effective only for the 1987 crop year and designed to encourage farmers to place highly erodible excess corn acreage into long-term conservation use. Bonus payments to participants were paid entirely in certificates.

Conservation Reserve Program (CRP). A major provision of the Food Security Act of 1985 designed to reduce erosion on 40-45 million acres of farmland. Under the program, producers who sign contracts agree to convert highly erodible cropland to approved conservation uses for 10 years. In exchange, participating producers receive annual rental payments and cash or payments-in-kind to share up to 50 percent of the cost of establishing permanent vegetative cover.

Conserving uses. Land idled from production and planted in a soil-conserving crop, such as annual, biennial, or perennial grasses. Uses exclude acreage (1) devoted to a crop of rice, Upland or extra-long staple cotton, feed grains, wheat, soybeans, peanuts, other program crops, or approved nonprogram crops; (2) required to be taken out of production under an acreage limitation program; and (3) designated under the Conservation Reserve Program or other conservation programs.

Consumer subsidy equivalents (CSE's). An economic concept measuring the value or cost to consumers of government food and agricultural programs. CSE's estimate the amount of subsidy consumers would need to maintain their economic well-being if all agricultural programs were discontinued.

Converted wetlands. Wetlands that have been drained or otherwise manipulated to produce agricultural commodities.

Cooperator program. A longstanding market development program administered by USDA's Foreign Agricultural Service which coordinates the export promotion efforts of more than 50 nonprofit commodity trade associations, including the U.S. Wheat Associates, Cotton Council International, and the National Potato Promotion Board.

Crop acreage base. A farm's average acreage of wheat, feed grains, cotton, or rice planted for harvest, plus land not planted because of acreage reduction or diversion programs during a period specified by law. Crop acreage bases are permanently reduced by the portion of land placed in the Conservation Reserve Program

Decoupling. A farm policy concept which, by separating farm program payments from the amount of production, represents an alternative to current policies. Farmers would make planting decisions based on market prices but receive income-support payments independent of production and marketing decisions if decoupling proposals were enacted.

Deficiency payment. A Government payment made to farmers who participate in wheat, feed grain, rice, or cotton programs. The payment rate is per bushel, pound, or hundredweight. It is based on the difference between the price level established by law (target price) and either the market price during a period specified by law or the loan rate, whichever is higher. The total payment is equal to the payment rate multiplied by the eligible acreage planted for harvest, and then multiplied by the program yield established for the particular farm.

For example, the 1987 target price for corn was $3.03 per bushel and the loan rate, $1.82. If the market price during the first 5 months of the marketing year had been less than $1.82 per bushel, the deficiency payment would have been $1.21 per bushel. If the market price during this time had reached $1.94, the payment would have totaled $1.09 per bushel. When the market price during the specified time period exceeds the target price, no deficiency payment is made.

Additional deficiency (emergency compensation) payments for wheat and feed grains must be made whenever the Findley loan rate (see definition) is in effect and season average market prices for wheat and feed grains are below the statutory loan rate. These payments are sometimes referred to as 12-month deficiency payments.

Delaney Clause. The 1958 Food Additive Amendment to the Federal Food, Drug, and Cosmetic Act prohibits the use of direct food additives that have been shown through appropriate tests to cause cancer in humans or laboratory animals. Color additives are also subject to the Delaney Clause. The clause implies a "zero cancer risk" standard for processed foods.

Disaster payments. Federal aid provided to feed grain, wheat, rice, and Upland cotton producers who have Federal crop insurance (when available), when either planting is prevented or crop yields are abnormally low because of adverse weather and related conditions.

Payments also may be made under special legislation enacted after an extensive natural disaster. The Disaster Assistance Act of 1988, for example, provided payments to crop producers who suffered losses in 1988 because of drought, hail, excessive moisture, or related conditions.

Discount rate. The rate at which the Federal Reserve typically lends to banks. The rate is set by the Federal Reserve.

Emergency Feed Assistance Program. A program that provides for the sale of Commodity Credit Corporation-owned grain at 75 percent of the basic county loan rate to livestock producers whose feed harvest has suffered

because of drought or excess moisture. Eligible livestock producers must have insufficient feed available to preserve and maintain their breeding stock. The Secretary of Agriculture must declare a county a natural disaster before this program can be implemented in that county.

Emergency Feed Program. A program that provides disaster assistance to eligible livestock owners by sharing the cost of feed purchased to replace the farm's normal production and feed purchased in quantities larger than normal because of an emergency. This program requires the Secretary of Agriculture to declare the county a natural disaster before implementation. The program is also called the Feed Cost-Sharing Program.

Erodibility index. A value which combines a soil's inherent erodibility with its susceptibility to damage by erosion. Soil type, amount of rainfall and runoff, and slope length and steepness determine a soil's inherent erodibility. The susceptibility of a soil to erosion damage is inversely related to the soil's natural rate of formation. Cropland fields containing primarily soil with an erodibility index of 8 or greater may be enrolled in the Conservation Reserve Program. Cropland with an erodibility index of 8 or more is also subject to the conservation compliance provisions of the Food Security Act of 1985.

Eurodollar market. The name given to the operations outside U.S. boundaries in which foreign banks and foreign branches of U.S. banks make loan and security transactions denominated in U.S. dollars rather than foreign currency.

European Community (EC). An organization established by the Treaty of Rome in 1957 and also known as the European Economic Community and the Common Market. Originally composed of 6 European nations, it has expanded to 12. The EC attempts to unify and integrate member economies by establishing a customs union and common economic policies, including the Common Agricultural Policy (CAP) (see definition). Member nations include the original six countries of Belgium, the Federal Republic of Germany, France, Italy, Luxembourg, and the Netherlands, as well as Denmark, Greece, Ireland, Portugal, Spain, and the United Kingdom.

Exchange rate. The number of units of one currency that can be exchanged for one unit of another currency at a given time. A decline in the value of the U.S. dollar, for example, drops the "price" of U.S. farm products in terms of the currency of many importers. Conversely, an appreciation in the value of the dollar means that foreign importers must spend more of their currency to buy American farm products.

Export allocation or quota. Controls applied by an exporting country to limit the amount of goods leaving that country. Such controls usually are applied in

time of war or during some other emergency requiring conservation of domestic supplies.

Export Credit Guarantee Program (GSM-102). The largest U.S. agricultural export promotion program, functioning since 1982. It guarantees repayment of private, short-term credit for up to 3 years.

Export Enhancement Program (EEP). A program initiated in May 1985 under a Commodity Credit Corporation charter to help U.S. exporters meet competitors' prices in subsidized markets. The program was formally authorized by the Food Security Act of 1985. Under the EEP, exporters are awarded generic certificates which are redeemable for CCC-owned commodities, enabling them to sell certain commodities to specified countries at prices below those of the U.S. market.

Export subsidies. Special incentives, such as cash payments, tax exemptions, preferential exchange rates, and special contracts, extended by governments to encourage increased foreign sales. These subsidies are often used when a nation's domestic price for a good is artificially raised above world market prices.

Farm acreage base. The annual total of the crop acreage bases (wheat, feed grains, Upland cotton, and rice) on a farm, the average acreage planted to soybeans, peanuts, and other approved nonprogram crops, and the average acreage devoted to conserving uses. Conserving uses include all uses of cropland except crop acreage bases, acreage devoted to nonprogram crops, acreage enrolled in annual acreage reduction or limitation programs, and acreage in the Conservation Reserve Program.

Farm bill. The omnibus agricultural legislation that expires every 4 or 5 years. The bill usually includes provisions on commodity programs, trade, conservation, credit, agricultural research, food stamps, and marketing.

Farm Credit System (FCS). The system is made up of cooperatively owned financial institutions in districts covering the United States and Puerto Rico that finance farm and farm-related mortgages and operating loans. Institutions within each district specialize in farmland loans and operating credit, or lending to farmer-owned supply, marketing, and processing cooperatives. FCS institutions rely on the bond market as a source of funds.

Farmer-owned reserve (FOR). A program designed to provide protection against wheat and feed grain production shortfalls and provide a buffer against unusually sharp price movements. Farmers can place eligible grain in storage and receive extended loans for 3 years with extensions as warranted by market conditions. The loans are nonrecourse in that farmers can forfeit the

commodity held as collateral to the Government in full settlement of the loan without penalty and without paying accumulated interest. Interest on the loan also may be waived by the Secretary of Agriculture, and farmers may receive annual storage payments from the Government. Farmers may not take grain out of storage without penalty unless the market price reaches a specified "release price" or the loan matures. When this price is reached, farmers may elect to remove their grain from the reserve but are not required to do so. However, at that point the storage and interest incentives may be reduced or eliminated.

Federal Agricultural Mortgage Corporation (Farmer Mac). An organization authorized by the Agricultural Credit Act of 1987 which creates a resale (secondary) market for agricultural mortgages, enabling lenders to obtain cash for further lending. The market links original borrowers and final investors. Mortgages from lenders are pooled into securities and sold on the capital market. Farmer Mac is fashioned after similar home mortgage secondary markets such as the Federal National Mortgage Association ("Fannie Mae"), the Government National Mortgage Association ("Ginnie Mae") and the Federal Home Loan Mortgage Corporation ("Freddie Mac").

Federal crop insurance. A subsidized insurance program which provides farmers with a means of risk management and financial stability against crop production loss. The insurance is available for 50 different crops, varying by county. Participation in the program is often required for farmers to qualify for Federal emergency loans.

Federal marketing orders and agreements. A means authorized by legislation for agricultural producers to promote orderly marketing and to collectively influence the supply, demand, price, or quality of particular commodities. The marketing order is requested by a group of producers, and must be approved by the Secretary of Agriculture and a required number of the commodity's producers (usually two-thirds). Conformance with the order's provisions is mandatory for all producers and handlers covered by the order. It may limit total marketings, prorate the movement of a commodity to market, or impose size and grade standards.

Federal Reserve System. The independent central banking authority in the United States. It consists of 13 district banks and a centralized decisionmaking body, the Board of Governors. The Federal Reserve provides currency upon demand by member banks, provides check-clearing services, and regulates the money supply.

Findley loan rates. An option available to the Secretary of Agriculture to improve U.S. competitiveness by lowering the loan rate up to 20 percent. Originally proposed by former Representative Paul Findley (R-IL) this

provision was adopted in the Food Security Act of 1985. If the rate is reduced under the Findley provision, USDA may be required to make additional deficiency payments to producers to provide the same total return as if there had been no reduction. The Findley payment rate equals the statutory loan rate minus (1) the national weighted season average farm price for the marketing year; or (2) the announced loan level, whichever is higher. If the season average price is above the statutory loan rate, no Findley payments are required. The Continuing Appropriations Act for Fiscal Year 1987 includes Findley payments for the 1987 through 1990 crops under the $250,000 payment limitation.

Food Security Act of 1985 (P.L. 99-198). The omnibus food and agriculture legislation signed into law on December 23, 1985, that provides a 5-year framework for the Secretary of Agriculture to administer various agriculture and food programs. The act amends permanent legislation–the Agricultural Adjustment Act of 1938 and the Agricultural Act of 1949–for the 1986 through 1990 crop years (see permanent legislation).

Free trade. Exchange of goods between countries with no trade barriers or restrictions such as tariffs or import quotas.

GATT. See General Agreement on Tariffs and Trade.

General Agreement on Tariffs and Trade (GATT). An agreement, originally negotiated in Geneva, Switzerland, in 1947 among 23 countries including the United States, to increase international trade by reducing tariffs and other trade barriers. This multilateral agreement provides a code of conduct for international commerce. GATT also provides a framework for periodic multilateral negotiations on trade liberalization and expansion. The eighth and most recent round of negotiations began in Punta del Este, Uruguay, in 1986. Currently 105 nations are participating in the talks, including most of the industrialized market economies, most of the less developed countries, and several centrally planned economies in Eastern Europe.

Generic commodity certificates. Negotiable certificates, which do not specify a certain commodity, issued by USDA in lieu of cash payments to commodity program participants and sellers of agricultural products. The certificates, frequently referred to as payment-in-kind (PIK) certificates, can be used to acquire stocks held as collateral on Government loans or owned by the Commodity Credit Corporation. Farmers have received generic certificates as payment for participation in numerous Government programs including acreage reduction, paid land diversion, the Conservation Reserve Program, rice marketing loans, disaster, and emergency feed programs. Grain merchants and commodity groups also have been issued certificates through the Export Enhancement Program and the Targeted Export Assistance Program.

Gramm-Rudman-Hollings Deficit Reduction Act. Common name for the Balanced Budget and Emergency Deficit Control Act of 1985 as amended in 1987 (P.L. 100-119). The law mandates annual reductions in the Federal budget deficit to eliminate it by 1993. If Congress and the President cannot agree on a targeted budget package for any specific fiscal year, automatic cuts could occur for almost all Federal programs. Social Security, interest on the Federal debt, veterans' compensation, veterans' pensions, Medicaid, Aid to Families with Dependent Children, the Special Supplemental Food Program for Women, Infants, and Children, Supplemental Security Income, food stamps, and the child nutrition programs are exempt from the cuts. The original Gramm-Rudman-Hollings law (P.L. 99-177) was declared unconstitutional in 1986.

Gross domestic product. A measure of the market value of goods and services produced by the labor and property of a nation. Unlike gross national product, GDP excludes receipts from that nation's business operations in foreign countries and the share of reinvested earnings in foreign affiliates of domestic corporations.

Ground water. Water beneath the earth's surface between saturated soil and rock that supplies wells and springs (see aquifers).

Highly erodible land. Land that meets specific conditions primarily relating to its land/soil classification and current or potential rate of erosion. The classifications, developed by the Soil Conservation Service, are used to determine eligibility of land for the Conservation Reserve Program.

Import barriers. Quotas, tariffs, and embargoes used by a country to restrict the quantity or value of a good that may enter that country.

Import quota. The maximum quantity or value of a commodity allowed to enter a country during a specified time period. A quota may apply to amounts of a commodity from specific countries.

Interest Payment Certificates. A means available to the Secretary to refund interest charges on nonrecourse price support loans. The Secretary may provide a negotiable certificate, redeemable for Commodity Credit Corporation commodities, to any producer who repays, with interest, a price support loan for wheat, feed grains, rice, or Upland cotton.

Intermediate Export Credit Guarantee Program (GSM-103). A program established by the Food Security Act of 1985 which complements the Export Credit Guarantee Program (GSM-102) but guarantees repayment of private credit for 3-10 years.

International trade barriers. Regulations imposed by governments to restrict imports from, and exports to, other countries. Tariffs, embargoes, import quotas, and unnecessary sanitary restrictions are examples of such barriers.

Loan deficiency payments. A provision of the Food Security Act of 1985 giving the Secretary of Agriculture discretionary authority to provide payments to producers who, although eligible to obtain loans, agree not to obtain loans for 1986-90 crops of wheat, feed grains, Upland cotton, and rice. The payment is determined by multiplying the loan payment rate by the amount of commodity eligible for loan. The loan payment rate per bushel is the announced loan level minus the repayment level used in the marketing loan. The amount of the commodity eligible for the loan deficiency payment is determined by multiplying the individual farm program crop acreage by farm program payment yield. This program has not been implemented to date.

Loan rate. The price per unit (bushel, bale, pound, or hundredweight) at which the Government will provide loans to farmers enabling them to hold their crops for later sale.

Macroeconomic policies. Policies affecting the general economic environment in which the total economy, or a sector such as agriculture operates. Examples include monetary policies that directly affect interest rates, money, and credit flows in financial markets, and fiscal policies that involve spending and taxation.

Marketing board. A major form of government involvement by other countries to control the marketing of a commodity. These boards generally handle all export sales for the commodity. They may administer provisions to guarantee farmers a minimum price each year based on the cost of production or provide an initial minimum price with supplemental payments later based on export sales. Boards may oversee a two-price plan in which domestic prices differ from the export price. Canada and Australia use marketing boards for selected grains, and Australia operates a wool marketing board.

Marketing certificate. A certificate which may be redeemed for a specified amount of Commodity Credit Corporation commodities. Such certificates may be generic or for a specific commodity.

Marketing loan program. A program authorized by the Food Security Act of 1985 that allows producers to repay nonrecourse price support loans at less than the announced loan rates whenever the world price for the commodity is less than the loan rate. Under the act, the programs are mandatory for Upland cotton and rice, and discretionary for wheat, feed grains, and soybeans. To date, the discretionary programs have not been implemented.

Marketing order. See Federal marketing order.

Marketing quota. Quotas authorized by the Agricultural Adjustment Act of 1938 to regulate the marketing of some commodities when supplies are or could become excessive. A quota represents the quantity USDA estimates to be required for domestic use and exports during the year. Marketing quotas are binding upon all producers if two-thirds or more of the producers holding allotments for the production of a crop vote for quotas in a referendum. When marketing quotas are in effect, growers who produce more of a commodity than their farm acreage allotments should yield are subject to marketing penalties on the "excess" production and are ineligible for Government price-support loans. Quota provisions have been suspended for wheat, feed grains, and cotton since the 1960's; rice quotas were abolished in 1981. Poundage quotas are still used for domestically consumed peanuts, but not for exported peanuts. Marketing quotas are also used for major types of tobacco.

Maximum Acceptable Rental Rates (MARR). Rental rate guidelines for designated areas eligible for the Conservation Reserve Program (CRP) as determined by the Agricultural Stabilization and Conservation Service (ASCS). Producers' applications for the CRP can be accepted if the yearly rental payment they would require (rental bid) does not exceed the established MARR.

Meat Products Export Incentive Program Payments. Payments made to guarantee equitable treatment of meat products in USDA's efforts to enhance foreign sales of U.S. agricultural products.

Milk Production Termination Program. A program, often called the Dairy Termination Program or the Whole-herd buyout, authorized by the Food Security Act of 1985. Producers received payments from USDA, based on bids submitted to the Secretary of Agriculture, to sell their dairy herds for slaughter or export in order to reduce milk production. The program was in effect from April 1, 1986, through September 30, 1987. During that period, 1.6 million dairy cows were removed from production.

Multilateral trade negotiations. Discussions of trade issues involving three or more countries. An example is the General Agreement on Tariffs and Trade which serves as a forum for intergovernmental tariff negotiations.

National farm program acreage. The number of harvested acres of feed grains, wheat, Upland cotton, and rice needed nationally to meet domestic and export use and to accomplish any desired increase or decrease in carryover levels. Program acreage for an individual farm is based on that farm's share of the national farm program acreage.

Nonpoint-source pollution. Pollutants that cannot be traced to a specific source, such as storm water runoff from urban and agricultural areas.

Nonrecourse loans. The major price support instrument used by the Commodity Credit Corporation (CCC) to support the price of wheat, feed grains, cotton, honey, peanuts, tobacco, rice, and sugar. Farmers who agree to comply with all commodity program provisions may pledge a quantity of a commodity as collateral and obtain a loan from the CCC. The borrower may elect either to repay the loan with interest within a specified period and regain control of the collateral commodity, or default on the loan. In case of a default, the borrower forfeits without penalty the collateral commodity to the CCC. The loans are nonrecourse because the Government has no option (or recourse) but to accept forfeiture as full satisfaction of the loan obligation, including the accumulated interest, regardless of the price of the commodity in the market at the time of default.

Nontariff trade barriers. Regulations used by governments to restrict imports from, and exports to, other countries. Embargoes, import quotas, and unnecessary sanitary restrictions are examples of such barriers.

Normal crop acreage. The acreage on a farm normally devoted to a group of designated crops.

Normal yield. A term designating the average historical yield established for a particular farm or area. Normal production is calculated as the normal acreage harvested of a commodity multiplied by the normal yield.

Organization for Economic Cooperation and Development (OECD). An organization founded in 1961 to promote economic growth, employment, a rising standard of living, and financial stability; to assist the economic expansion of member and nonmember developing nations; and to further expand world trade. The member countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

Paid land diversion. A program that offers payments to producers for reduction of planted acres of a program crop, if the Secretary of Agriculture determines acres planted should be reduced. Farmers are given a specific payment per acre to idle a percentage of their crop acreage base. The idled acreage is in addition to an acreage reduction program.

Parity price. A measurement of the purchasing power of a unit (bushel, hundredweight) of farm product. Parity was originally defined as the price that

gives a unit of a commodity the same purchasing power today as it had in the 1910-14 base period. In 1948, the parity price formula was revised to allow parity prices for individual commodities to reflect a more recent relationship of farm and nonfarm prices by making the base price dependent on the most recent 10-year average price for commodities. Except for wool, mohair, and certain minor tobaccos, parity is not currently used to set price-support levels for any program commodities. However, parity remains part of permanent legislation.

Payment-in-kind (PIK). A payment made to eligible producers in the form of an equivalent amount of commodities owned by the Commodity Credit Corporation. Payments-in-kind were first used in the 1930's to reduce government-held surpluses of cotton. A PIK program in 1983 offered surplus agricultural commodities owned by the Government in exchange for agreements to reduce production by cutting crop acreage.

Payment limitation. The maximum amount of commodity program benefits a person can receive by law. The payment limitation was first imposed by the Agricultural Act of 1970. A $50,000 per person payment limitation was established in 1981 and applies to direct payments to wheat, feed grain, cotton, and rice producers. The limit does not include the value of loans received, any gain realized from a marketing loan, deficiency payments made as a result of lowering the basic loan rate (see Findley loan rate), inventory reduction payments, or benefits received as a result of cost reduction actions by the Secretary. The Budget Reconciliation Act of 1987 defined persons as individuals, members of joint operations, or entities such as limited partnerships, corporations, associations, trusts, and estates that are actively engaged in farming. The law also placed a $250,000 limit on total program payments for 1987 through 1990 crops. The excluded programs mentioned above, as well as honey, are also subject to the $250,000 limit.

Permanent legislation. Legislation that would be in force in the absence of all temporary amendments and temporarily suspended provisions. The Agricultural Adjustment Act of 1938 and the Agricultural Act of 1949 serve as the principal laws authorizing the major commodity programs. These laws are frequently amended–provisions are added, suspended, and repealed. For the past several decades, periodic omnibus agriculture acts have provided for specific fixed-period commodity programs by adding temporary amendments to these laws, and suspending conflicting provisions of those laws for the same period. The temporarily suspended provisions of the 1938 and 1949 acts go back into effect if current amendments lapse and new legislation is not enacted.

Permitted acreage. The maximum acreage of a crop which may be planted for harvest by a program participant. The permitted acreage is computed by

multiplying the crop acreage base by the acreage reduction program requirement (announced by the Commodity Credit Corporation each year) minus the diversion acreage (if applicable). For example, if a farm has a crop acreage base of 100 acres and a 10-percent acreage reduction (ARP) is required, the permitted acreage is 90 acres.

PIK and Roll. A procedure by which producers attempt to profit from situations where certificate exchange values (posted county prices) are below nonrecourse loan rates. With this procedure, a producer places the eligible commodity under nonrecourse loan at the loan rate, and uses generic certificates to exchange for Commodity Credit Corporation commodities. If the posted county price is below the nonrecourse loan rate, then the producer is able to acquire the quantity placed under loan for less than the proceeds of the nonrecourse loan, in addition to saving interest and storage charges.

Point source pollution. Pollutants that can be traced to a specific source, such as a factory smokestack or chemical spill.

Prevented planting disaster payments. Payments made to eligible producers to compensate them for being unable to plant any portion of the acreage intended for wheat, feed grains, rice, or Upland cotton because of a natural disaster (such as drought or flood) or other condition beyond the producer's control. Producers are not eligible for prevented planting disaster payments if prevented planting crop insurance is available in their county.

Price support programs. Government programs that aim to keep farm prices received by participating producers from falling below specific minimum levels. Price support programs for major commodities are carried out by providing loans to farmers so that they can store their crops during periods of low prices. The loans can later be redeemed if commodity prices rise sufficiently to make the sale of the commodity on the market profitable, or the farmer can forfeit the commodity to the Commodity Credit Corporation (CCC). In the latter case, the commodity is stored and is not available to the market until prices rise above statutory levels that allow the CCC to sell the commodities.

Producer subsidy equivalents (PSE's). An economic concept used to estimate the effect of government policy by measuring the amount of the cash subsidy or tax needed to hold farmers' incomes at current levels if all government agricultural programs were removed. PSE's and Consumer Subsidy Equivalents (CSE's) are used to compare different policy tools and their effects on farmer revenue and consumer costs across countries. As a result, most General Agreement on Tariffs and Trade (GATT) trade liberalization proposals hinge on the use of measures such as PSE's and CSE's in negotiating lower protection levels.

Production controls. Any Government program or policy intended to limit production. These programs or policies have included acreage allotments, acreage reduction, set-aside, paid land diversion, quantity and acreage marketing quotas, payment-in-kind, production termination, and soil bank.

Program crops. Crops for which Federal support programs are available to producers. These crops include wheat, corn, barley, grain sorghum, oats, rye, extra-long staple and Upland cotton, rice, soybeans, tobacco, peanuts, sugar, wool and mohair, honey, and milk.

Program slippage. See Acreage slippage.

Program yield. The farm commodity yield of record determined by a procedure outlined in legislation. Under the Food Security Act of 1985, for example, program yields were found by averaging the yield for the 1981-85 program crops, dropping the high and low years. Program yields were constant for the 1986-90 crops. The farm program yield applied to eligible acreage determines the level of production eligible for direct payments to producers.

Public Law 480 (P.L. 480). Common name for the Agricultural Trade Development and Assistance Act of 1954, which seeks to expand foreign markets for U.S. agricultural products, combat hunger, and encourage economic development in developing countries. Title I, also called the Food for Peace Program, makes U.S. agricultural commodities available through long-term dollar credit sales at low interest rates for up to 40 years. Donations for emergency food relief are provided under title II. Title III authorizes "food for development" projects.

Reduced yield disaster payments. Payments made to eligible producers in compensation for reduced harvests because of a natural disaster. Producers of wheat, feed grains, peanuts, soybeans, and sugar are eligible if the total quantity harvested is less than 60 percent of the farm's established program yield times the acreage actually planted to the affected commodity. Rice and cotton farmers are eligible for disaster payments if the total quantity of crop harvested is less than 75 percent of the farm's established program yield. Producers are not eligible for reduced yield disaster payments if reduced yield crop insurance is available in their county.

Reopening signup payments. Payments-in-kind made to producers participating in a production control or loan program to encourage additional planted acreage to be diverted prior to harvest. The Secretary has the option to reopen signup and accept bids from producers willing to divert additional acreage if domestic or world supply or demand conditions change substantially after normal signup, resulting in burdensome and costly surpluses.

Set-aside. A voluntary program to limit production by restricting the use of land. Such a program restricts a farmer's total cropland base used for production rather than the acres used to produce a specific crop (as is the case with acreage reduction programs). Introduced in 1970, set-asides may be implemented at the discretion of the Secretary of Agriculture, but have not been offered since 1979. When a set-aside program is in effect, the total of the planted acreage of the designated crops and the set-aside acreage cannot exceed the normal crop acreage. Producers must comply to be eligible for commodity loan programs or deficiency payments.

Sodbuster. A provision of the Food Security Act of 1985 designed to discourage the conversion of highly erodible land from extensive conserving uses to intensive agricultural production. If highly erodible grassland or woodland is used for crop production without appropriate conservation measures, producers may lose eligibility for several USDA programs. Sodbuster applies to highly erodible land that was not planted to annually tilled crops during 1981-85.

State marketing boards. Government-controlled trading agencies used by countries such as Canada, Australia, and New Zealand to receive and market domestic products in domestic and international markets. Many developing countries and countries with centrally planned economies also use marketing boards for all import purchases.

Subsidy. A direct or indirect benefit granted by a government for the production or distribution (including export) of a good. Examples include any national tax rebate on exports; financial assistance on preferential terms; financial assistance for operating losses; assumption of costs of production, processing, or distribution; a differential export tax or duty exemption; domestic consumption quota; or other method of ensuring the availability of raw materials at artificially low prices. Subsidies are usually granted for activities considered to be in the public interest.

Supply control. The policy of changing the amount of acreage permitted to be planted to a commodity or the quantity of a commodity allowed to be sold by a program participant. Supply control is used to maintain a desired carryover or price level. (See also Acreage reduction program, and Set-aside.)

Swampbuster. A provision of the Food Security Act of 1985 that discourages the conversion of natural wetlands to cropland use. Producers converting a wetland area to cropland may lose eligibility for several USDA program benefits. The exceptions include conversions that began before December 23, 1985, conversions of wetlands that had been created artificially, crop production on wetlands that became dry through drought, and conversions that the Soil Conservation Service has determined have minimal effect on wetland values.

Target option program. A program, implemented at the Secretary's discretion, in which wheat producers have the option of choosing from a schedule of target prices and corresponding acreage reduction levels. This program, authorized by the Food Security Act of 1985, has never been implemented.

Target price. A price level established by law for wheat, corn, sorghum, barley, oats, rice, and Upland and extra-long staple cotton. Farmers participating in the Federal commodity programs receive the difference between the target price and either the market price during a period prescribed by law or the loan rate, whichever is higher. (See Deficiency payments and Loan rate).

Targeted Export Assistance Program (TEA). A program authorized by the Food Security Act of 1985 which assists U.S. producer groups or regional organizations whose exports have been adversely affected by a foreign government's policies. TEA promotes exports of specific American commodities or products in specified markets. Under the program, eligible participants receive generic commodity certificates (see definition) in payment for promotional activities approved by the Secretary of Agriculture.

Tariffs. Taxes imposed on commodity imports by a government. A tariff may be either a fixed charge per unit of product imported (specific tariff) or a fixed percentage of value (ad valorem tariff).

Variable levies. The difference between the price of a foreign product at the port and the official price at which competitive imports can be sold. Such levies are effectively a variable tax on imports or a variable subsidy to exports. Variable levies are used by the European Community, Austria, Sweden, and Switzerland.

Wetlands. Land that is characterized by an abundance of moisture and that is inundated by surface or groundwater, often enough to support a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wheat and Feed Grain Export Certificate Programs. Two discretionary programs for the 1986-90 crops designed to encourage exports of wheat and feed grains from private stocks. Under the Cash Export Certificate Program and the Export Marketing Certificate Program, the Secretary would issue wheat and feed grain export certificates to all eligible producers. The programs have not been implemented.

Whole-herd buyout. See Milk Production Termination Program.

0/92. An optional acreage diversion program that allows wheat and feed grain producers to devote all or a portion of their permitted acreage to conserving uses and receive deficiency payments on that acreage. The program makes deficiency payments for a maximum of 92 percent of a farm's permitted acreage. Under other types of acreage diversion programs, such as acreage reduction programs, producers cannot receive deficiency payments unless permitted acres are devoted to producing a crop.

50/92. A program that allows cotton and rice growers who plant at least 50 percent of their permitted acreage to receive 92 percent of their deficiency payments under certain conditions. The Farm Disaster Assistance Act of 1987 also authorized 50/92 for wheat, feed grain, cotton, and rice producers who were affected by a natural disaster in 1987 and met certain criteria stated in the law.