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Agricultural-Food Policy Review:

Commodity Program Perspectives

- HISTORICAL OVERVIEW
- DOMESTIC AND INTERNATIONAL SETTING
- COMMODITY PROGRAMS AND THEIR PERFORMANCE
- EMERGING AGENDA OF POLICY CONCERNS

AGRICULTURAL-FOOD POLICY REVIEW: COMMODITY PROGRAM PERSPECTIVES. Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 530.

PREFACE

This review brings together background information useful for evaluating commodity programs. Articles provide an historical overview of U.S. farm policies, a description of the general economic setting in which 1985 farm legislation will operate, an evaluation of the performance of current commodity programs, and a discussion of possible alternative policy tools and concepts. Particular focus is given to the purpose of commodity programs and an economic assessment of their performance.

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FREE REPORTS ON FARM POLICY

Other USDA reports providing background for 1985 farm bill discussions deal with the major program commodities, the farm industries that produce them, and the farm programs under which they are produced. These reports are available from Information, Rm. 208, 1301 New York Ave., N.W., USDA, Washington, D.C. 20005-4788. To order by telephone, call (202) 786-1515. Titles include: Honey (AIB-465), Wool and Mohair (AIB-466), Wheat (AIB-467), Tobacco (AIB-468), Peanuts (AIB-469), Rice (AIB-470), Corn (AIB-471), Soybeans (AIB-472), Oats (AIB-473), Dairy (AIB-474), Sorghum (AIB-475), Cotton (AIB-476), Barley (AIB-477), and Sugar (AIB-478).

Other free background reports on farm legislation topics are also available: Federal Credit Programs for Agriculture (AIB-483), History of Agricultural Price Support and Adjustment Programs, 1933-84 (AIB-485), The Current Financial Condition of Farmers and Farm Lenders (AIB-490), A Summary Report on the Financial Condition of Family-Size Commercial Farms (AIB-492), Foreign Exchange Constraints to Trade and Development (FAER-209), Financial Constraints to Trade and Growth: The World Debt Crisis and Its Aftermath (FAER-211), Possible Economic Consequences of Reverting to Permanent Legislation or Eliminating Price and Income Supports (AER-526), Do USDA Farm Program Participants Contribute to Soil Erosion? (AER-532), Analysis of Policies to Conserve Soil and Reduce Surplus Crop Production (AER-534), Sodbusting: Land Use Change and Farm Programs (AER-536), and The Impacts of Policy on U.S. Agricultural Trade (Staff Report No. AGES840802).

INTRODUCTION

This collection of articles provides background information on the economic setting facing agriculture, the changing profile of the farm sector, the programs that have accompanied its development, and what they have achieved. Care has been taken to avoid advocacy and implicit conclusions and viewpoints. Any subjectivity remaining is that of the authors and does not represent any official endorsement or position, expressed or implied, of the U.S. Department of Agriculture.

The first article in this Review, which provides an historical overview of U.S. agricultural policies and programs, points out that while most of our current policy legislation had its origins during the Great Depression, farm policy is as old as the Nation itself. Specific program operations may have changed over time, but the basic objectives of commodity programs have remained much the same for over 200 years--maintenance of a free and independent farm sector as the best guarantee of an adequate supply of food at reasonable prices.

Analyses of agricultural policy often focus solely on commodity programs. However, as emphasized in the second paper on U.S. agriculture and the macroeconomy, the farm economy and the general economy are now so closely linked that economic conditions and policies beyond the farm gate can affect agriculture's well-being as strongly as traditional farm commodity programs. In particular, a macroeconomic policy mix of fiscal stimulus combined with monetary restraint tends to operate against agriculture and other interest-sensitive or export-dependent sectors.

The farm sector of the eighties bears little resemblance to that of the thirties. The third paper, a profile of U.S. farming, explains how specialization, technology, and a financial system of credit, tax, and international monetary policies have altered U.S. farming from a collection of numerous, small, labor-intensive units to a diverse sector encompassing a wide range of sizes, costs, production efficiencies, and needs. Questions are raised about whether traditional commodity programs can adequately address the problems of a farm sector that has grown so diverse.

The productivity and technological advancement of U.S. farmers have made them the envy of the world. The fourth paper examines the implications of emerging technologies for farm programs. Technologies that promote efficiencies in U.S. agriculture are important to consumers and to the competitive position of U.S. farmers in international markets. However, the adoption of new technologies can have structural and distributional implications for the farm sector. Commodity programs which create rigidities in resource adjustment may translate rapid technical advance into increased Government budget costs.

Two articles address the current international setting in which the new farm legislation will operate. These articles point out that future agricultural export earnings depend on growth in global agricultural trade and the U.S. share, which is sensitive to many forces outside U.S. control. While many observers argue that the recent decline in U.S. agricultural exports reflects a reduced ability to compete, the United States remains a low-cost producer. The analysis presented suggests that the adjustments presently occurring in U.S. agriculture are not due to a loss of basic competitiveness, but rather to global recession, the appreciation of the U.S. dollar, changes in foreign agricultural policies,

and debt problems in some importing countries. U.S. policies that support producer prices and income also may often be in conflict with strategies to expand exports.

The concept of farm price and income support as it exists today is composed of a set of tools that work together in an often complex, sometimes conflicting manner. "Commodity Price and Income Support Policies in Perspective" looks at the interrelationships between nonrecourse loans, direct purchases, Government- and farmer-owned commodity stocks, and target prices and deficiency payments. Evidence is brought together to evaluate how well these programs have accomplished their objectives, how they have affected the U.S. position in world trade, how they have affected resource use and values in agriculture, how these policies altered the profile of U.S. farming, and what have been the costs of these tools to farmers, consumers, and taxpayers.

The next article describes how acreage reduction programs have tended to be a costly and inefficient way of controlling supplies. Acreage slippage has occurred because of more intensive production by participants who tend to idle lower yielding land, expanded production by nonparticipants, the program type, and the program rules. Acreage reduction programs may need to be evaluated in relation to these inefficiencies, foreign acreage response, and the production signals given producers by other program provisions.

The many programs used since the fifties to improve export performance and achieve domestic policy objectives are explained in an article on export programs and U.S. agricultural policy. Export market programs, such as credit and market development that expand export quantity demanded, and programs that lower the export price, such as export payments, have been used to decrease excess supply during periods of commodity surpluses. Also described are demand expansion programs that have been used in periods of weak demand to provide some support to market prices.

Soil and water conservation programs have long been an integral part of an overall U.S. agricultural policy. While originally intended to be complementary, recent experience indicates that conservation and commodity programs may at times be conflicting. "Resource Conservation Programs in the Farm Policy Arena" suggests that more consistency between all aspects of farm programs would help sustain our resource base over the long term.

Given the shortcomings identified in existing agricultural programs, proposals have been advanced to either modify existing programs, adapt new ideas within the current framework, or develop entirely new concepts with new goals. The final two articles examine three examples of these proposals--moving-average loan rates, commodity options, and revenue insurance--and consider the roles of credit and tax policies. A glossary of agricultural policy terms completes this volume.

Note: All tons in this report are metric.

I. DOMESTIC AND INTERNATIONAL SETTING

Historical Overview of U.S. Agricultural Policies and Programs

Wayne D. Rasmussen*

ABSTRACT

U.S. agricultural policy is as old as the Nation itself, going back to the struggle for independence against Great Britain. As the Nation developed, policies were implemented to promote the exploration and settlement of the frontiers. As the country progressed through cycles of business development, financed at first by farm exports, policies were formulated to help U.S. agriculture keep pace. By the thirties, a national concern arose to improve the depressed farm income situation, which many believed to be the root of the Great Depression. Most of our current programs--and much of our current agricultural success--had their origins in this period.

KEYWORDS: Agricultural Adjustment Acts, agricultural programs, Hatch Act, Capper-Volstead Act, Federal Farm Board, McNary-Haugen bills.

INTRODUCTION

For 200 years, agricultural policies have been a part of American government. Although they have changed as the Nation itself has changed, certain basic objectives have remained throughout:

- helping farmers to maintain themselves as free, independent business people, control their means of production, make their own decisions, and benefit from their own labor and management abilities;
- maintaining an adequate supply of high quality food at reasonable prices; and
- encouraging agricultural exports as a way to pay for the industrialization of the Nation and for imports.

When the United States declared its independence of Great Britain in 1776, it did so largely because of repressive agricultural policies. Great Britain was taxing and controlling Colonial exports of agricultural commodities, had limited westward movement by forbidding settlement west of the Allegheny Mountains, and was collecting quitrents, or small fees, on lands that settlers had bought. When

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the new Nation was established, quitrents were quickly abolished, export taxes were forbidden by the Constitution, and western lands were opened to settlement.

The Congress stimulated western settlement, which both protected our frontiers and encouraged independent farmers, by passing the Ordinances of 1785 and 1787. These made it easier for farmers to obtain title to land and brought new lands into the Nation as States as their populations increased. With the goal of making new farmers free, independent producers, Congress continued to modify the land laws until in 1862 it gave men or women who would settle on western lands for 5 years title to 160 acres.

By the late 1850's, a major depression had hit the Nation. Political leaders were concerned with maintaining a healthy, expanding agriculture in part because farm exports had been increasing, making up about 80 percent of total exports. In 1862, Congress passed and President Abraham Lincoln signed laws establishing the Department of Agriculture, granting land to the States for agricultural colleges, and giving homesteads to settlers in the West. Agricultural research was greatly strengthened in 1887 with passage of the Hatch Agricultural Experiment Station act. Together, research and opening new lands to farming increased total production and the productivity of individual farmers.

During the Civil War, the demand for farm products, both domestic and foreign, sent prices up sharply. Labor was short as young men from both the North and the South joined the armies. Farmers turned to the comparatively new horse-drawn machinery to increase production despite the labor shortage, a change that has been called the first American agricultural revolution. However, prices received by farmers fell irregularly but persistently from the end of the War until about 1896. Farmers experienced 30 years of hard times. The basic problem was overproduction, although farmers did not recognize it. Production was increasing about twice as fast as population. Increased domestic per-capita food consumption and exports were not enough to take up the slack.

Farmers organized nationwide associations to solve their problems through cooperatives and to press for Government action. They called for the regulation of railroads and warehouses and for the breakup of monopolies. Congress passed the Interstate Commerce Act and the Sherman Anti-Trust Act, but these had little effect on the farm situation. Farmers then called for an increase in the money supply, first for more currency and then for the free coinage of silver. In the 1890's, they organized the Populist Party and came close to electing a president.

After the turn of the century, the rate at which farm production had been increasing began to slow, while both domestic and foreign demand increased. Farmers also benefitted from a mild inflation, triggered by the discovery of gold in Alaska.

World War I led to a new approach in Federal agricultural policies--a guarantee of minimum prices for wheat and hogs. Farm prices rose, the Government called for increased production, and farmers responded. Large quantities of food went to our overseas allies and to relieve hunger in Europe after the War. Then, agricultural prices collapsed in July 1920, largely because of a sudden decline in export demand. Farmers averaged $2.16 per bushel for wheat in 1919, but only $1.03 in 1921. For more than a decade, prices went up and down, with the trend always down. The situation was aggravated by the rigidity of nonagricultural prices and wages, creating a new gulf between farm income and costs. The continuing farm depression was one of the causes of the Great Depression. Many farmers, of course, prospered. They managed their farms well, adopting the new technology that suited their situations. Some began using tractors, for example.

Hybrid seed corn became commercially available in the Midwest in 1926 and those who adopted it usually profited. Many farmers were aided by the Federal Farm Loan Act of 1916. It encouraged the establishment of both privately owned and cooperative farm mortgage banks, with financial guarantees by the Government.

Cooperatives seemed to many to be the answer to marketing problems, particularly after Congress passed the Capper-Volstead Act of 1922, allowing farm cooperatives some exemptions from the antitrust laws. Cooperatives, though, could not control the marketing of substantial enough amounts of the major crops to keep up prices. Production was increasing and foreign markets had virtually disappeared because of rampant nationalism in Europe and the change in status of the United States from a debtor to a creditor nation as a result of World War I.

Farm organizations, led by the new American Farm Bureau Federation, called for national legislation to maintain farm prices and incomes. Congress twice passed the McNary-Haugen bills, which would guarantee farmers fair prices for their share of the domestic market for basic commodities, while the surpluses would be sold abroad by a Government corporation. These bills were vetoed by President Calvin Coolidge in 1926 and 1927. In 1929, legislation was passed authorizing Government loans to cooperatives to hold products off the market until prices improved and authorizing the establishment of stabilization corporations to purchase wheat and cotton. The Farm Board which administered the program was out of funds by 1933, due to continuing sharp declines in farm prices as a result of the Great Depression and a lack of authority to control production. After his inauguration in 1933, President Franklin D. Roosevelt asked the Congress to pass legislation that would "increase the purchasing power of our farmers and the consumption of articles manufactured in our industrial communities." Congress responded with the Agricultural Adjustment Act of 1933. The act, signed on May 12, 1933, by President Roosevelt, gave the Secretary of Agriculture authority to reduce acreage or production by voluntary agreements, to enter into marketing agreements with processors to control prices paid to producers, and to license processors and others with the aim of eliminating unfair practices. Farmers could receive rental or benefit payments and the Department of Agriculture could spend money to expand markets or remove surpluses. These activities were to be financed by a processing tax.

The year after the act was passed, Secretary of Agriculture Henry A. Wallace wrote: "The present program for readjusting productive acreage to market requirements is admittedly but a temporary method of dealing with an emergency." Yet, 50 years later, this "temporary method of dealing with an emergency," while modified, is still in effect.

The Agricultural Adjustment Act was aimed primarily at improving the financial situation of the average farmer. It was followed by a number of agencies and laws aimed at particular farm problems. The Resettlement Administration, later the Farm Security Administration and now the Farmers Home Administration, was established by the President in May 1935 to help destitute farm families and to retire submarginal land from production.

Congress passed the Emergency Farm Mortgage Act on May 12, 1933, and followed it with the Farm Credit Act of June 16, 1933. The Farm Credit Administration was established in June 1933 to handle both emergency and long-term credit programs. The Rural Electrification Administration was established in 1935. The Soil Conservation Service was established in April 1935 under authority of the Soil Conservation Act of 1935. It succeeded the Soil Erosion Service. One of the most acute of the Depression-born problems was that of getting food to people in the midst of surpluses. Beginning in 1933, the Federal Government undertook

direct distribution of surplus food. School lunch, milk, low-cost milk, and food stamp programs came along.

The production control provisions of the Agricultural Adjustment Act were invalidated in 1936 by the Supreme Court. These provisions were replaced in part by the Soil Conservation and Domestic Allotment Act of 1936, which attempted to reduce production of surplus crops by payments for improved land use and conservation practices. However, surpluses began to accumulate and new legislation was passed. The Agricultural Adjustment Act of 1938 stressed an "ever-normal granary" plan of balanced abundance, with nonrecourse loans for cooperators, acreage allotments, marketing quotas for "basic" crops, and a goal of "parity" prices and incomes for farmers. This act, with many modifications, remains the basis of agricultural price support and adjustment law today.

World War II triggered a second American agricultural revolution, bringing major changes in land use, farm policies, agricultural production, farm management, and farm life. Even before the Japanese attack on Pearl Harbor, the United States supplied food to Great Britain and the Soviet Union. Secretary of Agriculture Claude Wickard called for increased production of many commodities in 1941 and Congress, in the Steagall Amendment, provided price supports for them.

World War II sent farm prices over 100 percent of parity and Congress guaranteed high support prices for 2 years after the cessation of hostilities. After this period, modifications of price support and adjustment legislation were marked by controversy and compromise. The major controversy for many years was between those advocating support levels at a high, fixed level of parity and those advocating flexible price supports adjusted to supply and demand. The Agricultural Act of 1949, which like the Agricultural Adjustment Act of 1938 is still on the books, supported major commodities at between 75 and 90 percent of parity, depending on supply.

During the fifties, surpluses began to accumulate and the Congress looked for ways to stimulate foreign trade. The Agricultural Trade Development and Assistance Act of 1954, known as Public Law 480, authorized the Government to make agreements for the sale of farm products for foreign currency, to make shipments for emergency relief and other aid, and to barter farm products owned by the Government for needed materials. P.L. 480 has proved so valuable that it has been extended into the eighties, but it is far from a complete answer to the surplus problem.

The Soil Bank, established by the Agricultural Act of 1956, was still another large-scale effort to deal with surpluses. The goal was to bring about adjustments between supply and demand for agricultural products by taking farmland out of production. An acreage reserve was aimed at a short-term withdrawal of land planted to major commodities, while a conservation reserve looked to the withdrawal from agriculture of any land designated by the farmer for a period of up to 10 years. In 1957, 21 million acres were in the acreage reserve and 29 million acres in the conservation reserve, with the program generally considered a success. Other types of land withdrawal programs were in effect during the sixties.

The Food and Agriculture Act of 1965 attempted to separate the income enhancement features of farm programs for basic crops from their stability-enhancing features, as had been done for wool since 1954. A similar step for wheat had been taken in 1964 after farmers turned down rigid marketing controls.

By 1973, the demand for U.S. farm products was at a high level due to world crop shortages and worldwide inflation. World demand, combined with export subsidies and the devaluation of the dollar, had liquidated the stocks which had been established under previous price support programs. The Agriculture and Consumer Protection Act of 1973 emphasized production to respond to "evergrowing worldwide demand for food and fiber" and permitted substantial changes in the ways programs were implemented.

The 1973 act was designed to provide protection for farm incomes while permitting American products to move into world trade. Farmers would be assured target prices, which would take into consideration the trend of domestic and world prices, supplies, cost of production, and other factors. Loan rates would be set below market prices to encourage products to move into markets rather than into Government storage. Direct payments on crops, called deficiency payments, would be made to farmers when the target price was higher than either the loan rate or the market price.

During the 4 years that the 1973 act was in force, market prices for most supported commodities remained above target prices, partly because of a strong world market. Many farmers, however, were concerned over rising production costs and felt a need for higher levels of price support. The Food and Agriculture Act of 1977 represented a compromise between the farmers' concerns and the need to keep potential program costs at reasonable levels. A farmer-owned reserve program for wheat was to encourage farmers to hold their grain from 3 to 5 years rather than turn stocks over to the Government. This would allow them to reap the benefit if prices increased significantly during that period.

During the 4 years covered by the 1977 act, demand and prices for farm products were generally high, although at the end of the period some falling off in both could be seen. However, the general pattern of price supports through loan programs and target prices established in 1973 was continued in the Agriculture and Food Act of 1981. The acts of 1973, 1977, and 1981 extended P.L. 480 and the food stamp and related programs.

During the time that the 1981 act has been in effect, agricultural exports have declined and market prices for farm products have weakened. Legislated levels of loan rates and target prices predicated on continued inflation and expanding markets proved to be well above actual market prices. During 1981 and 1982, substantial surpluses accumulated, and the costs of price support programs increased sharply. A payment-in-kind or PIK program used by the Department of Agriculture in 1983 offered surplus agricultural commodities owned by the Government in exchange for agreements to reduce production by cutting crop acreage. The program achieved its objectives of reducing production and eliminating much of the Government-owned surplus, except for wheat. Further improvements in the farm economy will depend upon continued recovery in the U.S. and world economies, adjustments in exchange rates, and better access to world markets for American farm products.

During the past 50 years, the Government has supported the prices of basic farm products by several different methods. These methods have varied as economic conditions and farm technologies have changed. During this time, the number of farms declined from 6.3 million to 2.4 million. The average farm increased from 157 acres to 437 acres, while the share of the employed working force in farming declined from 26 percent to 3.4 percent. In 1933, farm products made up 35 percent of America's exports, compared with 19 percent today, but the dollar volume has increased from $2 billion to $39 billion.

These trends may continue, yet the objectives of America's farm policies are much the same today as they were when we declared our independence. Partly as a result of these policies, American farmers today are free, independent business people, Americans enjoy an adequate supply of high quality food at a lower cost in terms of their income than in most other nations, and agricultural exports contribute substantially to the national economy.

U.S. Agriculture and the Macroeconomy

Paul T. Prentice and David A. Torgerson*

ABSTRACT

The farm economy and the general economy are so closely linked that economic conditions and policies beyond the farm gate can affect agriculture's well-being as strongly as farm programs which focus on individual commodities. Macroeconomic conditions and policies affect demand for farm products and, thus, farmers' revenue as well as the cost of farming. Longrun trends in the general economy suggest that future growth in domestic demand will not be sufficient to eliminate excess farm production. A macroeconomic policy mix of fiscal stimulus combined with monetary restraint is harmful to agriculture and other interest-sensitive, export-dependent, or import-competing sectors--at least in the short run.

KEYWORDS: Fiscal policy, macroeconomics, monetary policy, multiplier.

INTRODUCTION

From a policy perspective, one of agriculture's most important features is its integration into the broader economy here and in other countries. The linkages between the farm economy and the macroeconomy are so close that conditions and policies beyond the farm gate can have as much or more effect on agriculture's well-being as traditional farm programs which focus on individual commodities.

Farmers purchase more than four-fifths of their production items from outside the sector. They sell most of their production to the nonfarm economy and a substantial amount to international markets. Interest payments--the farmer's biggest cash production expense and, thus, a major factor deciding net income--are partly determined by conditions in national financial markets and are influenced by macroeconomic policies.

Farming has always been tied to the larger economy. But the nature of the relationship has been altered during recent decades by several developments:

- The world economy has grown more interdependent. The output of the world economy doubled from 1960 to 1980, the volume of all world trade quadrupled, and the volume of agricultural trade more than doubled. The United States accounts for about 25 percent of the world's economic output and about 35 percent of the industrialized nations' output. The value of agricultural exports rose from 14 percent of U.S. farm cash receipts in 1960 to about 30 percent in 1980.

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- The interlocking of the world economy and the associated development of global capital markets means that business cycles, like most other economic phenomena, are no longer confined to national economies; they are international. Since farm exports depend so heavily on economic conditions abroad, global business cycles, which are closely tied to U.S. economic conditions, have a major impact on demand for U.S. farm products. This is important because 2 out of 5 U.S. crop acres harvested now produce for export.

- Farmers have become more dependent on purchased inputs. The costs of many of these items are determined outside the farm sector, primarily by factors affecting the general economy.

- Farmers have become heavy users of capital-intensive technology and more of that physical capital is financed by debt. About 75 percent of farmland purchased also is debt-financed. The interest cost alone of farm debt rose from 5 percent of farm expenses in 1960 to 16 percent in 1982, as both debt levels and interest rates rose substantially. Thus, farmers are increasingly affected by developments in the general economy that determine the availability of loanable funds and level of interest rates.

The net result of these developments is that macroeconomic forces regularly influence farmers' production costs, the demand for their products, their competitiveness in domestic and international markets and, ultimately, their income levels and wealth.

FACTORS AFFECTING ECONOMIC GROWTH

In the long run, economic growth is primarily determined by growth in labor and productivity. But macroeconomic policy--both monetary and fiscal--also plays a role in economic growth.

Labor and Productivity

Economic growth (real GNP) is, by definition, the product of growth in the employed labor force and in output per worker (productivity) (2). While growth in the labor force is a result of a complex mixture of demographic and socio-economic factors, growth in productivity is largely a result of capital formation and technological advances. Longrun trends in the U.S. economy suggest that real gross national product (GNP) can potentially expand about 3 percent per year--based on labor force growth of just over 1 percent and productivity gains of just under 2 percent. Empirical evidence suggests that the elasticity of farm-level demand with respect to income is about 0.4, other things being equal (1). Thus, the 3-percent annual growth in potential real GNP implies an underlying trend growth in domestic demand measured at the farm level of about 1.2 percent per year. This is significantly below the nearly 2-percent annual trend increase in total factor productivity for agriculture. This basic domestic supply-demand imbalance implies that farmers are dependent on world markets for demand growth.

Macroeconomic Policies

Macroeconomic policies have important impacts on resource allocation and efficiency, affecting longrun potential GNP. Tax and spending policies can be

geared to provide increased incentives to work, produce, save, and invest, and they also help to determine the level of Government expenditures and revenues.

Credit policies partly control the supply of money in the economy. But they also can b designed to reduce regulation and subsidies in financial markets, thereby freeing resources for more efficient uses. On the international side, trade policies can raise real world economic output and incomes by allowing countries to best utilize their resources through the principle of comparative advantage.

Macroeconomic policies--both here and abroad--can raise potential economic growth by encouraging higher participation in the labor force, increased accumulation of productive physical capital, increased investment in research and development, and a more efficient allocation of international resources. Raising the longrun trend in growth of potential U.S. real GNP just 1 percentage point--from 3 percent to 4 percent--would be expected to increase real demand at the farm level by about $2 billion at the end of 10 years. Further improvements would also come from increased world economic growth and export demand.

THE IMPACT OF BUSINESS CYCLES

Although the economy's longrun trend rate of growth has been about 3 percent, significant business cycle fluctuations have occurred about every 3 to 5 years. In the short run, the economy can grow above potential during an expansion phase (with significant inflationary pressures) and fall below potential during a contraction (generally with disinflationary pressures). During the seventies and the early eighties, the economy operated below full potential most of the time. The gap between potential and actual real GNP reached a record $181 billion in the first quarter of 1983--a shortfall of about 11 percent (fig. 1).

Major factors responsible for the shortfall included oil price shocks, weak productivity growth, high interest rates, and back-to-back recessions. This implied about a 4.5-percent shortfall in domestic real farm-level demand from its longrun potential, or about $2 billion in foregone real agricultural output.

Inventory-Accelerator Investment Cycles

The U.S. economy experiences two types of business cycles, which have different impacts on agriculture. Inventory-accelerator investment cycles occur as a result of the tendency of firms to overproduce and build inventories in response to increases in final demand. When inventories become too burdensome relative to final sales, firms cut production and employment while they deplete inventories to more desirable levels--and the cycle starts over again.

Sometimes exogenous shocks can set off an inventory investment cycle. The farm export boom of the midseventies provides a good example. In response to sharp increases in export demand, farmers increased production.

The farm input and transportation sectors likewise raised production and employment, which then fed into other sectors. When anticipated longrun increases in exports failed to extend beyond the seventies, input suppliers, farmers, and shippers found themselves in a dramatic oversupply position. At such a point, farm policies can be used to initiate resource adjustments and move the sector toward equilibrium. The recent PIK program was an attempt to help farmers to bring supplies back in line with demand. However, should export demand remain sluggish, further resource adjustments may be necessary.

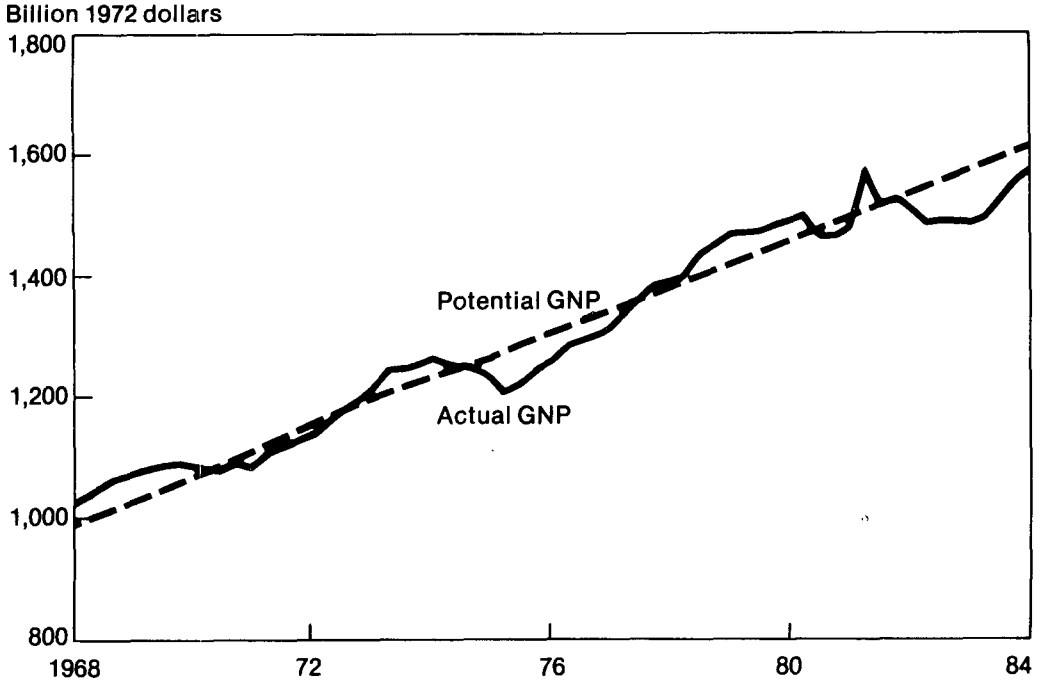
Monetary Cycles

Monetary cycles also play a role in the shortrun business cycle. As the economy expands towards full employment, labor and product markets tighten and inflation tends to accelerate. For a given level of the money supply measured in current dollars, a higher price level reduces its real (deflated) value--causing interest rates to rise. Final demand for interest-sensitive sectors such as consumer durables, housing, and business fixed investment weakens. Production and employment cutbacks in these sectors eventually lower final demand for other products and the economy slips into recession. As slack develops in labor and product markets, inflation eases (although with a time lag due to downward price and wage rigidities), causing real money balances to be higher than otherwise. This, in turn, lowers interest rates and causes a rebound in those same interest-sensitive leading industries and the cycle starts over again. Although monetary cycles used to be exacerbated by regulated ceilings on interest rates--which caused a near shut-off of credit flows to certain sectors--recent deregulation of financial markets has mitigated this problem.

Monetary cycles and policy shocks have a strong shortrun impact on agriculture. Interest rates affect domestic demand for crop inventories, influence investment in livestock herd expansion, and help to determine foreign exchange rates and, thus, export demand. Also, the debt structure of agriculture makes farm expenses sensitive to interest rates. High interest rates put the farm sector in the double bind of reduced demand but increased costs. Finally, monetary shocks often cause overshooting of commodity prices and associated asset values. Clearly, agriculture is very sensitive to monetary developments.

Figure 1

Actual and potential real gross national product



Modifying Business Cycles

Rather than being either inventory-accelerator or monetary in nature, most business cycles are a combination of both. Countercyclical macroeconomic policies can, in principle, be pursued in order to stabilize the business cycle. Because fiscal and monetary policies do have dramatic shortrun expansionary or contractionary impacts on the economy, they can be coordinated to dampen economic fluctuations. Fiscal and monetary policies can be gradually tightened as the economy expands towards full capacity in order to prevent an inflationary boom and gradually loosened during recessions in order to prevent a deflationary bust. Unfortunately, this "fine tuning" is very difficult to apply in practice. Policy initiatives that are delayed by political disagreement or encounter an economic time lag often have unintended consequences such as further stimulating the economy during an expansion or slowing it during a contraction.

Business Cycles and Agriculture

The response of the farm economy to business cycles differs from that of other sectors. When economic contraction weakens final demand in other sectors, firms tend to reduce output and employment. Prices for finished consumer goods tend to be extremely sticky--that is, they are slow to change--at least in the short run. Only after a prolonged period of weak demand do manufacturers reduce their prices, eventually reducing their excess inventories and restoring market equilibrium. This is in direct contrast to primary extractive industries such as farming, forestry, fishing, and mining, where prices adjust rapidly to changes in demand. Raw commodity prices are often determined in competitive auction markets or have contracts written for shorter duration than for finished goods.

In agriculture, resources are inflexible in the short run. There are few alternative uses for farmland and specialized capital equipment. Further shortrun output rigidities are due to time lags in the biological nature of agricultural production. For example, demand may increase during one growing season, but the farmer cannot increase output until the next.

A second and related factor is that modern farming is capital intensive. Agriculture uses nearly three times more capital per unit of output than other businesses. Also, the capital-to-labor ratio is twice as high. Consequently, when the economy weakens and the demand for farm commodities declines, prices tend to adjust more rapidly than output because of relatively high fixed costs. In agriculture prices adjust to changes in demand, while in other sectors output adjusts. Because of the inelastic supply, farm output price volatility is passed through to volatility in factor returns--including net farm income. Only after a prolonged period of weak demand does agriculture adjust output, sometimes with the help of Government programs. Price volatility is the rule rather than the exception for raw industrial inputs--including agricultural products (fig. 2). Variations in weather and export demand also contribute to agricultural price volatility. Evidence suggests that the flexibility of aggregate real farm prices with respect to growth in real GNP is about 1.5--other things being equal. Thus, a 10-percent change in real GNP will, on average, lead to a 15-percent change in aggregate real farm prices. Of course, price response varies among individual commodities. For example, demand for consumer durables often leads a recovery, cotton demand is typically concurrent, and livestock demand may lag until the second year of the recovery. Although Government programs can help smooth out this volatility somewhat, no program can totally insulate agriculture from these economic fundamentals.

Recent history provides an excellent example of agriculture's response to the business cycle. During recovery from the 1973-75 recession, fiscal policy was gradually tightened while monetary policy was gradually loosened. This policy mix kept real interest rates low and led to a vigorous economic expansion until 1979. At that point, the economy was operating close to full capacity and the earlier monetary stimulus initiated a high and rising wage-price spiral, with little room for further real growth. Monetary policy was then tightened in order to reduce inflation; real interest rates rose; and the economy plunged into recession in early 1980 and didn't fully recover until 1983. The world economy followed a similar pattern--although lagging the U.S. cycle. The low real interest rates during the 1976-79 recovery caused the value of the dollar to fall in foreign exchange markets, just as the high real interest rates during the ensuing recession caused the dollar to rise (fig. 3). Also, fiscal policy became expansionary in 1981. Taxes were cut and consumer spending and business investment increased. These policies were especially expansionary in light of the deficit (fig. 4), discussed below.

Agricultural conditions followed about the same pattern as the general economy, except for weather-induced fluctuations in crop yields. As the domestic economy expanded during 1976-79, so did demand for farm products. Also, strong world economic growth combined with a weak dollar boosted export demand. When the world plunged into recession in 1980, domestic as well as foreign demand weakened, and farm exports were further hurt by the strong dollar. As agricultural output did not decline, farm prices plummeted even further while costs continued to rise due to high interest rates and time lags (about 2-3 years) between the onset of recession (1980) and the eventual reduction in

Figure 2

Implicit price deflators for GNP and farm output

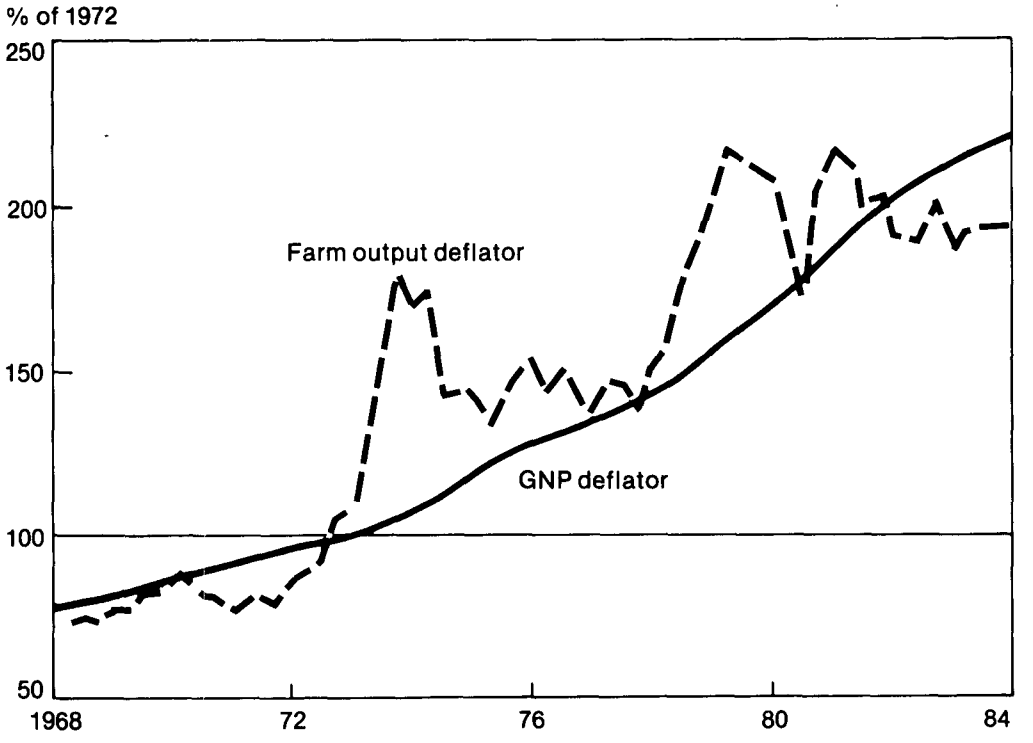


Figure 3

Foreign exchange value of the U.S. dollar

Weighted index (percent of 1970)

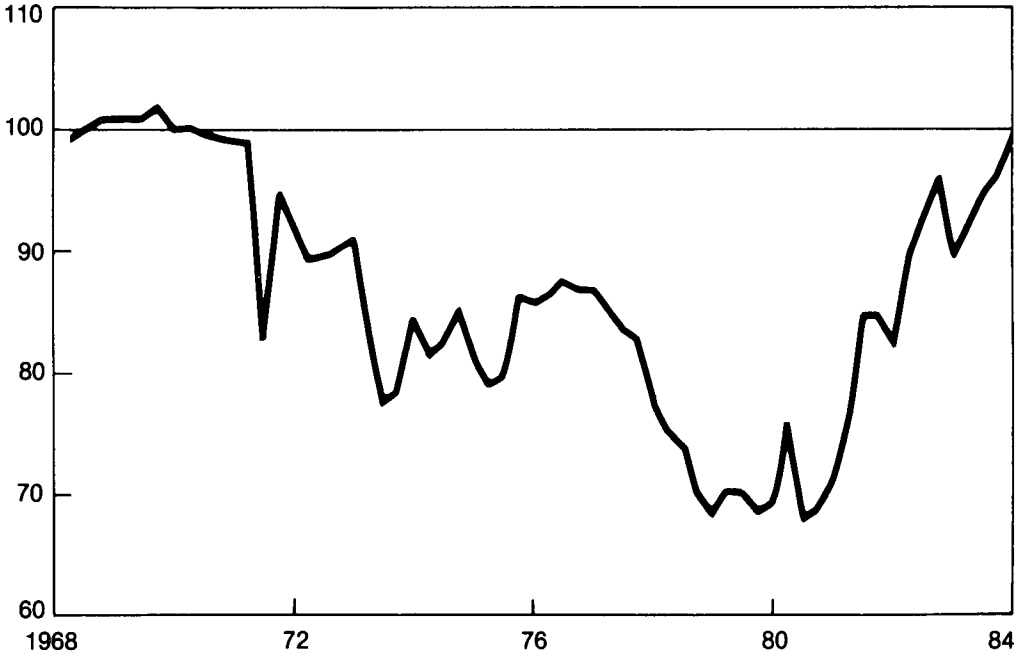
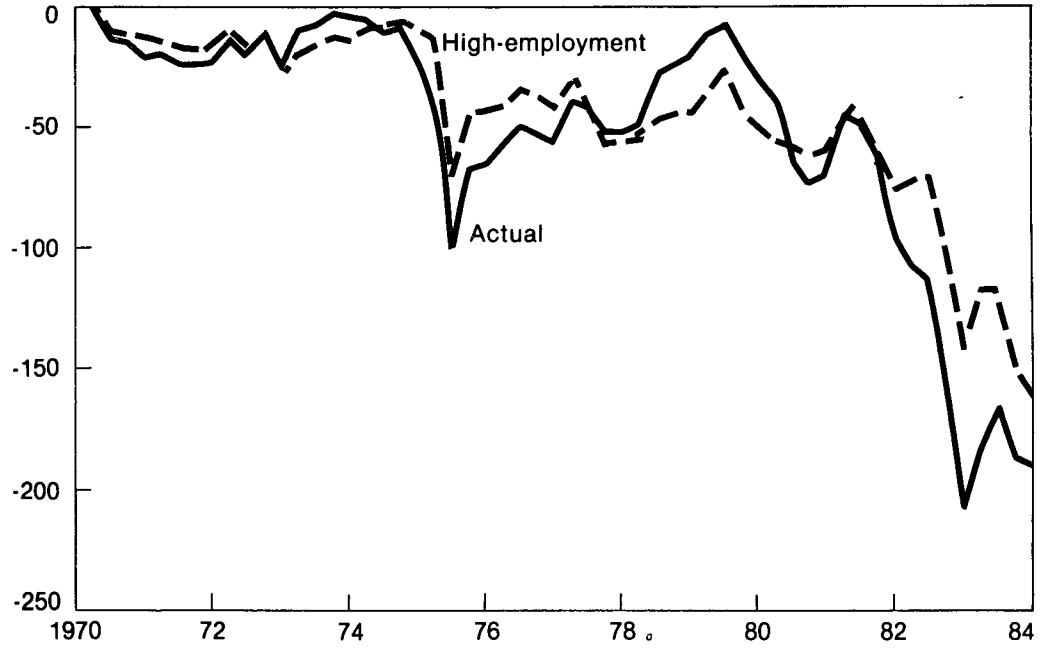


Figure 4

Actual and high-employment Federal deficit

Billion dollars



general inflation (1982-83). This is a typical overshooting phenomenon--raw commodity prices respond quickly to monetary shocks but manufactured input prices respond with a lag. As mentioned earlier, real farm prices and incomes are very sensitive to monetary shocks. Real net farm income measured in 1972 constant dollars dropped nearly in half from its peak of $19.8 billion in 1979 to $10.7 billion in 1982.

THE MACROECONOMIC OUTLOOK AND AGRICULUTRE

Current forecasts for the rest of 1985 and 1986 show disposable income up moderately, implying a modest increase in consumer demand for food and beverages (a 1-percent increase in real per capita income results in approximately a 0.3- to 0.4-percent increase in food demand). However, not all of the increase in demand will be felt at the farm gate, and it will vary from commodity to commodity. A large portion of the increase will be allocated to restaurant spending and other marketing service additions to raw farm products. Nevertheless, continued economic recovery will most likely generate some increase in domestic farm-level demand.

The outlook for a sustained, strong U.S. recovery is still clouded by concerns over the large Federal deficit. Continued restraint in the growth of the money supply, combined with a large demand for both public and private credit, suggest that real interest rates will remain high. This could eventually weaken economic growth in coming years and dampen domestic demand for farm products. So far, about one-half of the Federal budget deficit is being financed by increased net capital inflows from abroad. This implies an equal but opposite current account deficit--largely consisting of a huge negative trade balance. Foreign savings are coming in to finance the shortfall of domestic savings (a Federal budget deficit represents dissaving) so that, in effect, the trade deficit is a reflection of the unmonetized budget deficit. Unless fiscal policy is tightened or monetary policy is loosened, the U.S. recovery will remain dependent on foreign capital. This means that recovery will continue to be unbalanced, largely bypassing export-dependent or import-competing industries--including agriculture. Real gross national product will continue to increase, but the sectoral mix will continue to shift away from interest-sensitive and trade-oriented sectors.

The value of the dollar is likely to remain high because of favorable returns on American investments and confidence in the U.S. economy. But this also means that U.S. products will remain relatively expensive to foreign customers. Over the past 2 years alone the United States has lost about $6 billion in foregone agricultural export sales just due to the appreciation of the dollar. It should be noted, however, that in the late seventies the dollar was unusually weak and exports were unusually strong.

Although the rise in the value of the dollar has had a negative effect on farm exports, it has also cut 2 to 4 percentage points off the general inflation rate through direct and indirect effects on the U.S. general price level, benefiting farmers from the cost side. Farmers purchase a significant amount of fertilizer, chemicals, and farm machinery from international sources. A strong dollar has held down cost increases of these inputs. The prices of internationally produced energy goods such as oil and natural gas also have been held down by the strong dollar. Nevertheless, although a strong dollar has a positive influence on the agricultural sector by moderating production costs, such benefits are at least partially offset by the negative impact of reduced export demand.

Foreign exchange rates are not the only determinant of demand for U.S. farm exports. Foreign economic growth is the major factor in total world trade and foreign exchange rates are more of a determinant of market share of that total.

As world gross domestic product (GDP), personal incomes, population, and employment generate increases in world demand for food, part of the increased demand will be met by larger imports from the United States and elsewhere. So far, the world recovery is lagging the U.S. recovery and is forecast to continue to lag in 1985. For the first 3 years of this decade, the European Community had an average real growth rate of 0.4 percent, compared to a trend of about 4 percent during 1960-79. Japan had a corresponding growth rate of 3 percent, less than half of the 7-percent trend shown by past performance. If trend levels had continued through 1983, U.S. grain and soybean exports would have been 10 million metric tons higher. It may be towards the end of the decade before the economies of major trading partners are fully recovered and substantial strengthening in agricultural exports is achieved. Also, developing countries were the fastest-growing markets for U.S. farm products in the seventies, partly due to their higher income elasticity of food demand and partly due to cheap credit at low (sometimes negative) real interest rates. Current debt constraints and slow economic growth are causing developing countries to curtail imports while they try to spur their own exports. This has further dampened U.S. agricultural exports.

Interest rates are expected to rise moderately in 1985 and 1986. This will likely raise farm costs because interest expense is a large share of total production costs. At recent levels, a 1-percentage point change in the average interest rate on outstanding farm debt would lead to about a $2-billion change in farm production expenses. However, it takes time for farmers to feel such an impact since the average interest rate on their debt (old and new) changes slowly. The high fixed interest expenses that many farmers now pay will continue to be a problem.

Inflation in the economy increases prices paid by farmers in about a 1-to-1 ratio on average, over time (fig. 5). Thus, the rapidly accelerating inflation in the late seventies was matched by rapidly accelerating farm costs. Similarly, the lessening in inflation has helped to slow rises in prices paid by farmers for nonfarm origin inputs to about 2 percent in 1983--the slowest increase in over 10 years.

At recent levels of production expenses, a 1-percentage-point increase in inflation will lead to about a $1.5-billion increase in farm production expenses. Thus, with a slight increase in inflation that is forecast for 1985 and 1986, farm costs should increase somewhat, too.

EFFECTS OF FISCAL AND MONETARY POLICIES ON AGRICULTURE

The mix of monetary and fiscal policies can have major implications for agriculture. Fiscal deficits can exert opposing influences on agriculture, depending on their source.

Fiscal Policy

The impact of the Federal budget deficit on agriculture and the general economy is a major concern. However, it is important to distinguish structural from cyclical Federal budget deficits. Cyclical deficits are largely passive in nature, being the result of automatic stabilizers built into expenditures

(such as unemployment compensation and food stamps) that automatically rise during recessions even as tax revenues fall. These deficits merely replace falling private demand with rising public demand and have little impact on interest rates or foreign exchange rates.

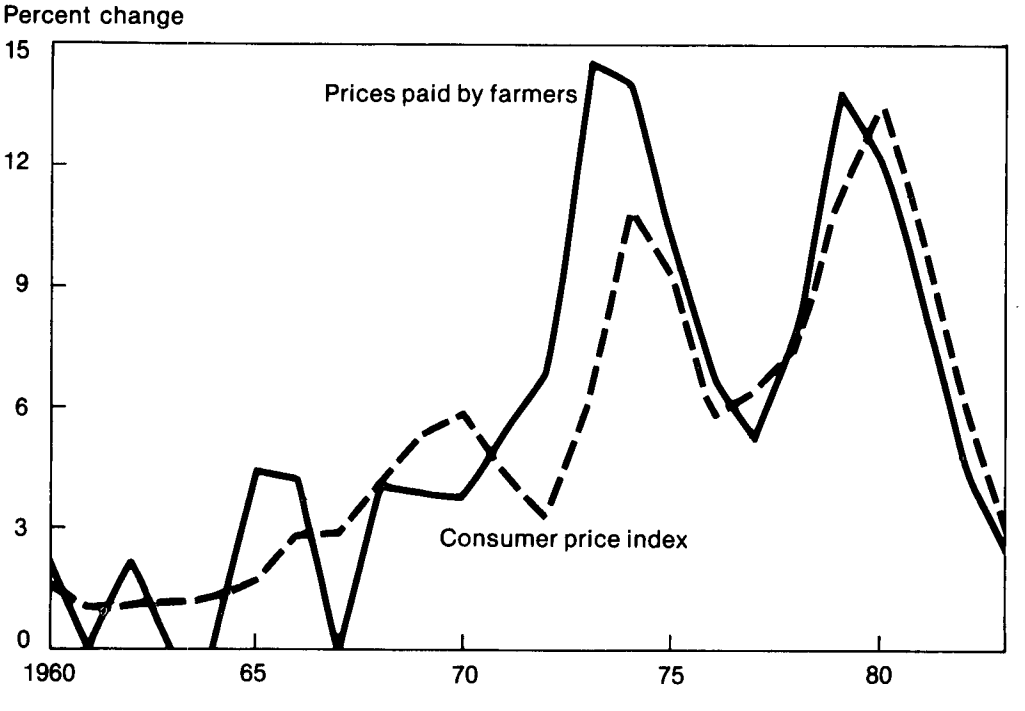
Conversely, a structural, or high-employment, deficit measures what the deficit would be if the economy were operating at full potential, and is a better measure of net fiscal stimulus than the cyclical deficit. High-employment deficits put upward pressure on interest rates as Government competition for funds crowds out other borrowing sectors such as investment and housing. Sectors that depend on exports or compete with imports are also crowded out as higher interest rates lead to higher foreign exchange rates, net foreign capital inflows, and an offsetting trade deficit.

The current policy mix of fiscal stimulus combined with monetary restraint is the exact opposite of the policy mix during the previous recovery. Rather than the strong growth, low interest rates, and weak dollar, followed by the rapid inflation during the 1976-79 recovery, current policies are expected to result in more moderate growth, higher interest rates, and a stronger dollar in the short term, but would be significantly less inflationary. Budget deficits resulting from a true countercyclical fiscal stimulus are likely beneficial to agriculture--at least in the short run--as they help shore up final demand during recessions with little or no impact on interest rates or foreign exchange rates. The longrun impact is likely neutral.

Conversely, structural deficits are likely detrimental to agriculture. In the short run, final domestic demand will be stronger, but because of higher interest

Figure 5

General inflation and prices paid by farmers



and exchange rates, export demand will be weaker. Furthermore, farm costs will be higher because of higher interest rates. The longrun impact is likely to be adverse. Domestic demand will be unchanged but export demand will be less and farm interest expenses will be higher, although the strong dollar will hold down prices for manufactured inputs.

Monetary Policy

A Federal deficit can be financed by monetizing it (printing more money) or by borrowing from private capital markets. Printing more money creates artificial demand and is a primary source of inflation. To minimize the danger of refueling inflation, especially after going through so much pain to get it under control, the Federal Reserve has chosen to hold down growth in the money supply. Hence, the deficit is being financed by the Government borrowing in the money market in competition with private borrowers. Federal borrowing in 1983 required approximately 40 percent of the $617.3 billion in loanable capital raised from domestic and foreign sources. By comparison, corporations borrowed just $57.4 billion and issued only $15 billion in new bonds. A large Federal deficit financed by borrowing rather than monetization increases competition for credit and drives up real interest rates.

Inflation is kept in check, but farmers feel the effects of high interest rates:

- Cash flow problems for heavily debt-leveraged farmers are increased.
- Economic growth and income growth are dampened, which reduces farmers' domestic sales.
- Competition for U.S. dollars in world markets drives up their value, makes U.S. exports more expensive to others, and thus reduces farm exports.
- Foreign capital is invested in the United States or in dollar accounts abroad; while this may appear beneficial in the short run, it reduces funds available in foreign countries to pay for imports and for their internal investment and growth, further reducing U.S. farm exports in the long run.
- The credit problems of debt-ridden countries worsen, making it more difficult for them to borrow for internal investment; the net result is reduced ability to import U.S. farm products.

The Monetary Control Act of 1980 provides a phased deregulation of U.S. financial institutions. The purpose of the Act (as well as followup legislation in 1982) is to provide a more market-oriented, competitive financial environment. This should increase economic efficiency, allowing funds to flow more smoothly to and from economic sectors, geographic locations, and individual enterprises according to their ability to earn competitive rates of return.

For agriculture, deregulation has led to a closer interlocking of rural credit conditions with national, rather than regional, financial markets. The agricultural sector is now less insulated from national monetary shocks, and increased interest rate volatility nationally has translated into increased volatility in local rates. Management strategies at rural banks must now include hedging against future changes in interest rates, as well as more traditional portfolio and balance sheet considerations. Also, the Farm Credit System

has always had access to national markets, while commercial rural banks have not. Thus, deregulation will make commercial banks more competitive than they used to be and should halt or reverse their recent trend of declining market share. Under deregulation, credit crunches--a shut-off of credit to certain sectors--are likely to be supplanted by general squeezes on all sectors. These squeezes will ration credit by price. Finally, financial deregulation means that U.S. agriculture will have to earn its access to credit in more direct competition with other sectors. This could contribute to a flow of excess resources out of the farm sector. The current Farm Credit System, by charging below-market interest rates, has contributed to excess agricultural production capacity.

AGRICULTURAL IMPACTS ON THE GENERAL ECONOMY

Just as macroeconomic developments affect agriculture, agricultural developments and policies affect the general economy. For example, higher farm prices typically mean higher net farm income. As farmers spend their additional income (either on consumption goods or capital equipment), it multiplies through the general economy to bring about higher levels of aggregate production, income, and employment. Recent studies indicate that aggregate demand multipliers are about 2 to 1 for most of the economy, including agriculture. (Each $1 of additional demand generates about $2 in additional GNP.) Thus, at 1982 levels, each additional $1 billion in farm demand would likely generate 60-65,000 additional jobs annually. This is a rough estimate, as multipliers vary over the course of the business cycle and with the degree of stimulus. It is important to keep in mind that this impact is generated by raising farm prices and income through increased demand for farm products, rather than by restricting supply. A simple transfer of income would have little multiplier impact, as no net increase in demand would be generated.

Higher farm prices and incomes can also be generated by restricting supply. But reducing agricultural production might actually reduce real GNP, aggregate income, and employment in the rest of the economy. Farmers would have more real income, but other sectors would have less, at least in the short run. Agricultural supply restrictions redistribute a share of the total income pie to agriculture rather than increasing the total pie and may, in fact, reduce it. Estimates show that a 10-percent reduction in agricultural acreage would reduce input use about 6 percent in the short run, generating less income and employment in the associated industries, with negative multipliers through the general economy. Further losses in economic activity and income would occur in the transportation, processing, and marketing industries. These losses may not be offset by the positive job-creating impacts of the higher farm incomes. The net impact of higher farm incomes but lower associated industry incomes could be negative.

In summary, higher commodity prices that result from increased demand mean higher net farm incomes which, when spent, generate additional jobs nationally for additional net farm income. On the other hand, higher farm commodity prices that result from reducing output--with no changes in demand--result in higher net farm income, but the job-creating impacts of spending that income are offset by the job-reducing impacts of reduced production and reduced use of production inputs (fertilizer, fuel, seed, machinery, and the like).

A much larger (7-to-1) multiplier impact of higher farm income has been cited to support the argument that the Government could cure a recession by artificially supporting high farm commodity prices. Three points are relevant here:

- The forties study using those high impact multipliers was based on unique conditions of the Depression of the thirties.

- The high artificial price supports would have to be accompanied by supply reduction programs which would offset the job-creation impacts of the higher prices.

- The cost of artificial price supports would have to be paid by taxpayers and would be a Government-directed redistribution of income from taxpayers at large to farmers. The negative job-reducing impact of reducing income to taxpayers would offset jobs created by the higher farm prices, although the jobs would be in different industries.

CONCLUSIONS

Macroeconomic conditions and policies affect the demand (revenue) side of agriculture as well as the supply (cost) side. Given a low income elasticity of demand for farm products in the aggregate, longrun trends in the general economy suggest that growth in domestic demand will be insufficient to eliminate excess production. To alleviate this basic supply-demand imbalance, U.S. agriculture must either increase exports or reduce resource use and productive capacity.

- Trend growth in real per-capita income has been about 2 percent, the retail income elasticity of demand for food and beverages in the aggregate is about 0.4, and the farm-level aggregate GNP income-elasticity is about 0.4. Thus, a 10-percent change in real GNP will generate about a 4-percent change in aggregate farm-level demand while a 10-percent change in real per-capita income will generate a 4-percent change in retail food demand.

- Given these elasticities and population growing at 0.8 percent, annual trend growth in potential retail demand for food and beverages is about 1.6 percent.

- Measured at the farm level, trend growth in potential domestic total food demand is probably between 1.0 and 1.2 percent--well below the 1.6-percent trend growth in retail food demand.

- Trend growth in total factor productivity for agriculture has been about 2 percent.

- Under these conditions, aggregate supply will continue to outstrip domestic demand by almost 1 full percentage point per year.

Fiscal and monetary macroeconomic policies affect inflation and interest rates in the economy as well as influence the business cycle. Inflation and interest rates have a direct impact on the cost side of agriculture.

- Inflation in the general economy is passed through to prices paid by farmers in about a 1-to-1 ratio. At recent levels of production expenses, a 1-percentage-point change in the general inflation rate will lead to about a $1.5-billion change in farm production expenses (3).

- Current interest expenses of around $20 billion are about 15 percent of farm production expenses. A 1-percentage-point change in the average interest rate on outstanding farm debt will lead to about a $2 billion change in farm production expenses.

- High U.S. interest rates contribute to a strong dollar internationally. While this reduces export demand, it also reduces U.S. inflation and farm input costs. A 10-percent increase in the value of the dollar reduces general inflation about 1 percentage point.

- A macroeconomic policy mix of fiscal stimulus combined with monetary restraint is more harmful to agriculture (and other interest-sensitive or export-dependent sectors) than the opposite mix of fiscal restraint combined with monetary stimulus, at least in the short run.

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Profile of the U.S. Farm Sector

David H. Harrington and Alden C. Manchester*

ABSTRACT

The farm sector of the eighties bears little resemblance to its forebear of the thirties. Specialization, technology, and a sophisticated financial system of credit, tax, and international monetary policies have dramatically altered U.S. farming from a set of numerous, small, labor-intensive units to a diverse sector encompassing a wide scale of size, costs, needs, and production efficiencies. Indeed, there is a growing concern that the farm sector has grown so diverse that a single farm policy may be insufficient to address those needs. Domestic and international economic policies play important roles in the well-being of farmers, and future farm policy will need to incorporate those concerns if it is to address the issue of instability of incomes and prices.

KEYWORDS: Debt-asset ratio, farm income, farm numbers, farm size, financial organization, specialization, tax policy, technology.

INTRODUCTION

The organization of farming and the effects of public policies upon it have been issues in American public life since independence. For the first 80 years, the principal issue was the basis upon which public land was made available to settlers, culminating in the Homestead Act of 1862. From then through World War I, the establishment of agricultural science, extension, and marketing services received major attention. The agricultural depression of the twenties brought concern for the generally low level of farm income and attempts to deal with it through the first commodity programs. The Great Depression created a crisis for agriculture which prompted New Deal agricultural programs, directed toward the great bulk of family-operated farms with severe income problems.

The postwar debate on agricultural policy focused on an agriculture composed primarily of family farms, which were defined as viable operations, able to support their operators adequately and offer full employment (3; 4, p. 68). The consolidation of part-time, marginal, or subsistence operations into larger farms was part and parcel of a family farm policy. The major policy issue relating to small farms during the forties, fifties, and sixties was the problem of moving excess human resources out of agriculture and off the small farm. Rural development programs were seen as a way to provide jobs off the farm in rural areas. The small farm issue came to be seen as a welfare matter that really had little to do with commercial agriculture (4, p. 70). The major structural problem of the forties--the overabundance of resources, especially labor--was

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largely solved by events of the fifties and sixties--by the millions, the operators of such small farms and their families picked up and moved to cities and suburbs.

Today's commodity policies are the descendants of the programs of the thirties, differing in many ways but more alike than different. At the depth of the Depression, it was decided that commodity programs would be generally neutral as to farms of different sizes. Farms of all sizes were in deep trouble and all would be helped by curtailing production and raising prices.

During the past half-century, the organization of farming and its economic and financial situation have changed markedly. There is mounting evidence that the farm sector has grown so diverse that it may require a policy perspective that extends beyond the farm gate, implying that the policies appropriate for the eighties need to be examined anew.

THE EVIDENCE OF DIVERSITY IN THE FARM SECTOR

To examine the diversity of the farm sector, this section looks at two broad components: the organization of production and the financial organization.

Organization of Production

The U.S. farm sector has evolved from a large collection of small family-operated units to a spectrum of farms ranging from small to large, with varying degrees of output, technology, and specialization.

Farm Numbers and Sizes

The number of farms has declined by nearly two-thirds since 1935 while the amount of land in farms has decreased only 1 percent (table 1). The decline in farm numbers slowed after the fifties and sixties and is now confined to farms with sales of less than $40,000 per year in current dollars.

When corrected for inflation, farms with sales of $40,000 to $99,999 increased in number until 1970 and then declined (fig. 1 and table 2). In the seventies, the rate of decline in farm numbers was greatest for the smallest farms and the rate of increase was highest for those with sales over $200,000 per year. The change in the inflation-corrected size distribution has been due to technology, increasing off-farm income, and increasing specialization.

Family Farms and Sales Classes

Throughout the history of agricultural policy, support for a family farm concept has assumed a primary position. In economic terms, the concept of the family farm is one large enough to support a family and provide fulltime employment for the operator. In this article, family farms are defined as those with sales of $40,000 to $199,999 at 1980 prices; those with larger sales are defined as larger-than-family farms, many of which are multiple-generation family farms.

Because of the relative decreases in the sales of small farms and the growth of very large farms, the share of sales by the largest 5 percent of farms has gradually increased:

Percent of total sales by largest 5 percent of farms	
1939	38.3
1949	38.8
1960	41.5
1970	46.6
1980	50.6
1982	50.1

Only 55 percent of all farm operators listed farming as their principal occupation in 1982 (table 3). About 90 percent of those with sales of $40,000 or more were principally farmers, but only 23 percent of those with sales of less than $2,500 were, and many of these were 65 years or older.

Specialization

Farming has become increasingly specialized as farmers have applied specialized, capital-intensive production technologies that increase the advantages of size, aided by Government farm programs that reduce the need for farm diversification as a method of lessening risk. But specialization has increased for all commodities--not just for those with Government programs (table 4).

Just as farms are becoming more specialized in producing specific commodities, they are also becoming more specialized in performing the functions required for producing and marketing agricultural commodities. Much of the work and many of the functions formerly performed on farms have shifted to nonfarm firms. Much more of the inputs which farmers use are now purchased rather than produced on the farm itself, and this trend is continuing. Between 1910-14 and 1980, total inputs used in farming increased 19 percent. Those purchased by farmers rose 224 percent, while nonpurchased inputs--operator and family labor and inputs from land, buildings, and machinery--decreased 48 percent. At the same time, intensive use of purchased inputs has increased farmers' vulnerability to rising prices and interruptions of input supplies.

Technology of Production

American agriculture achieved tremendous gains in productivity between 1930 and 1980. Total output rose by almost 150 percent, while total inputs increased only slightly--by 7 percent (fig. 2). The source of productivity gains was adoption of technological change. Mechanization, hybrids and improved varieties, commercial fertilizer, pesticides, and irrigation all enhanced the productivity of land and labor, encouraged the substitution of capital for labor, and facilitated a large outmigration of labor from agriculture (8,19,24). In the last two decades alone, labor use dropped by nearly half, but the share of hired labor increased (fig. 3). Land inputs have remained fairly constant. Current agricultural production technologies were developed in an era of abundant, low-cost energy and were designed primarily to replace human labor with mechanical power and chemicals. This input substitution has been a key factor behind the decreasing number and increasing size of farms for several decades. Since financial stress of declining incomes and asset values gripped the farm sector in the early eighties, chemical input expenditures have declined.

Technological changes, especially those which encouraged substitution of capital for labor, combined with specialization of production into farm units producing

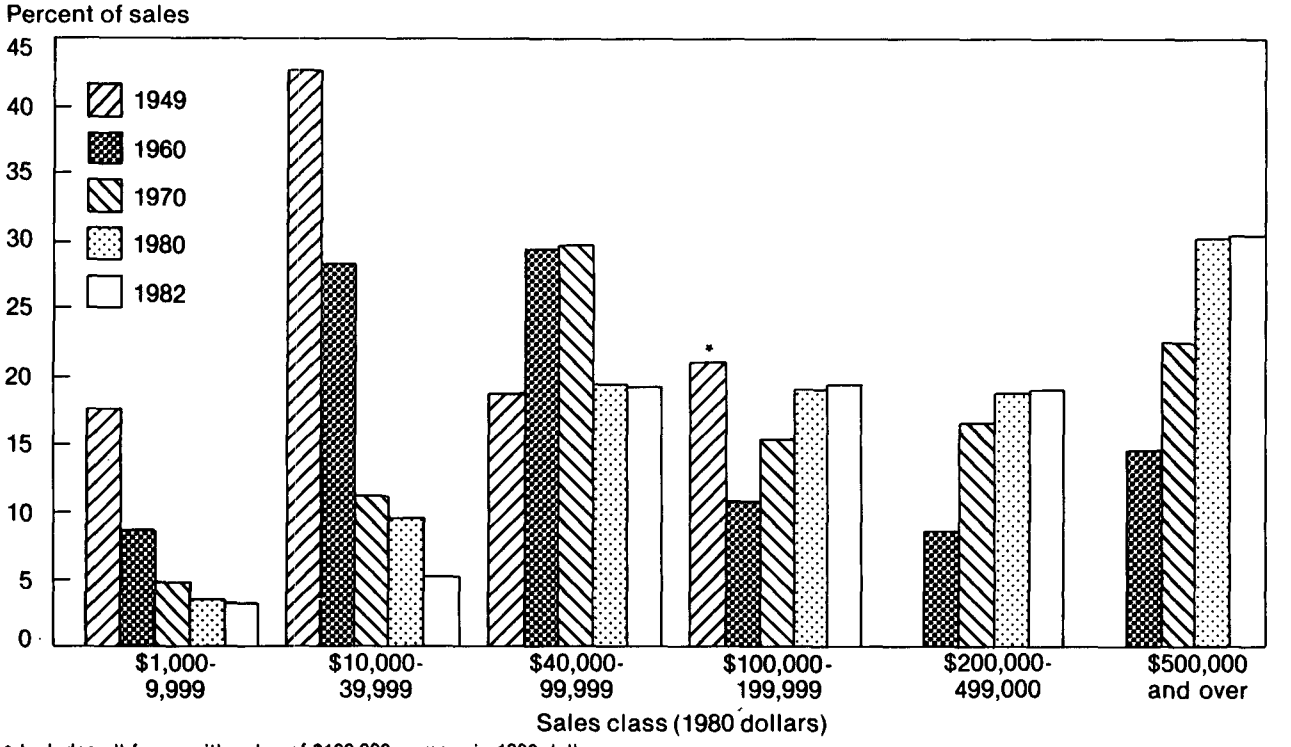
Table 1--Farm numbers and sizes

Year	Number of farms 1/	Land in farms	Average size of farm
	Thousands	Million acres	Acres
1930	6,295	990	157
1935	6,812	1,054	155
1940	6,102	1,065	175
1950	5,648	1,202	213
1960	3,963	1,176	297
1970	2,949	1,102	374
1980	2,433	1,039	427
1981	2,434	1,034	425
1982	2,401	1,028	428
1983	2,370	1,024	432
1984	2,333	1,020	437

1/ The definition of a farm changed in 1959 and 1974.

Figure 1

Distribution of farm sales by sales class, 1949-82



* Includes all farms with sales of $100,000 or more in 1980 dollars.

Table 2--Approximate distribution of farms and sales at 1980 prices, by sales class, 1949-82 1/

Year and item	Larger-than-family farms		Family farms		Small family farms		Rural residences		All farms 1/
	$500,000 and over	$200,000 to $499,999	$100,000 to $199,999	$40,000 to $99,999	$20,000 to $39,999	$10,000 to $19,999	$5,000 to $9,999	$1,000 to $5,000	
	1,000 farms								
Number of farms:									
1949	--	--	50	239	601	878	1,002	2,205	4,975
1960	16	32	76	455	594	636	675	1,300	3,784
1970	16	68	122	566	314	376	338	1,075	2,875
1980	24	84	179	388	279	286	332	856	2,428
1982	25	87	186	393	273	281	331	824	2,400
	Percent								
Percent of farms:									
1949	--	--	1.0	4.8	12.1	17.7	20.1	44.3	100.0
1960	0.4	0.8	2.0	12.0	15.7	16.8	17.9	34.4	100.0
1970	.5	2.4	4.2	19.7	10.9	13.1	11.8	37.4	100.0
1980	1.0	3.4	7.4	16.0	11.5	11.8	13.7	35.2	100.0
1982	1.0	3.6	7.7	16.4	11.4	11.7	13.8	34.4	100.0
Percent of sales:									
1949	--	--	21.0	18.7	24.4	18.3	9.5	8.1	100.0
1960	14.6	8.6	10.9	29.2	17.9	10.2	5.1	3.5	100.0
1970	22.5	16.5	15.3	29.6	6.8	4.5	1.9	2.9	100.0
1980	30.0	18.8	19.0	19.3	6.3	3.2	1.9	1.5	100.0
1982	30.1	19.0	19.3	19.2	6.1	3.1	1.8	1.4	100.0

-- = Not available. Included in $100,000-$199,999 sales class.

1/ Includes only farms with sales of $1,000 or more at 1980 prices.

Table 3--Age and principal occupation of farm operators by sales class, 1982

Sales class	Farming			Other occupations			Total farming and non-farming
	Under 65 years	65 and older	Total farming	Under 65 years	65 and older	Total non-farming	
	Percent						
$500,000 or more	81.9	9.1	91.0	7.7	1.3	9.0	100.0
$250,000 to 499,999	86.1	6.9	93.0	6.2	.8	7.0	100.0
$100,000 to 249,999	86.6	6.2	92.8	6.5	.7	7.2	100.0
$40,000 to 99,999	79.0	9.2	88.2	10.7	1.1	11.8	100.0
$20,000 to 39,999	57.6	14.3	71.9	25.4	2.7	28.1	100.0
$10,000 to 19,999	38.7	17.8	57.5	38.1	4.4	42.5	100.0
$5,000 to 9,999	24.9	16.7	41.6	50.8	7.6	58.4	100.0
$2,500 to 4,999	18.8	14.8	33.6	57.5	8.9	66.4	100.0
Less than $2,500	12.9	9.8	22.7	66.9	10.4	77.3	100.0
Total	42.9	12.2	55.1	39.3	5.6	44.9	100.0

Source: Census of Agriculture, 1982, Vol. 1, Part 51, pp. 48-49.

Table 4--Farm specialization: Farm sales derived from primary commodity, by type of farm, 1969 and 1982

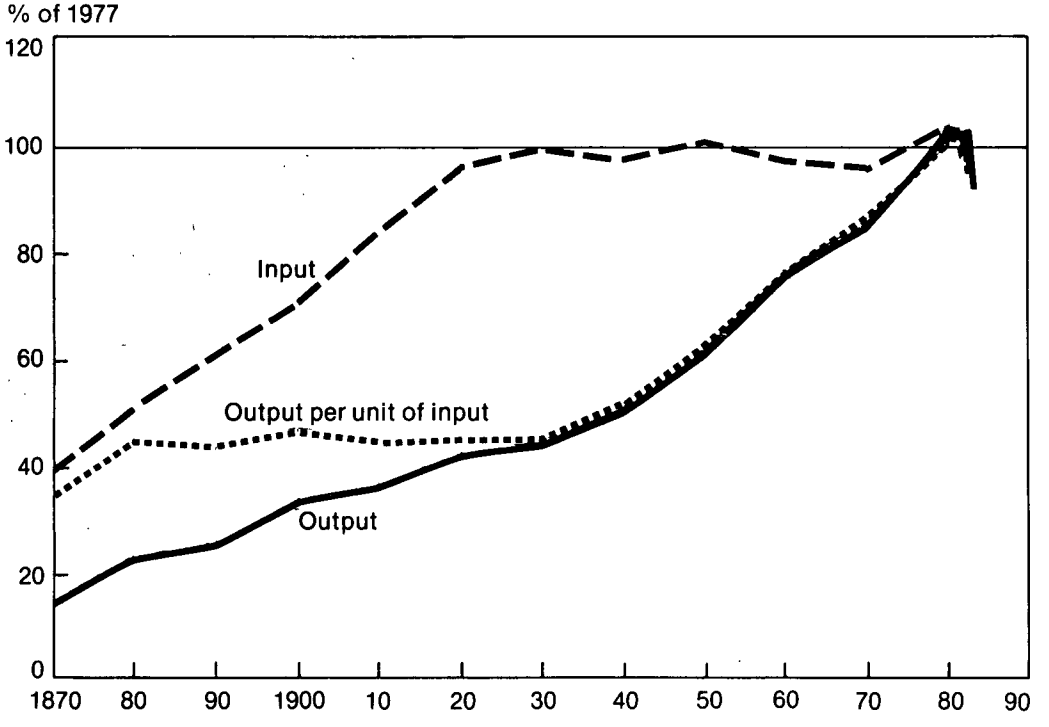
Type of farm	1969		1982	
	Percent of farms	Share of sales from primary commodity	Percent of farms	Share of sales from primary commodity
	Percent			
Cash grain	21.3	81	25.7	86
Tobacco	5.2	80	5.9	80
Cotton	2.3	69	0.9	76
Other field crops	1.8	82	4.5	79
Vegetables	1.1	86	1.4	86
Fruits and nuts	3.1	95	3.8	95
Horticultural specialties	--	--	1.3	98
Dairy	15.1	78	7.3	84
Poultry	3.3	94	1.9	95
Animal specialties	--	--	2.9	95
Other livestock	32.8	84	40.5	86
Total	86.0		97.5	
Other farms	14.0	less than 50	2.5	less than 50

-- = Not available.

Sources: U.S. Bureau of the Census, Census of Agriculture, 1969 and 1982.

Figure 2

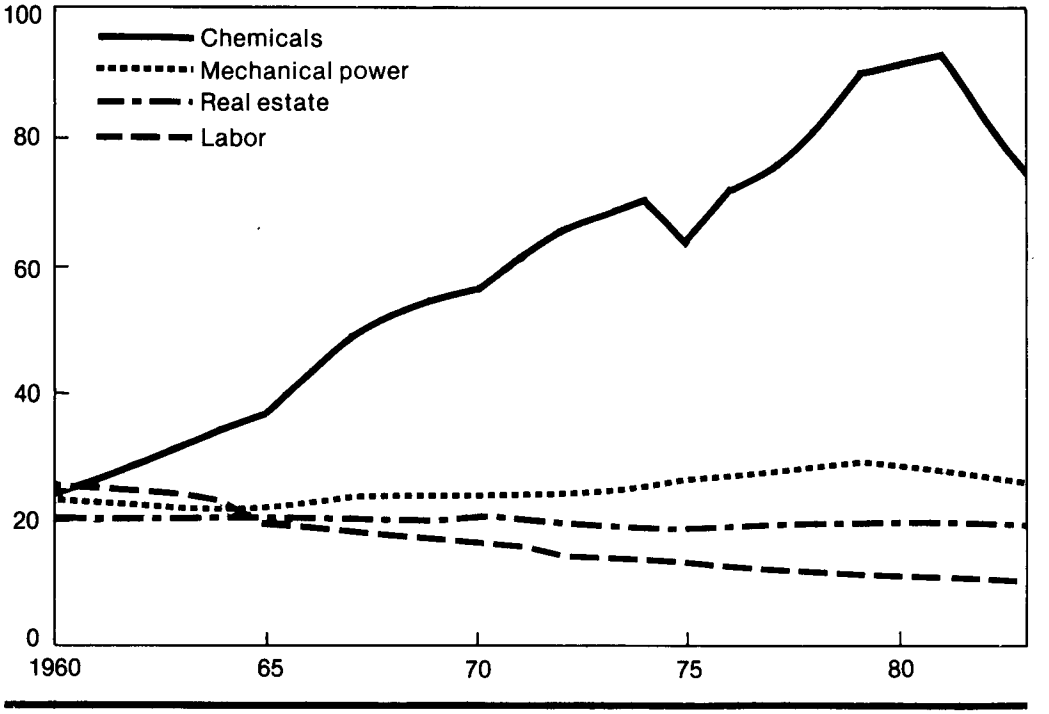
Farm productivity



1983 preliminary.

Figure 3

Changing mix of inputs used in farm production



a single or a few commodities, made traditional size family farms too small to fully employ a farm operator family. The low net income of these farms provided a strong incentive for their owners to adjust. In the fifties and sixties, this seemed to be an incentive to "get bigger or get out." In the seventies and eighties, by contrast, the farmer seems to have an incentive to "get bigger or get smaller" (become a part-time farmer) in order to achieve a desired standard of living.

Economies of size have been a source of productivity gains, but the potential contribution of further farm expansion to enhancing productivity is unclear (28, 29). Economies of size arise from:

- Technical economies--efficiency in use of inputs.
- Buying economies--quantity discounts and better terms for larger purchases.
- Marketing economies--higher prices for larger quantities sold and lower unit marketing costs.
- Tax advantages--nonmarket tax gains for delaying or avoiding taxes on income from any source.
- Managerial economies--more effective management of risk, hired labor, and other functions.

Empirical estimates of longrun average cost curves for various farm types and sizes based solely on technical economies of size suggest that costs per dollar of gross income consistently decline as small farms expand, then taper off for medium-size farms, and fall very little for large farms. Virtually all technical economies of size inherent in the current technology have already been exploited by family-size crop farms. Although further technological changes will almost certainly continue to hold down food costs, for the typical family farm, financial, tenure, and equity considerations are capable of overshadowing gains due to technical economies of size (13, 14).

Comparing size classes of farms in 1982 with comparable sizes in 1960 summarizes the changes of the period (table 5). The cutoff points between the farm-size categories in 1982 are roughly 4 to 5 times the corresponding sales values of 1960, yet the percentage distributions of numbers of farms and total production are nearly unchanged. Roughly half the farms are noncommercial, rural residences; roughly 5 percent are larger-than-family-sized operations. The noncommercial half of the farms produce only 3 to 5 percent of total output, but the larger-than-family-sized operations have increased their share of total output from one-third to one-half in the last two decades. It took slightly fewer acres of crops to equal the dollar sales of the various size classes in 1982 than in 1960. Forty acres of corn at 1982 yields and prices would put a farm at the $10,000 break between rural residences and small family farms. In 1960, it would have taken 45 acres to produce $2,500 worth of corn, the break between the two size categories at that time. In 1982, a family-sized farm would require between 160 and 640 acres of land--if it were all used for crops as intensive as corn. Larger-than-family-sized farms, beginning at about 640 acres, do not necessarily imply large, nonfamily agriculture, but rather multiple-operator or multiple-generation family farms.

Table 5--Profiles of farm size categories, 1960 and 1982

Measure	Rural residences	Small family farms	Family farms	Larger-than-family farms
Sales class:				
1982	Less than $10,000	$10,000-39,999	$40,000-199,999	$200,000 and up
1960	Less than $2,500	$2,500- 9,999	$10,000- 39,999	$40,000 and up
Percent of farms:				
1982	49	23	23	4
1960	46	32	19	3
Percent of production:				
1982	3	9	39	49
1960	5	22	40	33
Approximate cropland used 1/:				
1982	up to 40 acres	40 to 160 acres	160 to 640 acres	640 acres and up
1960	up to 45 acres	45 to 175 acres	175 to 700 acres	700 acres and up
Approximate labor input at most common technology: 2/				
1982	up to 5 person-wks.	5-20 person-wks.	20-100 person-wks.	>100 person-wks.
1960	up to 9 person-wks.	9-36 person-wks.	36-144 person-wks.	>144 person-wks.
Ratio of production expenses to cash receipts:				
1982	2.35	1.20	0.96	0.76
1960	.84	.71	.74	.75
Net farm income per farm:				
1982	-$737	-$121	$10,100	$169,402
1960	806	2,594	6,030	17,274
Off-farm income per farm:				
1982	$19,894	$15,092	$10,746	$16,696
1960	2,732	1,706	1,390	2,177
Assets per farm:				
1982	$134,493	$313,372	$791,174	$2,337,491
1960	18,600	40,000	105,000	260,000

1/ Approximate acres of corn, at yields and prices of the day, that would be required to provide gross sales equal to sales cutoff points of size category: 1982 = 109 bu./acre @$2.10, 1960 = 54 bu./acre @$1.05.

2/ Approximate labor input required to produce the acreage of corn required in footnote 1, assuming common field crop technology of the day.

Most striking is the decline in labor inputs required by a crop farm in each of the size categories. Owing to more mechanization, the introduction of pesticides and herbicides, increasing yields from new varieties, and higher rates of fertilization, the amount of labor that would be required to be in the rural residence category dropped from 9 weeks to 5 weeks. Similarly, the labor required by a corn farm at the cutoff point between family-sized farms and larger-than-family-sized farms was 144 weeks in 1960, but only 100 weeks in 1982. This fact alone helps explain the squeeze on the incomes of operators of family-sized farms; comparable-sized farms are putting in less labor now than they did in 1960.

Financial Organization

This section looks at the changes that have taken place in the financial environment of agriculture. Income and its sources, the composition of assets and claims, and the financial strength of the sector are evaluated.

Form of Business Organization

Farm businesses are organized in three principal ways: sole proprietorships, partnerships, and corporations. Sole proprietorships are the simplest and most common form of organization (87 percent of farms in 1978 and in 1982), followed by partnerships (10 percent), and corporations (2 percent in 1978, 3 percent in 1982) (fig. 4). All types are chiefly family organizations: in partnerships, the partners are usually related by blood or marriage and most corporate farms are family-owned and operated (9, 31). Corporations have grown the most, especially in the larger sales classes, both in total numbers and as a proportion of all farms (tables 6 and 7).

Figure 4

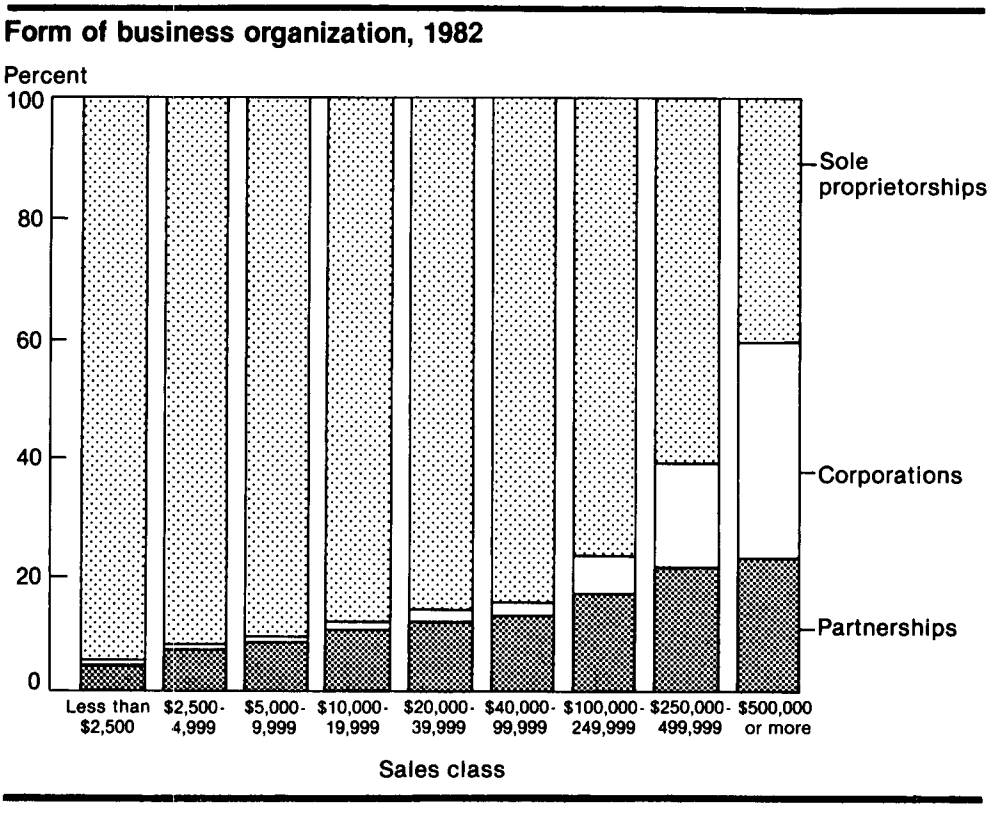


Table 6--Number, land ownership, and value of sales of corporate farms as a percentage of all farms

Item and year	Corporate farms with--	
	10 or fewer shareholders	More than 10 shareholders
	Percent	Percent
Number of farms:		
1974	1.1	0.1
1978	2.0	.1
1982	2.6	.1
Land in farms:		
1974	7.3	2.1
1978	10.1	1.6
1982	11.7	1.9
Sales:		
1974	12.3	5.7
1978	17.4	4.2
1982	19.8	4.1

Sources: U.S. Bureau of the Census, 1974 Census of Agriculture, Vol. IV, Part 5; 1978 Census of Agriculture, Vol. I, Part 51; and 1982 Census of Agriculture, Vol. 1, Part 51.

Table 7--Average income per farm, by type of business organization, 1974 and 1978

Year and type of organization	Net farm income	Off-farm income
	Dollars	
1974:		
Sole proprietorships	7,482	10,193
Partnerships	16,683	11,003
Corporations	65,937	--
Other	23,003	--
All farms	9,303	10,066
1978:		
Sole proprietorships	8,715	12,301
Partnerships	18,283	10,059
Corporations:		
Subchapter S	57,708	--
Other	334,475	--
Other	13,647	--
All farms	10,942	11,790

-- = Not applicable.
Source: Richard W. Simunek and Lise Poirier, "Comparing IRS Farm Data Trends with USDA Measures of Farm Income," Economic Indicators of the Farm Sector. Farm Sector Review, 1982, ECIFS 2-1, Econ. Res. Serv., May 1983.

Federal tax policies probably have had more influence on the conversion of farms to corporate organization than have other Federal policies (1, 7, 15, 20). Corporate tax rates are much lower than individual rates for taxable incomes above $25,000 to $35,000 (1). Corporate income tax provisions enable farm corporations to increase equity capital through retained earnings at a faster rate than sole proprietorship or partnerships. Corporate farmers who reinvest a significant portion of farm earnings in the business can still make substantial total tax savings. Further, Federal tax policies encourage certain nontaxable fringe benefits for corporate farmowners. On the other hand, Social Security taxes are higher on the salaries of incorporated farmers than unincorporated farmers.

Tenure

Some farm operators own all their land, some rent all of theirs, and others own some and rent the rest. The full tenancy rate declined noticeably from the thirties to the late sixties and has remained constant at about 11 percent since then. Land rented by farm operators from nonoperator landlords has increased. As a percentage of total land in farms, rented farmland dropped from 45 percent in 1935 to 37 percent in 1969 and has remained relatively constant since then.

Farms in the lower sales classes are overwhelmingly full owners--70 percent of those in the rural residence category--while only 11 percent are full tenants and 19 percent are part owners. Among family-size farms, 60 percent are part owners, 27 percent are full owners, and 12 percent are full tenants. Larger-than-family-size farms have a slightly higher proportion of full ownership, 33 percent, and slightly lower proportions of full tenancy, 10 percent, and part ownership, 57 percent.

Current Income

The income of farm operator families, which includes farm-generated income, off-farm income, and Government payments, was below the national median and average family income in 1982, a year that typifies the income situation of the eighties, except for the largest sales classes (fig. 5). Income of farm operator families in the $200,000-and-over sales classes significantly exceeded the national median family income.

The distribution of income among farm families has become more bimodal due chiefly to the growth of off-farm income in the lower sales classes. Farm operator families on small family farms ($10,000 to $39,999) have incomes below the U.S. median family income in most years. They are too small to generate favorable incomes exclusively by farming but too large to allow full-time off-farm employment. Incomes of operator families in the $40,000 to $199,999 sales class were unusually low in 1982 because of low prices of farm products and continued inflation in farm input and operating costs.

Larger farms account for an increasing share of farm-generated income. 1/ Farms with $40,000 or more in sales accounted for 28 percent of farms and virtually all of the farm-generated net income from 1980 through 1982. Farms with sales of

1/ 1982 was chosen for this analysis because it is the most recent near-normal year. The payment-in-kind program significantly distorted 1983 income sources, especially Government payments and inventory changes.

less than $40,000 (61 percent of farms, mostly rural residences) had negative farm-generated income in 1982.

Off-farm income raised the average of all farmers above the national median family income and constituted 67 percent of all 1982 income of farm operator families.

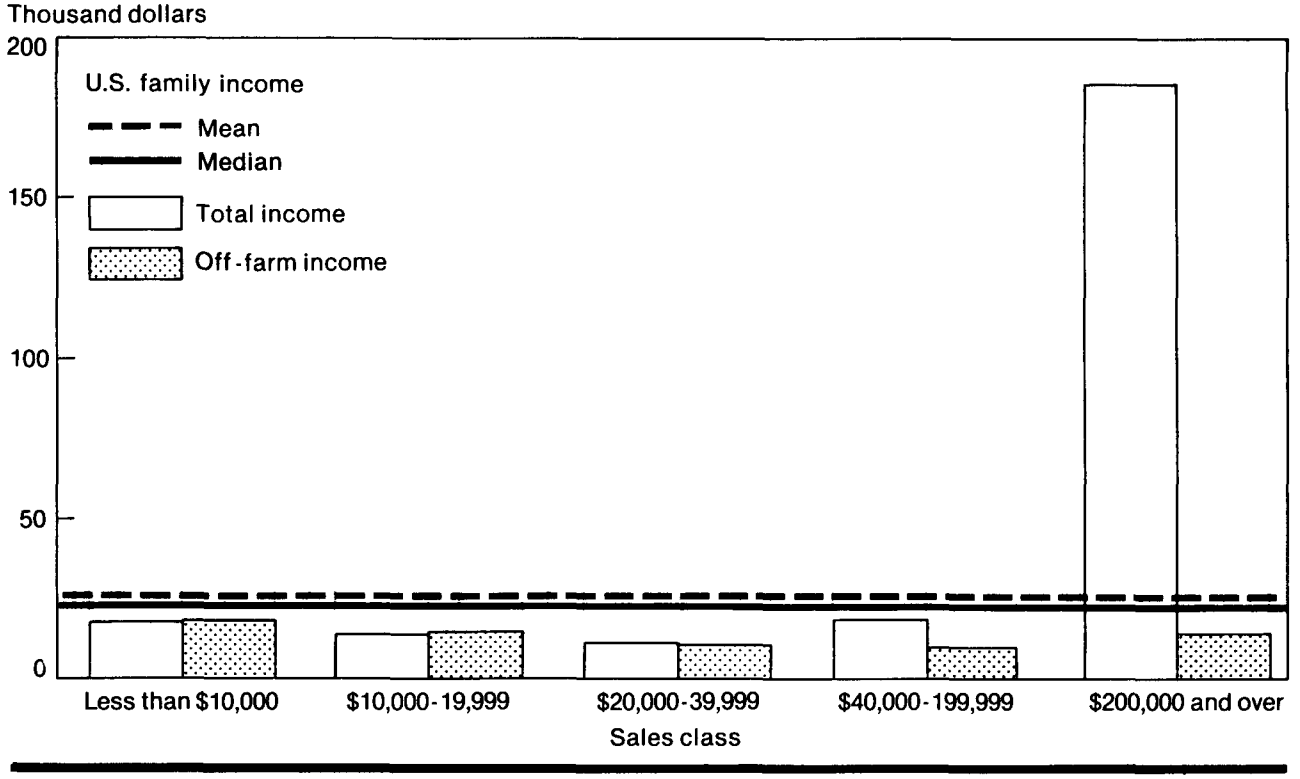
Direct Government payments in 1982 amounted to almost $3.5 billion, 6 percent of the current income of farm operator families. Since direct commodity payments are made on the basis of volume of production, the larger sales classes received most Government payments. However, the concentration of farms producing fruit, vegetable, and animal products which do not receive direct commodity payments means that direct Government payments were distributed differently than cash receipts in 1982:

	Percent of cash receipts	Percent of direct Government payments
Larger-than-family farms	49.1	22.3
Family farms	38.5	56.1
Small family farms	9.2	14.5
Rural residences	3.2	7.2

Note, however, that indirect benefits received through the market from support programs, market orders, and other programs are reflected in cash receipts, rather than Government payments.

Figure 5

Average farm family income, 1982



Composition of Assets and Claims

In general, even farms in the smallest sales categories represent substantial accumulations of wealth and equity, with assets ranging from $134,000 for rural residences to $2.3 million for larger-than-family farms. Similarly, proprietors' equities average from $120,000 to $1.6 million per farm over these same sales classes (table 8).

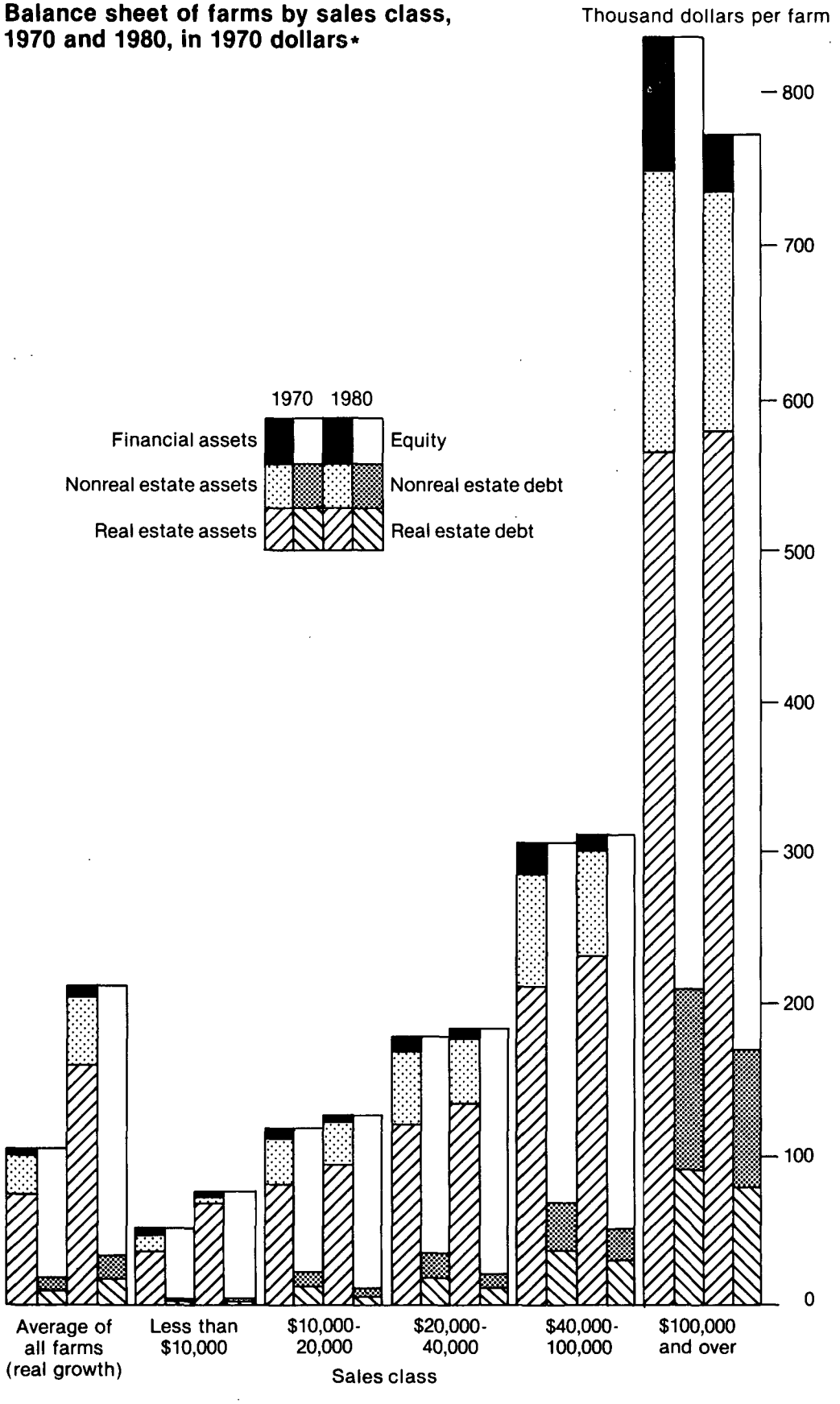
Assets, debts, and proprietors' equities grew substantially during the seventies both in aggregate and on the average in each sales class (fig. 6). Aggregate assets tripled in nominal terms between 1970 and 1980. For the average farm, assets nearly quadrupled in the same period, but real growth was 67 percent. In the seventies, proprietors' equity increased faster and debt grew more slowly than the value of assets, implying a net strengthening in the debt/asset position of farmers. In the early eighties, however, real wealth of the sector declined each year.

Table 8--Balance sheet of the farming sector: Profile of average farm, by sales class, January 1, 1984.

Item	Rural residences	Small family farms	Family farms	Larger-than-family farms	All farms
	$10,000 or less	$10,000-$39,999	$40,000-$199,999	$200,000 and over	
			Dollars		
Assets:					
Real estate	100,873	239,855	597,751	1,704,906	322,624
Nonreal estate	29,373	66,927	177,815	434,925	91,373
Financial	8,082	13,481	30,161	154,701	21,123
Total	138,328	320,263	805,727	2,294,532	435,120
Claims:					
Real estate debt	10,407	26,120	86,206	347,019	47,108
Nonreal estate debt	5,591	19,624	66,471	354,075	38,925
CCC loans	58	2,060	10,898	32,878	4,558
Total	16,056	47,804	163,575	733,972	90,591
Proprietors' equity	122,272	272,459	642,152	1,560,560	344,529
			Percent		
Debt-to-asset ratio	11.6	14.9	20.3	32.0	20.8

Figure 6

Balance sheet of farms by sales class, 1970 and 1980, in 1970 dollars*



* 1980 converted by using GNP implicit deflator (includes farm households).

Capital gains have been extremely important in the growth of wealth of farm operators. In the seventies, capital gains were positive and at least four times as great as net farm income for all but 3 years. Nominal capital gains, although largely unrealized, exceeded realized net farm income for every sales class in 1980--as was the case throughout most of the seventies. In fact, pursuit of such capital gains may have induced farmers to expand and use credit more than was prudent in the seventies. Nominal capital gains to the farm sector were negative in 1981-82 and small in 1983, as declining real estate values resulted in capital losses in some areas. However, just as capital gains usually remain unrealized, so do capital losses unless a farm experiences such severe cash flow problems and declining equity levels that liquidation or bankruptcy occurs. The most highly leveraged farms--those that recently expanded or that used a lot of their equity to cover past cash flow losses--are the first to feel the stress of declining rates of capital appreciation or, more severely, lower values of farm assets (see also 27).

Financial Strength of the Farm Sector

As of January 1, 1984, farms in the highest sales category had the highest debt/asset ratios and farms in the lowest sales classes the lowest ratios. Farmers with debt/asset ratios above approximately 40 percent generally must delay or refinance debts when faced with a year of unfavorable income. Thus, a few years of poor returns, badly spaced, as have occured since 1980, can bring even a reasonably well-established farm with 60 percent equity and 40 percent debt to forced liquidation.

A relatively high proportion of farms in the family farm and larger-than-family farm categories have debt/asset ratios above 40 percent, which many financial analysts consider a danger point. Over 20 percent of the family farms have debt/asset ratios in excess of 40 percent. Nine to 15 percent of the farms with sales greater than $50,000 have debt/asset ratios of 70 percent or more, which analysts view as the extreme vulnerability zone (fig. 7).

The farm sector is subject to extreme variability of net income with attendant cash flow problems (fig. 8). Low and variable realized returns and high, fixed interest payments contribute to financial instability of the sector. In short, the farm sector is becoming increasingly prone to "boom or bust" cash flow situations. Without some form of cash flow stabilization or diversification of income sources, farms will be able to support only modest debt/asset ratios. This also is due, in part, to the strong reliance on the sole proprietorship form of organization as opposed to partnerships or corporate forms. The latter can seek new equity sources for expansion rather than rely totally on debt financing.

The resulting restrictions on debt acquisition could inhibit the ability of farms to make capital investments in improved technology or adopt specialized, capital-intensive, cost-reducing production methods. This financial instability influences the patterns of farm consolidation in the sector. Acquiring additional farmland would place most medium-sized farms in highly vulnerable, leveraged positions. But large, well-established farms have the financial means to absorb other farms or large tracts of land; and small farms can purchase small tracts because of their off-farm income, without such vulnerability. Thus, midsize fulltime farms are at a disadvantage to both small and large farms in acquiring additional land.

Figure 7

Farm operators with high debt/asset ratios by sales class, 1984

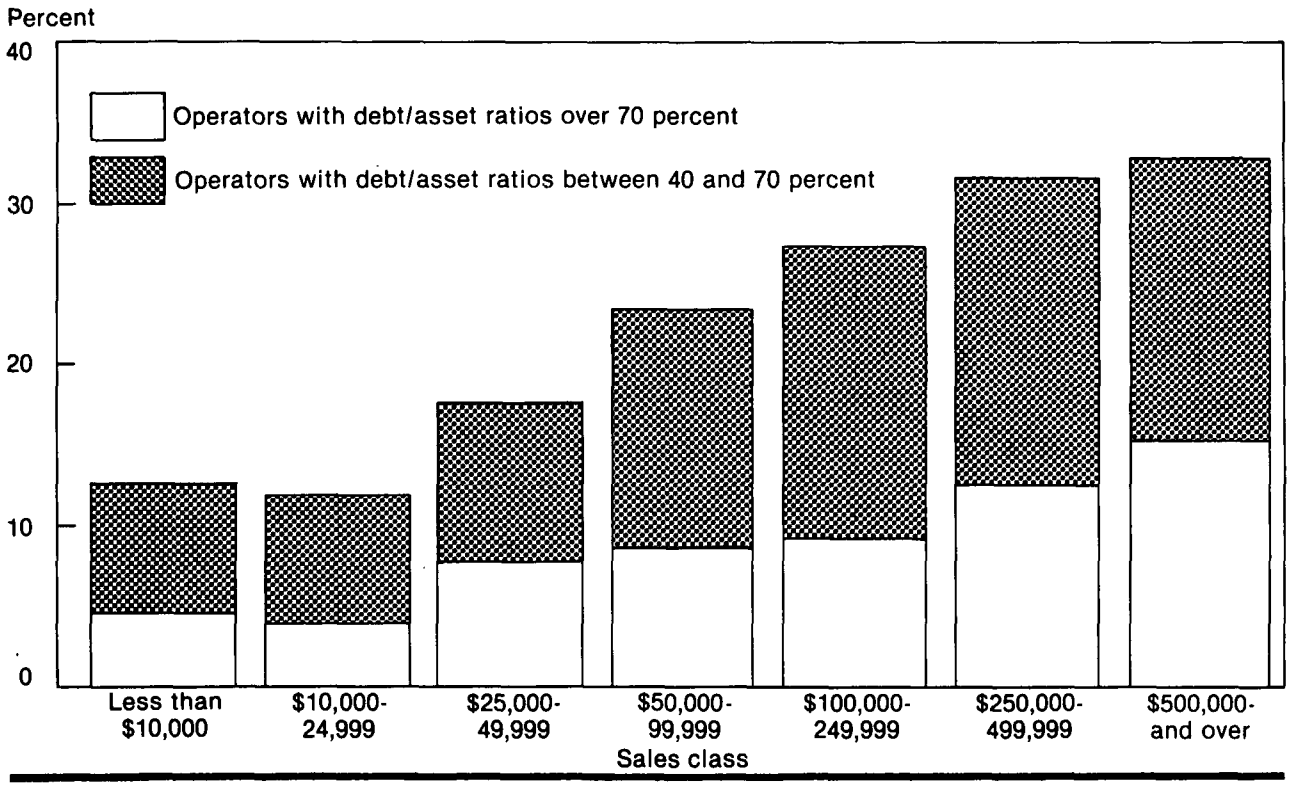
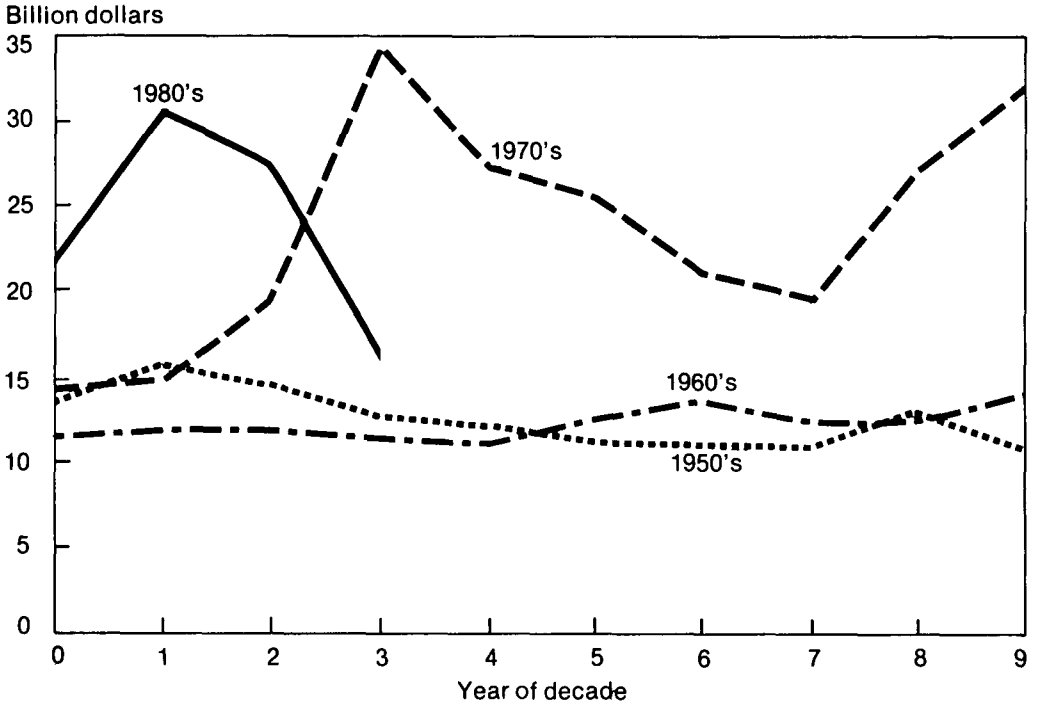


Figure 8

Instability of net farm income over three decades



Farm income after inventory adjustment.

INSTITUTIONAL ENVIRONMENT

The farm sector operates in a unique economic and institutional environment, which has led to a number of public policies aimed at altering its performance in the face of the environment. The farm sector is composed almost entirely of owner-operator farms that are price-takers, with a high proportion of their assets in the form of land, operating in unstable markets characterized by inelastic domestic demands and uncontrollable fluctuations in exports.

Competitive Unstable Markets

Since individual farmers are price-takers, they have quickly adopted new, cost-reducing or output-increasing technologies of production, storage, and marketing to increase profit margins. Early adopters of a technology derive only temporary benefits from it. The cost-reducing technology results in an increased total supply of the products affected, driving down prices and profits of the early adopters to the new cost levels and forcing late adopters to use the new technology merely to stay in business. Because of this technological treadmill, the sector has had to be progressive and efficient and the benefits of technological advances and productivity increases have been passed on to consumers of farm products, who--as taxpayers--financed much of the research behind those changes (6, 24, 35). (See the article on emerging technologies elsewhere in this report).

After remaining relatively stable through the fifties and sixties, net farm income gyrated widely in the seventies and early eighties (see fig. 8). Prices received and personal income of the farm population are more variable and cash receipts a little less variable. Net farm income changed from one of the most stable portions of farmers' personal income to one of the most unstable elements. Instability of incomes in agriculture stems from many sources, all important.

Domestic Demand

Farming, being biologically based, is subject to yield and production variability caused by weather, disease, and natural hazards. For example, national average yields and total production of corn dropped by almost 20 percent between 1979 and 1980. And because domestic markets for agricultural products have inelastic demands, total income to producers of a commodity can be severely depressed by bumper crops while a partial crop failure can raise receipts sharply. Increases in supplies result in even greater decreases in prices, causing total incomes to fall. The opposite happens if production falls short. As a result, current income to the farm sector can be very volatile from year to year. Over a period of several years, however, the responsiveness of the farm sector--in increasing the supplies of products that show shortrun profits--causes reductions in all commodity prices and increases in factor prices (primarily land) to levels that just cover the costs of maintaining the resources in production (12).

Global Uncertainties

World demand for U.S. agricultural products is highly variable due to both global production and the trade practices and policies of large international customers. Also, some foreign customers are marginal or occasional participants in the world market. That is, exports and imports depend a great deal on the size of their current crops, making the United States the residual source of supply to the rest of the world. In the three decades from 1950 to 1980, exports

increased from 5 percent to 18 percent of gross farm output. For some important agricultural exports, up to 60 percent of the world's exportable supplies have been produced in the United States in recent years. Exports have taken as much as 70 percent of U.S. production for wheat and 50 percent for soybeans. International markets are thin, volatile, and subject to the vagaries of weather, international politics, and currency exchange relationships. World grain production did not deviate more than 5 percent from trend in 1972/73, but this shortfall, exacerbated by the policies of many of our trading partners, resulted in large commodity price increases and sharply increased farm income and U.S. agricultural trade grew at rates exceeding 8 percent per year throughout the balance of the seventies.

While expanded markets for U.S. farm products have contributed to growth in the farm sector, they have also contributed to the instability of agricultural markets. U.S. crop and livestock producers and consumers have absorbed most of the costs of the resulting variability. The variability of net farm income was about twice as great in the seventies and early eighties as in the fifties. The sensitivity of international markets to changes in currency exchange relationships is underscored by the fact that in 1982 the realized dollar value of U.S. agricultural exports declined even though foreign buyers paid more in their own currencies than they did in 1981. The strengthening of the dollar in international exchange is related to the current high interest rates that accompany efforts to fight inflation through monetary policy.

Variability of net returns stemming from production, demand, and cost variation is only part of the problem. Concurrent changes in the economic environment and the inflationary expectations of investors in farmland have amplified the problem of instability. In the seventies and early eighties, several changes in the economic setting of agriculture occurred--largely linked to inflation in the general economy and to the value of the dollar in international exchange.

The real-world combination of institutional factors--inflation, capital gains treatment of certain types of farm receipts, cash accounting, and abundant credit at favorable terms--caused the realized cash income portion of returns to shrink and the unrealized capital gains portion of returns to expand during the seventies. By contrast, inflation caused the actual cash expenditures portion of costs to increase and the opportunity costs portion to shrink, because opportunity costs are partially or completely offset by capital gains return to assets (11). By the midseventies, farmers and investors in farmland felt that they could benefit from continuing inflation by aggressive investment in farmland (10).

Changing Farm Returns and Asset Values

Most farm assets--73 percent on January 1, 1985--are in the form of real estate, chiefly farmland. This farmland is valued mostly by its expected return from continued use in farming (2). It is physically and economically impossible for most farmland to be converted to nonfarm use within any short period, except where urban or industrial development may be taking place.

The value of farmland adjusted to the conditions of the seventies as farmers and investors in farmland came to view it as a superior hedge against inflation. Also, by the midseventies, land had become analogous to a growth stock (27). The inflation-hedge motive attracted more nonfarm investors to the land market and induced more farmland owners to hold onto their investments. The former led to a

higher demand for land and the latter to a lower supply of land offered for sale; the combination of the two raised the price of land much faster than the inflation rate throughout the seventies. And, farmers and investors were led by a long history of favorable capital gains on land investments to acquire more land and use more financial leverage.

The growth-stock characteristic of land is that its value increases because of expected future increases in returns to land ownership, exceeding that justified by current income alone. Investors in farmland, like investors in any growth stock, must be prepared to experience negative cash flows for several years. Thus, investors, farm or nonfarm, had to subsidize their land purchases from either previously owned farmland for which the net cash flow was positive or from off-farm income sources.

Given the above, the value of farmland largely reflects the expected returns (both cash returns and capital gains) from continued agricultural use of the land (27). These expectations are frequently conditioned by long-term return factors that may be unrelated to the current year's cash return to farm assets. As a consequence, owner-operators of farms are frequently caught between a cash outflow that reflects the longrun expected value of farmland and a cash inflow that reflects temporarily reduced income.

The land market is a thin market--only about 3 percent of farmland changes ownership in any year. Also, all farmland is valued on the basis of the few arm's-length sales that do occur each year. In years of favorable incomes or expectations, land prices are likely to be high; in the face of low incomes or expectations (that is, forced sales), the land market is likely to be severely depressed.

One would expect sharp declines in farmland values if expectations for future growth of farm returns were even to level off. As with any growth stock, when growth expectations decline or even taper off, its price must fall. The trend of increasing land values has changed, at least temporarily. In early 1985, the price of farmland was more than 30 percent below its 1980-81 peak and continuing to decline in many States. Land values could be expected to stabilize and begin to increase modestly if real interest rates and the value of the dollar in international exchange were to decline.

POLICY RESPONSES

The various commodity subsectors have reacted differently to the economic and institutional framework of the agricultural sector.

Commodity Policies

Producers of grains and fibers have obtained governmental stabilization and support of their prices through commodity programs providing target prices, loans, and storage facilities and payments (17, 18, 23, 30). These commodity price support programs have tended to increase the value of cropland, both by increasing the expected returns from production and from reducing their variability--especially on the down side.

Producers of fresh fruits and vegetables have reacted to intraseasonal as well as interseasonal instability of prices and to disparities in bargaining power

between producers and handlers by seeking Government authority to partially regulate markets under marketing orders (16, 36, 37). Marketing orders with supply or product quality regulatory powers have increased the stability of returns, but many have not increased the longrun level of returns over what they otherwise would have been (16, 36).

Producers of processing vegetables have utilized negotiated production contracts to manage their risks and processors have used these contracts to assure timing, quality, and quantities of raw-product supplies (33). They receive some assistance through Government purchase of their products under Section 32.

Dairy farmers have obtained rigid import quotas, marketing orders, and Government support of prices to reduce the risks of cyclically unstable prices as dairy herds expand or contract. Since the national dairy herd can be expanded only by raising heifers to 24-27 months of age, milk prices could be depressed or elevated for long periods before the industry could adjust to bring supply and demand into balance (26). These programs have both increased milk supplies and increased the value of dairy production assets above what they would otherwise be.

Cattle producers have been subject to cyclical expansion and liquidation of beef herds for the last 50 years. The beef subsector has not resorted to Government assistance except import quotas and purchases of ground beef under Section 32. Instead, beef producers have used various market means to spread their risks: hedging on futures markets, spreading ownership of cattle on feed among many nonfarm investors through custom feeding, and more recently, increased contracting (33).

Poultry producers do not have Government programs to stabilize prices except purchases of canned chicken (mostly spent laying hens), turkey, and processed eggs. Consumers have benefitted from the technological and structural changes in the poultry industry--real prices of eggs and poultry meat have declined by over 75 percent since 1950. The broiler subsector is the classic case of private sector adjustment to risk (8, 33). It is almost entirely vertically integrated, with broilers owned by an individual firm (the integrator) all the way from hatchery flock to supermarket loading platform. In the grow-out phase, farm operators contract their labor and facilities to integrators and raise broilers for a contractual margin. Eggs and turkeys are not as integrated, but their organization is still highly industrialized and coordinated through contract as well as ownership integration.

Dairy farming is the least concentrated of all livestock enterprises, with the highest proportion of family-sized farms except for hog farming, where disease problems prevented the development of large specialized enterprises until recently. The stability provided by the dairy price support program is a major contributor to this lack of concentration of production. Note, however, that the real price of dairy products has not fallen the way that real prices of poultry products have. Removal of dairy supports would create pressures toward large-scale organization in dairy farming, along the lines of California and Florida dry-lot dairies, rather than the smaller landbased farms of Wisconsin and New York (5).

In beef cattle feeding and broiler, turkey, and egg production, the need to develop new ways to deal with substantial risks has led either to large-scale

units, as in cattle feeding, or contractual integration, or both, as in poultry production.

A part of the adjustment to variable prices and incomes has been to move toward large-scale units--as in eggs, turkeys, fed cattle, and potatoes--which can better spread risk through marketing and financing of production.

Tax Policies

Tax policies have made farming an attractive investment for farm operators and many others (37). Table 9 shows that large farm losses are strongly correlated with large off-farm incomes, indicating a use of farm assets as tax shelters. The tax-sheltering possibilities of farm assets have raised the capital barriers to entry facing new owner-operators by:

- Making current cash income and expenditures a downward-biased indicator of economic returns in agriculture.
- Inflating asset values by their expected return as possible tax shelters, further depressing the apparent rates of return based on cash income and expenditures.
- Stimulating more investment in farm assets than would otherwise be warranted, which leads to overproduction of farm products, lower farm prices, and lower rates of return from the market.
- Encouraging farmers' investments in assets with lower effective tax rates. Since there are wide differences in effective tax rates between various classes of farm equipment and structures, investments tend to be concentrated where the tax treatment is most favorable rather than where they are economically most efficient.
- Fostering ownership of farm assets with tax-sheltering possibilities by those who can best reap the benefits of the tax treatment of these assets. Overall rates of return remain nearly the same, but more return is realized from tax sheltering and less from the market (15).

Estate and inheritance tax policies and rules governing incorporation also influence the organization of agriculture. Several provisions of estate and gift taxes--Federal taxes on wealth transferred during life or at death--can affect the ownership of farms and the maintenance and accumulation of wealth across generations, encouraging agriculture as a potential estate tax shelter as well. Among the most important are special use valuation of farm assets and deferred payment of estate taxes. Special use valuation, within certain limits, allows farm assets to be valued on the basis of the prevailing rental rates for these assets capitalized at the Federal Land Bank interest rate. This method of valuing agricultural assets ignores several components that contribute to the fair market value of farmland: its inflation-hedging, growth-stock, and tax sheltering potentials. These components contribute up to 50 percent of the market value of farmland in some areas and at some times (7).

Deferred payment of estate taxes, with favorable interest rates on the first million dollars of taxable estate values, provides heirs with valuable financing breaks. Access to these provisions is focused toward farmers by requiring material participation and qualified use tests for eligibility (7, 21). Other

institutional rules surrounding incorporation of farms, provision of fringe benefits, and liabilities for certain employment taxes, such as workers' compensation, provide significant means for farms to obtain favored tax positions (20).

ISSUES FACING FARMERS, THE INDUSTRY, AND SOCIETY

Organizational change issues of the farm sector can be viewed from three vantage points: those of farmers, agriculture as an industry, and society, on whose behalf public policies are formulated.

Farm Firm Issues

Farmers' problems are very concrete and revolve around how to enter farming, how to survive and grow, and how to pass the farm on to the next generation. Entry is made difficult by high and rising capital requirements. Rapid inflation in the seventies also created barriers to entry by stimulating even more rapid

Table 9--IRS-reported farm and off-farm income, by individuals reporting farm profits and losses, per farm, 1976

Item	Number of returns	Adjusted gross income	Farm income or loss	Off-farm income
	Thousands		Dollars	
Farm profits:				
$50,000 or more	17	81,673	74,911	8,706
$25,000 to $49,999	81	37,671	32,979	5,684
$10,000 to $24,999	231	21,196	15,624	6,110
$5,000 to $9,999	210	13,291	7,178	6,507
$2,000 to $4,999	252	11,027	3,233	8,226
$1,000 to $1,999	179	9,872	1,441	9,148
$1 to $999	358	10,512	397	10,851
All farms with profits	1,328	15,366	7,716	8,245
Farm losses:				
$50,000 or more	12	16,362	-104,448	122,080
$25,000 to $49,999	24	17,366	-33,942	51,602
$10,000 to $24,999	93	15,423	-15,154	32,348
$5,000 to $9,999	191	13,571	-6,836	20,641
$3,000 to $4,999	228	13,638	-3,842	18,151
$1 to $2,999	917	13,329	-1,184	14,864
All farms with losses	1,465	13,631	-4,568	18,669
All individuals	2,793	14,533	1,268	13,877

Source: (33), p. 84.

increase in farmland values (10, 31). A slowdown in inflation reduced farmland values during the eighties, but the long-term future trend is unclear.

Farm survival and growth are as much a matter of financial management as production or marketing management. The rapid increase in farm asset values in the seventies followed by the shocks of the early eighties established financial strategy as a key to farm growth and survival and demonstrated that a financial strategy that spells success in one economic environment can spell disaster in another. Farmers' financial growth and survival decisions center around:

- Adjusting to the economic instability of the agricultural sector--balancing income streams; utilizing public and private sector means to handle risks.

- Adjusting to the disparity between cash flows and economic returns--balancing returns from current net income and capital gains; balancing equity and credit financing to achieve growth and security.

- Adjusting to farm and nonfarm opportunities for investment and employment--balancing farm and nonfarm income sources and investments.

These financial decisions are superimposed upon day-to-day production and marketing decisions, and may be of equal or greater importance.

The third problem from the farmer's point of view is passing the farm on to the next generation--whether within the family or to a new entrant. Concern centers upon estate taxes, but most farms except the multiple-operator, larger-than-family farms can be passed to a qualified heir without being subject to a heavy estate tax burden under current Federal law. A potentially more important problem is that of equitably sharing the estate (or the proceeds from operating it) among many nonfarm heirs. Farming and farmland ownership have traditionally returned low rates of current return and high rates of capital gains, so it is difficult for the farm-operating heirs to buy out the nonfarm heirs; but it is equally difficult for the nonfarm heirs to receive a fair share of returns without selling the land to realize the capital gains.

Industry Issues

From an industry perspective, the "one-farm, one-owner, one-operator," low-debt model of agriculture is no longer strictly applicable to farming. This type of organization dominates small farms and rural residences, but among family farms and larger farms it is becoming less true (see business organization, fig. 4; tenure, p. 36; and debt, fig. 7). With the decline of full ownership and the increased use of credit, the sector has lost some of its resilience and flexibility because every factor--land, labor, capital, management, and riskbearing--must be rewarded every year. This is far different and far less flexible than the situation of an owner-operator able to allocate an undivided margin above shortrun variable costs to the most pressing needs in any year. Decreased flexibility makes the industry less able to absorb economic or natural shocks. Its ability to cope with instability is weakened at just the time that the magnitudes and probabilities of external shocks have increased. The increased use of credit is currently the most serious of these problems.

Issues Facing Society

In an endeavor to achieve certain goals of society with respect to agriculture, such as food safety, security, abundance, and reasonable prices, policymakers face several problems. The first is that organizational change usually has been viewed as an unintended side-effect of policies designed to accomplish other ends. The United States has not had an overt farm-size policy at least since the Homestead Act. Certain programs such as land reclamation, commodity support payments, or lender-of-last-resort programs have had size limitations, but most policies are not intended to affect organization any differently than would an unassisted free market. While the intention has seemed clear, the realization has not been. Unintended organizational side-effects of policy have abounded and have been described since the thirties.

Historically, agricultural policies and programs were seen as needed to assist a chronically depressed and chronically unstable sector of the economy. They were designed accordingly, to stabilize prices and improve incomes. Programs aimed at increasing the income or wealth of farmers should address the question of whether farmers are, in fact, a disadvantaged group in society or would be, without the programs. Programs aimed at mitigating instability should be justified by the improved welfare or efficiency of a more stable industry as opposed to a less stable one.

Most farm programs distribute direct payments and benefits on the basis of output and confer indirect benefits by raising prices in the marketplace; thus both direct and indirect benefits are proportional to volume. Farm program benefits go heavily to the larger-than-family farms, which account for nearly half of production and have current incomes and net worth that are clearly above the average of the U.S. population. It has become increasingly hard to justify agricultural programs that transfer income on the basis of production volume alone, despite objectives to promote stability. Moreover, it is becoming increasingly evident that farm programs administered without due regard for the importance of nonagricultural factors will be insufficient to address the income and stability needs of a diverse U.S. farm sector.

One general relationship appears clear: While public policies may help the current group of family farms to survive, they may also hinder the long-term survival of family farming as a system. By establishing policies that are applicable to all types of ownership and operating units in farming, policies which create a favorable environment for family farms may also attract other types of farm organization, inviting nontraditional investors and new forms of farm business organizations to enter the industry. Thus, the policies may inadvertently preserve the family farm in a disadvantageous position, and may perpetuate the need for Government support.

Nevertheless, some elements of programs appear to contribute primarily to reducing price, production, and resource instability: the farmer-owned reserve for grains, nonrecourse loans at or near world price levels, crop insurance, lender-of-last-resort and economic emergency lending programs, or marketing orders for fruits, vegetables, and milk. Other elements contribute primarily to increasing the income or wealth of farmers through taxpayer transfers (such as target price programs, direct costs of dairy support purchases, and credit at subsidized rates) or at consumers' expense (such as the indirect costs of dairy support purchases, or tobacco and peanut quotas). The total budgetary costs for

income transfer programs greatly exceed the costs of programs aimed at controlling or coping with instability in agricultural markets.

SUMMARY

Major changes in the organization of farming since World War II have called into question the rationale for farm programs used since the thirties. In the depths of the Depression, the decision was made to help all farmers without regard to their size by raising prices through restrictions on production. The need for more stability was also recognized; however, the emphasis was on income enhancement from Depression levels.

In the sixties and seventies, deficiency payments (direct payments to farmers) were introduced to partially separate income enhancement from price enhancement. Deficiency payments, based on volume of production, help large farmers more than smaller farmers.

The evidence points overwhelmingly to major changes in the physical, financial, and institutional organization of farming since World War II. Farm numbers declined until the late seventies and number 2.3 million today. The concentration of production has increased sharply. The largest 5 percent of farms produce 50 percent of output in the eighties compared to 42 percent in 1960. The share of sales by farms with sales of $500,000 or more doubled from 15 percent in 1960 to 30 percent in the eighties.

The decline in farm numbers is almost entirely among those with sales of less than $40,000 per year. The smallest farms have become mostly rural residences with substantial off-farm income offsetting paper or tax losses on minor farming operations. The tax-sheltering possibilities of farm assets have made it more difficult for new people to enter farming and have put more emphasis on tax treatment of assets than on making the most efficient investment.

Changes in technology and specialization of production have encouraged the formation of very large, highly capitalized farms, and very small, part-time farms. This has left the middle of the size distribution--small family farms--too large to allow full-time, off-farm employment and too small to yield an adequate income from farming.

With increasing mechanization, farms must be larger to fully employ farmers and their families--up to 80 percent larger in 1982 than in 1960. This created pressure for farms to grow larger and drove up land prices in the sixties and seventies.

Farmers made substantial paper returns from the increasing value of farmland, providing a basis for loans to buy more farmland and newer machinery, and for farm operation. In the eighties, farmland values have fallen at a time when need for credit has increased for many farmers. As farmers borrow more and their cushion of equity decreases, they are increasingly vulnerable to income swings. Over 30 percent of farms with sales between $50,000 and $500,000 have debt/asset ratios in excess of 40 percent which could bring them to the point of forced liquidation with a few years of poor returns. Nearly 14 percent of these farms with sales of over $50,000 have debt/asset ratios in the extreme danger zone of 70 percent or more, as of January 1985.

Farm income was quite stable in the fifties and sixties, but since 1972 it has been extremely variable. A substantial portion of the underlying instability arises from natural variation in production, much of it weather-related. Another substantial and increasingly important portion is due to increased reliance on export markets for crops. The demand for U.S. agricultural products in the rest of the world is highly variable, especially when large international customers alter their trade practices and policies. Instability is much greater than it was in the fifties and sixties; the role of public programs in providing a measure of income stability is a more important continuing rationale for public farm programs than is low incomes among farm operators.

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The Implications of Emerging Technologies for Farm Programs

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ABSTRACT

Technological innovation is important to the growth and development of the U.S. agricultural economy. Resources freed through adoption of new technologies can be put to other productive uses. Technology that promotes efficiencies in U.S. agriculture is important to consumers and to the competitive position of U.S. farmers in international markets. However, the adoption of new technologies can have structural and distributional implications for the farm sector. Commodity programs which create rigidities in resource adjustment may translate rapid technical advance into mounting Government budget costs.

KEYWORDS: Broilers, commodity programs, corn, cotton, dairy, HFCS, soybeans, sweeteners, technological change, wheat.

INTRODUCTION

Adoption of more efficient ways of doing things in agriculture usually proves profitable to the first farmers who try the new ideas. Once enough farmers have adopted a new technique, prices fall and consumers benefit through the opportunity to consume more at lower cost. And, advancing technology helps the Nation's agricultural economy remain competitive in international trade. In the long run, agricultural resources displaced by technical change can be absorbed into more productive uses elsewhere in a growing economy. However, the blessings of new technology are mixed; while some groups may gain from the increase in efficiency, other groups may lose. For example, in the short run, people displaced by machines may have difficulty finding other jobs. The declining demand for resources replaced by new technology can result in lower returns than would have occurred otherwise, but there may be opportunities for those resources to earn greater returns in other uses.

This article examines four emerging agricultural technologies as examples of the kinds of major changes that farmers may see in coming years. A bovine growth hormone promises to increase milk output; a soybean growth regulator is expected to facilitate double cropping of soybeans with wheat, resulting in increased production of both crops; a bacterial control for wheat fungal disease could well increase yield in wheat grown in the Pacific Northwest; and a table sweetener resulting from the crystallization of high fructose corn syrup (HFCS) will likely

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offer a substitute for other sweeteners. Each of these techniques promises to improve the income of the first innovators to successfully adopt them, to increase the supply of food at lower prices to domestic consumers, and to improve the comparative advantage of U.S. agriculture in international trade.

However, each of these techniques also promises to increase the supplies of some major farm commodities and decrease the demands for others. The result could be lower prices and narrower profit margins for producers of some commodities. Those last to adopt the new ideas would be faced with a cost/price squeeze as the economic impacts work through agriculture. After the new ideas are in general use, even the profit advantage of those first adopters could be narrowed, possibly to less than before the new techniques emerged. Therefore, a major concern of this article is the general effects of technical advance on the output, prices, and income of farmers; and on the redistribution of income that tends to accompany an increase in efficiency. One of the findings is that Government programs such as those that have been in place over the past half-century tend to restrain price and resource adjustments, thus modifying both the beneficial and the adverse effects of the technology. Some aspects of Government programs speed up the adoption of technology, as when yield-increasing practices are adopted on reduced acreages; and other aspects slow the adoption, as when labor retained in agriculture reduces incentives to adopt labor-saving machinery. These effects could add to Government stocks of surplus commodities, and to the costs of agricultural price and income support programs. This suggests that it may be all the more imperative to develop alternative means of accomplishing policy objectives with regard to the well-being of landowners, producers, consumers, and taxpayers.

OUTPUT, PRODUCTIVITY, AND TECHNICAL CHANGE IN FARMING

During the past half-century, total agricultural production increased; the pace varied with changes in factors affecting both the demand for and the supply of farm products. During 1910-35, crop production was about constant and growth in livestock production was the result mostly of gains in dairy. There was an important switch to mechanization from power supplied by horses and mules. Two major forces affected the demand for crop products. Export demand fell steadily from the close of World War I to the late thirties. The cropland harvested for export dropped from a high of 62 million acres in 1918 to a low of 8 million in 1940. With mechanization, the acreage producing feed for workstock fell from a high of 93 million acres in 1915 to 56 million acres in 1935 (and to about zero by the midsixties). The cropland harvested per capita for domestic use was about constant during this period. During 1910-35 no significant improvement in yield levels occurred, although considerable yield variability resulted in year-to-year surpluses and shortfalls. The domestic supplies relative to domestic demand and the reduced demand for exports and for feed for workstock resulted in severe downward pressure on prices received by farmers during the twenties and thirties.

During 1935-50, a remarkable growth in agricultural production occurred. Farm programs imparted increased price stability, more credit was used for the purchase of nontraditional inputs, and information delivered by extension workers and salespeople assisted in accelerating the adoption of technical advance. Annual growth rates in production were 2.5 percent for livestock, 3 percent for feed grains, 4 percent for food grains, and 8 percent for oil crops. Livestock production subsequently slowed to about keep pace with growth in the domestic population, but crop production expanded rapidly through the seventies, spurred by burgeoning export markets, particularly for corn, wheat, and soybean products.

The productivity of agricultural resources also varied during the past half-century. During 1935-50, the multifactor productivity growth rate was 1.9 percent per year. During this period, inputs increased and so did outputs. During 1950-65, output continued to grow even as the aggregate level of inputs decreased, partly in response to supply management programs. Consequently, productivity growth accelerated to 2.4 percent per year. Since 1965, the level of inputs increased again, and the growth in productivity slowed to 1.7 percent per year.

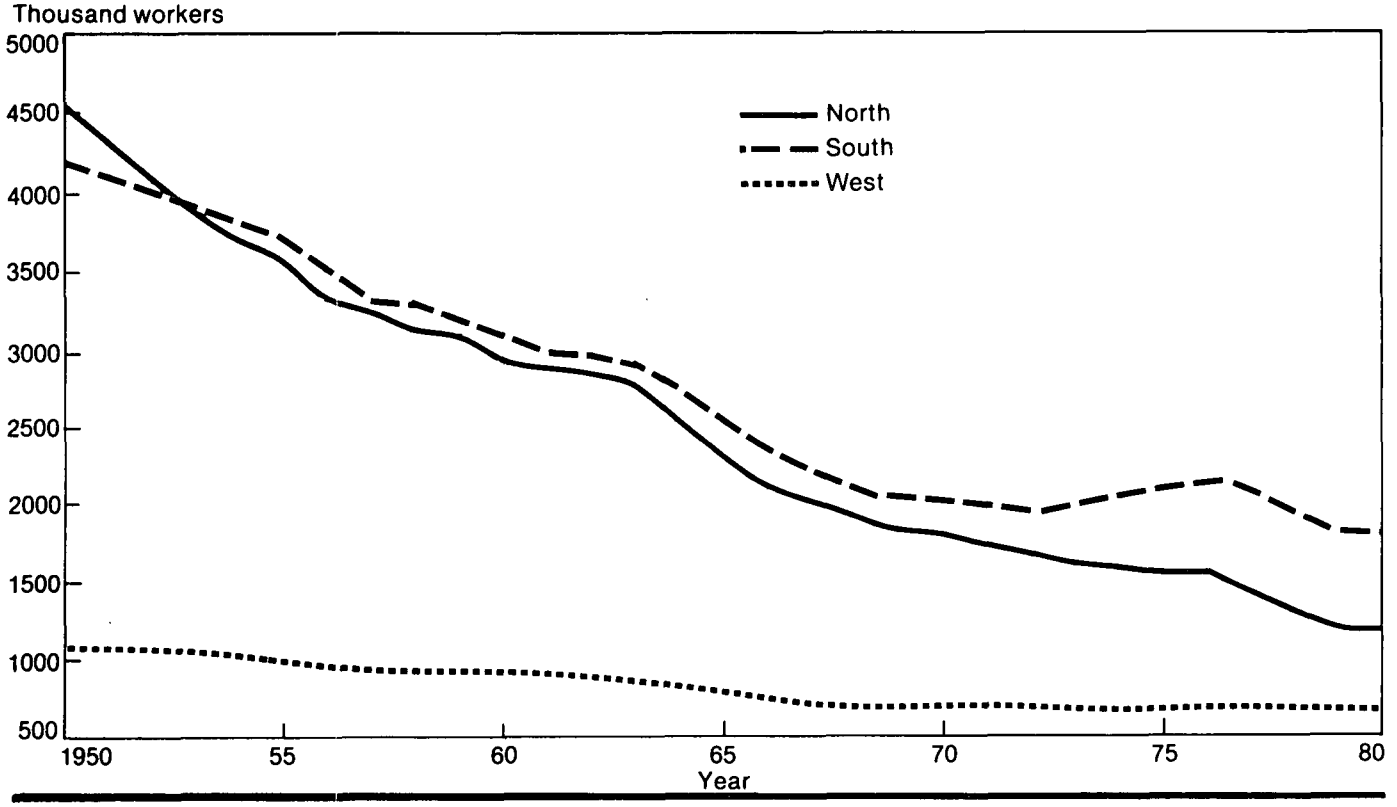
Structural changes in the farm sector have slowed from the rate at which they occurred between the forties and early seventies. General farms have specialized into crop farming and livestock farms, and the commodity mix has shifted to include relatively more crop production. Several important regional shifts in production accompanied this change. Purchased input use followed an uninterrupted 30-year increasing trend. Land removed from production in the sixties returned to production in the seventies and early eighties. Farm labor use has leveled off since 1970 after 25 years of decline (fig. 1). The number of farms and the distribution of farms by size have changed less in the last decade than in the preceding three decades. The population in rural areas increased relative to urban areas during the last decade. As a result, the productivity of land and labor and the multifactor input index have increased less rapidly since 1965 than during 1950 to 1965.

Aggregate Effects on Consumers and Farmers

Growth in the supply of farm products relative to demand reduced the real price of food to the American consumer. Expressed in terms of the minutes of work

Figure 1

Average regional farm employment



required to earn the equivalent take-home pay, the market basket which required 1 hour of work in 1967 and 62 minutes in 1984, required more than 2 hours of work to purchase in 1929. As an example, the purchase of a dozen eggs required only one-third of the wage time in 1984 that it had in 1950 (table 1).

Technological change in agriculture has been embodied in inputs which farmers have purchased from other farmers and manufacturing industries to replace or augment their own limited time and land. As a result, the expenses for nonfarm, intermediate inputs increased from 38 cents per dollar of gross receipts from farming in 1940 and 1950 to 52 cents in 1982. When the landlord, hired worker, tax collector, and banker are paid off, the margin per dollar of receipts remaining for operator living (and land investment) is considerably less than it was a third of a century ago. But, the picture for farm operators is actually more positive than it might seem--the value of farm sales per farm operator has increased. Gross receipts per farm increased from $12,734 (in 1982 dollars) in 1940 to $67,564 in 1982.

The obverse side of increasing productivity is reduced input requirements per unit of output. Agricultural labor is a case in point. Mechanization reduced the number of workers required for a given level of crop production. As technology relieved the limiting labor resource, the retirement of older farmers and migration of younger farm people to nonfarm areas released the other resources (such as land and machinery) necessary for farmers and innovators to expand and intensify their operations. Between 1950 and 1969, farm numbers and farm employment were halved and hours worked decreased 55 percent, with the South and Northwest experiencing a greater portion of the labor adjustment than the rest of the country (fig. 1). Since that time, the labor exodus has slowed considerably outside the South. The effects of technological change were, until the midseventies, reduced farm employment and farm numbers, and increased farm size 1/.

1/ Kislev and Peterson (11) suggest that attractive off-farm employment opportunities were as important as farm technological change in explaining the total decline in farm employment.

Table 1--The price of selected food items in minutes of work 1/

Item	Unit	1930	1950	1970	1980	1984
				Minutes		
Round steak	1 lb.	48.4	43.8	28.8	29.4	24.3
Potatoes	10 lb.	40.9	23.3	20.7	22.1	20.2
Bacon	1 lb.	48.3	29.8	21.0	15.5	15.5
Eggs	1 doz.	50.6	28.3	13.6	8.9	8.6
Bread	1 lb.	9.8	6.7	5.4	5.4	4.5
Butter	1 lb.	52.7	34.1	19.2	20.0	17.6
Milk	1 qt.	16.0	9.6	7.3	5.6	4.7
Coffee	1 lb.	44.9	37.2	20.2	33.3	21.6
Sugar	5 lb.	34.7	22.7	14.4	22.8	15.2
All the above	Total	346.3	235.5	150.6	163.0	132.2

1/ Price of food item relative to manufacturing wage rate after taxes and employee Social Security contributions.

A Synthesis of Effects

Technical change relieves the production constraints imposed by critical resources. The marginal cost of producing the original output is reduced. This permits early adopters to expand output and farm size. The added output puts downward pressure on product prices if demand is not expanding commensurately. This puts noninnovating firms at a disadvantage, increasing the likelihood that they will go out of business. The new technologies frequently require increased purchases of nontraditional inputs, which increases the market exposure of the adopting firms. The credit arrangements to finance the change become an important consideration. They leverage the firm by increasing the fixed cash payments to be made from the variable income stream. If net revenue is not increased enough to offset the higher risks, the new technology may turn out to be a bad investment for the producer. With the declining prices caused by increased product supplies, even technological innovators generally derive no lasting benefits from the technology because their initial profits subsequently fall as the technology spreads. Consumers, however, benefit from the lower prices. Cochrane (6, p. 66) identified this process as part of the "treadmill of agriculture:"

> In summary, the innovators reap the gains of technological advance during the early phases of adoption, but after the improved technology has become industry wide, the gains to innovators and all other farmers are eroded away either through falling product prices or rising land prices or a combination of the two, and in the long run the specific income gains to farmers are wiped out and farmers are back where they started--in a no-profit position. In this sense, technological advance puts farmers on a treadmill.

The price effects described by Cochrane are illustrated by an economic model of change for the agriculture sector 2/. The model separates the effects of technological change and its adoption from changes in product demand and input supply, permitting observation of the effects on individual firms and on prices. The model shows that innovation expands the size and increases the profits of the innovating firm. But as additional firms innovate, net income to the sector declines and the income and production of every other firm declines. The price decreases resulting from widening dissemination of the technology cause both traditional firms and those with the new technology to contract. Innovation is size-expanding; diffusion of technology is size-contracting. A point is reached where the profits of firms with the new technology are less than the original profit was under the traditional technology. At this point, or even sooner, the early adopters will start looking for an even better technology which again will boost their profits. This accelerates the treadmill on which all of the firms are running. Firm exit, changes in market demand and input supplies, and the adoption of an entire cascade of other technological changes alter the structure and performance of the agricultural sector (12).

PROSPECTIVE TECHNOLOGICAL CHANGES

The prospects for the future depend on the technologies that are being developed today and on the economic environment at the time of introduction. Emerging

2/ A nontechnical discussion of the model is in Van Chantfort's Farmline article (26). A more complete discussion of this model is forthcoming in "The Distributional Effects of Technological Change," by Lloyd D. Teigen, to appear in Agricultural Economics Research.

technologies in dairy, soybean, wheat, and sweetener production illustrate the potential consequences of biotechnology for agricultural producers and consumers. In what follows, only the consequences of expanded U.S. supplies will be examined. The effect of a less expensive dollar on farm exports is not examined. The spread of technology is not restrained by national boundaries, and supplies in other countries will also expand. In an open world economy, those supplies generated in other countries will effectively reduce the demand for U.S. exports. This second-order effect of technology on commodity demand is also not examined. It would magnify the price and income effects attributable to the domestic supply effect.

Biotechnology alters life forms. It includes: transfer of genes from one plant to another, from one animal to another, and from animal species to plants, or vice versa; gene manipulation; embryo transfers; and sex determination in semen and eggs. Biotechnology alters the processes internal to the organism, in contrast with technologies which alter elements of its nutrition or environment (such as nutrients, moisture, fertility, pests, and shelter) or improve materials handling by farmers (mechanization).

In the dairy and soybean examples, a hormone is administered to the animal or plant which affects its internal workings without altering its genetic make-up. In the case of wheat, a bacterium which is introduced into the soil enhances the external environment of the plant by producing a substance which controls the fungal disease called take-all. And finally, high-fructose corn syrup, which already competes with natural sugar, may capture an even larger market share if crystallization is made cheaper. While these technologies are at varying stages of research and commercial application, and uncertainties surround health and safety standards, testing, and product registration, it is possible that they could be introduced in the next 3 to 5 years.

Growth Hormones for Dairy Production

Bovine growth hormone (BGH) technology involves the daily supplemental injection of a growth hormone into a lactating dairy cow which increases milk production. The growth hormone is naturally produced by the cow and is one factor regulating milk production. Scientists, however, have been able to identify the gene responsible for its production, isolate it from experimental animals, and splice it onto bacteria. The altered bacteria is reproduced on a large scale by standard fermentation techniques. The resulting growth hormone can then be isolated, purified, and made available for commercial use. This synthesized hormone, when injected into cows daily, has increased production 15 to 40 percent in field trials (10). Field trials also show that only additional grain (and not roughage) is required to sustain the additional milk production. To illustrate the effects of BGH technology, assume that the milk production system at the time of adoption has the following characteristics:

- production cost increases due to the adoption of BGH on dairy farms are estimated to run $0.25 per day per cow for injections plus feed costs of $5.00 per additional hundredweight of milk produced;
- annual milk production per cow before BGH treatment averages 12,300 pounds;
- the price for milk at the farm gate averages $12.10/hundredweight;

- o price elasticity of demand at the farm gate equals -.3 (which means that milk prices will decrease about 3.3 percent for every 1-percent increase in milk supply);

- o aggregate production gains of 5, 10, and 15 percent are assumed to occur (to account for varying rates of adoption or BGH efficacy).

Changes in costs and returns on a typical dairy farm due to adopting BGH technology are given in table 2. The current revenue for an average-size farm (34 cows) with milk prices of $12.10 per cwt is $50,602.

If the hormone raises production 5 percent, revenue per cow increases about $75, but costs increase more than $100. Thus BGH would not prove commercially viable if only a 5-percent gain in production per cow is realized. With milk at $12.10, BGH is commercially viable when production increases at least 8 percent 3/. At

3/ As market prices adjust (downward) to the increased milk production, the breakeven production increase required to justify the new technology increases. With an annual fixed cost per cow of $76.25 for BGH, feed costs proportional to production increments (and equal to $5 per cwt of milk), and a base level of milk production per cow of 123 cwt per year, the breakeven percentage increase of milk production is 76.25/123 (PM - 5), where PM is the milk price (dollars/cwt) prevailing at that time.

Table 2--Bovine growth hormone: Partial budget for alternative production effects, annual basis

Item	Units	Base	Production increments		
			5 percent	10 percent	15 percent
With current prices and policies:					
Milk production per cow	Lb.	12,300.00	615.00	1,230.00	1,845.00
Value at $12.10/cwt	Dol.	1,488.30	74.42	148.83	223.25
Change in costs per cow:					
BGH injections ($.25/day)	Dol.	NA	76.25	76.25	76.25
Added feed ($5/cwt milk)	Dol.	NA	30.75	61.50	92.25
Change in net revenue per cow	Dol.		-32.58	11.08	54.74
Value to a 34-cow farm	Dol.	50,602.00	-1,108.00	377.00	1,863.00
Change in U.S. milk:					
Production	Bil.lb.	NA	7.00	14.00	21.00
Removals	Bil.lb.	NA	7.00	14.00	21.00
Change in dairy program costs	Bil.dol.	NA	1.00	2.10	3.20
Without price supports:					
Price 1/	Dol.	10.50	8.84	7.17	5.50
Net revenue per cow	Dol.	1,291.50	1,034.69	832.35	609.48

NA = Not applicable.
1/ If there were no other changes in production due to lower prices.

this point, all costs involved in BGH are recouped by additional revenue. For every 1-percent increase in production over this breakeven point, about $8.70 in additional profits per cow are generated for the dairy farmer. If on-farm production increases approach the levels realized in field trials, a substantial profit incentive would motivate individual farms to adopt the new technology (12).

The production gains projected to result from use of BGH would increase supply faster than consumption at current prices. Moreover, any production increase would keep prices at support levels and force the Government to acquire additional stocks, especially if future dairy programs continue to use rigid price supports. Costs associated with surplus removal are currently about $15 per hundredweight removed.

By contrast, in an unsupported free market, such industrywide production gains would force some serious adjustment decisions. Under these conditions, prices would decline significantly. A 5-percent industrywide supply increase causes prices to decline to $8.84 per cwt; a 10-percent gain, to $7.17 per cwt; and a 15-percent gain, to $5.50 per cwt (table 2). Price changes of this magnitude are so great that under no circumstances would the adoption of BGH be profitable for the industry as a whole. However, it is probable that before price levels would reach even into the $8.50-$9.00 range, structural adjustments (herd reductions and farmers switching from dairy to other enterprises or other lines of work) would negate some of the supply increases and thus moderate the downward price pressure.

Regional adjustments were examined using ERS analytical models 4/. Production in the Lake States, Southern Plains, and Pacific regions would likely expand, and production in the Southeast and Delta States would decrease. The 15-percent output effect suggests increases in total milk production to the 165-175 billion pound level within 5 to 7 years of commercial introduction. Prices would likely fall as a result of higher production, resting at support levels throughout this period, and prompting the regional adjustments noted. All of the projected production increase (28-35 billion pounds) would go into manufactured dairy products, primarily cheese. These production increases would reduce prices and increase consumption somewhat, but still require massive Government removals (some $3.2 billion if national production is 15 percent higher than the base).

The results in table 2 illustrate the important relationships of all technological advances in agriculture: Adoption of new technology is favorable for individual farmers--assuming prices do not change; the marginal cost of producing the original output is less under the new technology than under the old; nonadopting farmers are placed at a disadvantage relative to adopters; adoption of the technology expands output, reduces prices, and can ultimately reduce producer total revenues (in the absence of price supports); and price changes finally channel almost all of the benefits of the technological change on to consumers (in the absence of price supports). With Government price supports, some of the depressing effects on producer revenue can be controlled, but only at the cost of higher prices to consumers or higher program costs to taxpayers. If incomes per farm fall enough, farms will leave production and the effects of the new technology on the remaining farms will be moderated.

4/ These are the United States Mathematical Programming (USMP) model (9) and Food and the Agricultural Policy Simulation (FAPSIM) model (18). The USMP model is a regional adjustment model and the FAPSIM model is a time-path forecasting model.

Soybean Growth Regulators

Brassinolide was first discovered and isolated by USDA scientists in 1970. It is found in minute amounts in all young plants (200 parts per billion) and is necessary for seedling growth. It was 1980 before processes were found to chemically synthesize the hormone. The synthetic hormone, brassiosteroid, has been under field testing by the Agricultural Research Service for the past few years. In these tests, brassiosteroid is sprayed on seedlings when plants are very young. Seedling growth is accelerated by as much as 10 days without any loss in quantity or quality of yields. In fact, yields may actually increase because early-season losses to insects and diseases are reduced. For example, yields of radishes, lettuce, and green beans were increased by 15-30 percent (14). No process is yet available to cheaply synthesize brassiosteroids, but research may develop one.

If commercial use of brassiosteroids becomes a reality, one of its likely first uses will be on soybeans (15). Soybean yields fall when planting is delayed beyond June 15, which occurs when soybeans follow winter wheat. In west Tennessee, for example, every week's delay after June 15th costs 1 bushel per acre and, after July 1, every week's delay reduces yields as much as 6 bushels. Brassiosteroids could cut growing time of soybeans by 2 to 4 weeks, avoiding these yield reductions. In addition, doublecropping of soybeans and wheat could increase in the South and perhaps move north into Kansas and Missouri. Rotations any further north than this would not likely be affected because moisture is too limited for late-planted soybeans (13, p. 73).

Costs to administer brassiosteroids vary from $15 to $25 per acre. Potential production increases for doublecropped soybeans in most of the Delta States represent present yield losses due to late plantings. Using the West Tennessee rule of thumb, on average, an additional 3 bushels of soybeans per acre could be expected on doublecropped acreage. This would add an additional 20-30 million bushels to the soybean crop.

A larger effect of the soybean growth hormone occurs in the wheat market. Brassiosteroids will allow some fraction of singlecropped soybeans to switch into a doublecropped rotation with wheat. An assumed doubling of the acreage of soybeans doublecropped with winter wheat would add about 7.6 million planted acres in the South. With an average yield of 32 bushels per acre, this would increase wheat production 243 million bushels before price effects are considered. Projected adjustments to introduction of growth regulators on soybeans in the wheat and soybean sectors as prices change are presented in table 3.

As the technology comes on line, production of both soybeans and wheat is projected to increase, prices would decline, and exports, domestic use, and ending stocks would all increase. Net Government program costs for soybeans (primarily intra-year loan activity) would probably not change, despite the added supply and lower price of soybeans. Wheat program costs, though, could be substantial. Average farm prices would likely hover around the loan rate, assuming the current commodity program structure is continued, with further declines prevented by the nonrecourse provisions of CCC loans 5/. Deficiency payments, based on the assumed $4.38 target price, exceed $1.00 per bushel for the added bushels and are increased by the amount of the price change for all

5/ In the absence of the wheat program, price changes would be larger, demand effects greater, and supply effects smaller than estimated here. The value of farm commodities sold would decrease as a result of the inelasticity of demand.

quantities already in the wheat program. In total, wheat program costs could increase more than $2.00 per bushel for every added bushel of production above the baseline if no program changes accompany the technological change.

The regional effects of the technology were examined using the ERS regional adjustment model (USMP). This analysis suggests that net farm income (gross income after variable expenditures) would increase 2.8 percent in the Southeast, 4.0 percent in the Delta States, and 4.6 percent in the Appalachian region. Net farm income in the Corn Belt and Lake States would decline by 0.5 percent and in the rest of the country, 0.4 percent. Deficiency payments made under the wheat program would tend to somewhat moderate this regional redistribution of income.

Brassiosteriods provide an example of a technology having specific application in one commodity but with greater effect in another. Even if the actual effects on wheat production are smaller than calculated, a substantial impact is possible.

Table 3--Soybean growth regulators: Impact on supply, use, and Government cost

Variable	Changes from the base				
	1985	1986	1987	1988	1989
			Percent		
Soybean sector:					
Yield	0.2	0.6	1.2	1.4	1.5
Harvested acreage	-.02	-.02	-.3	-.7	-.7
Production	.2	.4	.7	.8	.8
Domestic use	.07	.02	.4	.5	.6
Exports	.1	.3	.7	.9	1.1
Ending stocks	.5	1.3	2.6	3.2	3.5
Season-average soybean price	-.4	-1.2	-2.6	-3.4	-4.0
Soybean program payments:	0	0	0	0	0
Wheat sector:					
Yield	-.1	-.2	-.3	-.3	-.3
Harvested acreage	1.2	3.0	5.9	7.0	7.8
Production	1.1	2.9	5.6	7.0	7.8
Domestic use	.8	1.8	3.1	3.7	3.8
Exports	.7	1.8	3.8	4.8	5.4
Ending stocks	.5	1.9	4.9	8.6	12.9
Season-average wheat price	-1.1	-3.3	-6.9	-8.5	-9.9
Wheat program payments:					
Deficiency payments	4.4	12.8	27.3	35.5	40.4
Storage payments	.7	2.6	6.8	11.9	17.8
Total Government payments1/	1.1	3.7	8.0	11.2	10.5

1/ Including increased payments in other commodity programs resulting from production adjustments.

More important than the technological assessment is the institutional assessment, comparing the effects of the wheat program with the soybean program. The marginal costs of the soybean program are negligible, while the marginal costs of the wheat program are substantial. The major differences between the two programs are that the soybean program has neither target prices nor deficiency payments, and very few defaults occur under the nonrecourse provision of CCC loans because the soybean loan rate is usually considerably below market-clearing prices.

Microbial Control of Wheat Diseases

Since 1967, Agricultural Research Service scientists have researched various methods for controlling a fungus that causes take-all, a black decaying of the roots and lower stems of wheat and barley. Microbial control, a general term that refers to the use of microorganisms for the control of pests, appears more promising than other chemical, physical, and cultural control measures. Several strains of bacteria called Pseudomonas fluorescens were found that attach themselves to wheat roots and produce a substance antagonistic to take-all.

Sometimes called "bacterization," the innoculation of seed with bacteria has been used successfully in many crops. Experiments in California have shown marked increases in the production of wheat, potatoes, sugarbeets, and radishes when seeds were treated with strains of root-colonizing bacteria. For wheat the best strains of Pseudomonas applied on seeds at planting significantly reduce take-all damage. Experiments in Washington State conducted during 1979, 1980, and 1982 suggest yield increases of 20 to 30 percent (8). "Bacterization" of wheat seeds could become available for commercial adoption in 5 years and certainly should be available for commercial adoption within 10 years.

A take-all control program would combine appropriate cultural practices with seed innoculation of the antagonistic root-colonizing Pseudomonas. A one-time introduction of Pseudomonas into a field may be sufficient if wheat is sown on virgin land or if wheat is continuously grown. Fields subject to crop rotation most likely will require innoculated seed to reintroduce the bacteria into the soil each year.

Successful innoculation of wheat seed with the identified antibiotic root-colonizing bacteria strains will likely benefit Pacific Northwest growers first. Other regions also experience take-all, but may require different bacterial strains. Growers in the Northwest could obtain yield increases ranging between 20 and 30 percent (table 4). Economic seed coating methods would increase the price of seed. However, the effect on total production costs per acre would be negligible. Adaptation of the technology to other wheat-producing areas would require observation and isolation of bacterial strains indigenous to the other regional production areas.

A 20-percent yield increase in the Pacific Northwest would increase total U.S. wheat production about 2 percent in the long run. By 1989, production would exceed the baseline by 1.7 percent (table 5). Exports, domestic use, and carryover stocks would be higher than the baseline, and prices would fall. Because Western White Wheat is the variety affected by the technology, its price, stocks, and consumption would be affected to a greater degree than other varieties of winter and spring wheats. Revenue per acre would increase in the Pacific Northwest but fall in other regions. Until the new technology was adapted to other wheat-growing areas, the competitive position of Northwest wheat producers would be improved. Wheat acreage and production and both gross

Table 4--Innoculated wheat seeds: Projected impact on regional production and income

Region	Wheat subsector		Agriculture sector	
	Acres	Production	Gross income	Gross income minus variable costs
	Percentage change from base solution			
Pacific	+27	+51	+12	+8
Mountain	+34	+54	+5	+11
Northern Plains	-15	-15	+7	-2
Southern Plains	-26	-26	-16	-4
Other regions	-16	-15	-.3	-.5
U.S. total	-6	+3	+.1	+.3

Table 5--Innoculated wheat seeds: Projected impact on supply, use, and Government cost

Variable	Change from the base				
	1985	1986	1987	1988	1989
	Percent				
Wheat sector:					
Yield:					
Pacific Northwest	1.3	6.4	8.2	10.9	12.2
U.S. average	.3	.8	1.3	1.8	2.3
Harvested acreage	0	-.2	-.3	-.5	-.6
Production	.2	.7	1.2	1.6	1.7
Domestic use	.1	.3	.5	.6	.8
Exports	.1	.5	.9	1.1	1.2
Ending stocks	.1	.5	1.1	2.0	2.9
Season-average price	-.3	-.8	-1.6	-1.9	-2.2
Wheat program payments:					
Deficiency payments	1.2	3.7	7.1	9.5	10.3
Storage payments	.2	.7	1.6	2.6	4.0
Total Government payments 1/	.2	.8	1.5	2.0	2.3

1/ Includes increased payments in other commodity programs resulting from production adjustments.

and net agricultural sector income would increase in the Pacific and Mountain regions and decline in others.

Assuming the current configuration of Government programs, program costs would be affected by the increased supply of wheat resulting from the innovation. If it is assumed that there will continue to be a target price set at current levels, it will be higher than the likely market-clearing price and the added production would increase program payments. In addition, the added production would probably put downward pressure on the market-clearing price, increasing the per-bushel deficiency payments made on existing production. Finally, storage payments would increase, just as in the wheat-soybean doublecropping example. Government costs would increase more than $2.00 for every additional bushel of wheat production, given programs like the current ones.

High-Fructose Corn Syrup

High-fructose corn syrup (HFCS) is a product of the enzymatic breakdown of corn starch. Converting corn starch into something sweet is not a novel idea--first attempts date back to 1811 and yielded only glucose corn syrup and dextrose. HFCS was first produced in 1967. In 1972, a new enzyme process made HFCS far less costly than sugar. This new process, involving the use of immobilized glucose isomerase--which "fixes" the enzyme, so that it can be used again and again--made continuous (rather than batch) processing possible. Major capital investments and continued research and development have enhanced efficiencies of HFCS production and use. For example, the current yield of syrup per unit of enzyme is 4-5 times its level in the seventies, reducing the costs of using the enzyme from $1 per 100 pounds of corn syrup to about $0.35 (in late 1982). New plants in the industry require about one-half the labor of comparable plants built in the late sixties. Equally important, product quality has been improved, widening HFCS's use as a sugar substitute.

Prices for HFCS have ranged between 15 and 50 percent less than the domestic price of sugar over the last 5 years, depending on the type of HFCS and capacity utilization in HFCS production. HFCS price levels reflect real differences in production costs, in addition to the marketing strategy of producers. Although allocation of costs among joint products complicates the analysis, HFCS has lower production and processing costs and higher byproduct values than sugar (5). The variable costs of producing HFCS are about 9 to 12 cents per pound. This is about the same as world raw sugar prices of 3 to 6 cents, imported without duties, and processed into refined sugar. The high domestic sugar price, maintained over the years by import quotas, duties, and other support programs for sugar, provided a major incentive for the development and adoption of HFCS.

Growth in production and use has averaged about 25 percent per year since the midseventies. In 1983, about 3.6 million tons (dry basis) of HFCS were produced in the United States. Most HFCS is used in the beverage market where it represents about 75 percent of the total caloric sweetener used. The remainder is used in other food processing industries, such as baking, canning, processed food, and dairy products. Consumption of HFCS in 1983 amounted to over 30 pounds per person in the United States, compared with less than a pound in 1970. Sugar consumption during this same time declined from 102 pounds per capita to about 71 pounds. Table 6 shows how consumption of sweeteners has adjusted to the introduction of HFCS.

The largest share of the adjustment to HFCS has been borne by foreign suppliers of sugar, reflecting a 22-pound-per-capita decrease in consumption of imported sugar between 1970 and 1983 to 23.9 pounds per capita. Domestic sugarbeet

production decreased 8 pounds per capita between 1970 and 1983, while per-capita sugarcane production declined 1 pound.

The cost-competitiveness of HFCS with sugar caused major structural changes in the sugar processing industry, reducing overall production capacity, but raising plant size. Between 1970 and 1983, 21 beet factories closed down, but processing capacity per factory rose 19 percent, and total capacity fell 14 percent. The number of cane mills dropped from 75 to 43, but capacity per mill rose 71 percent and industry capacity remained relatively unchanged (1).

HFCS affects corn producers as well, but to a substantially lesser extent. About 250 million bushels of corn go into HFCS production, nearly 3 percent of recent corn crops. Since 1 bushel of corn can be converted to 33 pounds of HFCS, over 300 million bushels of corn could be used for HFCS production by the late eighties based on projected use.

HFCS enjoys several advantages over sugar. The major advantage, of course, is lower cost at sweetness levels equivalent to the use of sugar in food products. Like sugar, HFCS blends well and adds desired bulk. In addition, HFCS provides desired moistness for some products and enhances certain flavors, such as citrus. Production advantages include year-round operation of plants producing HFCS and lower operating costs relative to the seasonally operated cane and beet sugar plants. One major impediment for future growth in market penetration, however, is that HFCS is available only in liquid form with a relatively short shelf life. Its use is primarily in beverages. In other uses, HFCS's tendency to attract moisture would probably limit its ultimate penetration of the U.S. sweetener market to less than 45 pounds per capita (compared with 36 pounds in 1984).

If fructose in HFCS could be economically crystallized and kept dry (presently the price of crystalline fructose is several times greater than that of sugar) that product could have another major impact in U.S. sweetener use. Pure crystalline fructose (PCF) presently enjoys a small, stable position in the sweetener market and is considered by most industry observers to be a specialty sweetener. If processes could be found to produce PCF at costs comparable to those of sugar, sugar would be challenged in the table sweetener market. Widespread PCF use could double the use of corn in HFCS/PCF production and displace a substantial portion of the 1.1 million acres of sugarbeets and 0.7 million acres of sugarcane. Future impacts due to cost-effective crystallization technology for HFCS depend on several factors, the most important of which is

Table 6--High fructose corn syrup: Effects on sweetener market

Sweetener	1970-75	1975-80	1980-83
		Pounds per capita	
Total caloric sweeteners	-4.5	+7.0	-0.6
Sugar:	-12.6	-5.4	-12.7
Domestic beet sugar	-1.2	-3.2	-3.8
Domestic cane sugar	-.4	-.3	-.3
Imported cane sugar	-11.0	-1.9	-8.6
Glucose and dextrose	+3.9	-1.6	+.4
High-fructose corn syrup	+4.3	+14.1	+11.6

the effect of noncaloric sweeteners on the total market. Consumer acceptance of the new products is another.

With sugar prices continuing to be supported at a substantial premium over HFCS, about 10 pounds of sugar per capita could be displaced from the market between 1983 and 1986, and possibly more by 1990 if cheap crystalline fructose could be developed. If annual sugar production or import levels were not adjusted, substantial inventories could accumulate. Policy issues would likely arise regarding the share of adjustment borne by domestic versus foreign sugar suppliers and the distribution of the domestic adjustment between cane and beet producers. The price effects could be substantial owing to the inelastic sweetener demand, especially if imports of lower priced foreign sugar were allowed to expand.

IMPLICATIONS FOR COMMODITY PROGRAMS

Technological change will continue to occur in American agriculture. The changes may reduce costs, increase output, enhance the productivity of some resources, or overcome a specific bottleneck in the production process. Ultimately the marginal cost is reduced and output increases for a given level of prices received. The new technology may also shift the demand for productive factors even before product prices adjust, increasing demand for resources complementary with the new technique and decreasing the demand for other resources. In addition, when the change in product supply is large enough to affect the market for that commodity, its price will likely fall and the relative prices of all production inputs will be affected. Purchased inputs might be reduced and the returns to owners of resources used in the production of particular commodities might decline.

If technological change occurs more rapidly than the growth of demand, commodity prices would be expected to fall and producers could experience reduced incomes. If technological change is less rapid, consumer prices rise. A balanced rate of technological change would be rapid enough to match the growth in the market but slow enough to permit the resources displaced by technological change to be absorbed elsewhere in the economy. If the increased production is mostly for export, the benefits will accrue to those who import U.S. farm products in addition to domestic farmers and consumers.

Resources are almost invariably displaced by technological change. Labor was displaced by the cotton picker. Land producing horse feed was freed up when tractors replaced horses and mules. In the future, growth hormones may displace some dairy cows. Wheat production gains in the Northwest from the control of take-all may displace acreage and production in other regions. High-fructose corn syrup now displaces sugar and other sweeteners and may displace more in the future.

Technological change affects the costs and returns of individual farms and alters the geographical distribution of production. Changes in soybean technology affect the income of wheat growers. As adoption of new technology sends larger supplies to market, prices fall--unless Government policy and programs prevent adjustment by the farm sector. Total income to the farm sector may fall but, to the extent that it is shared among fewer farmers, the average income per farmer can rise. The structure of agriculture would change as some traditional farms innovate and others drop out, so that there is a larger proportion of higher technology farms to lower technology farms. Each of these classes of farms is facing lower prices received as the technology spreads and therefore

receives lower incomes at each stage of the process. As the proportion of high-tech farms rises, the weighted average income of all farms rises even though the incomes of every farm in each of the two classes are falling. In the long run, income per farm will approach a level below which even the high-tech farms would leave the sector. Ultimately the benefits of technological change are captured by consumers here and abroad in the form of lower food prices.

When Government policy does not permit price and resource adjustments, both the level and the distribution of benefits from technological change are affected. Larger supplies require additional Government removals at greater cost to the taxpayer. Some benefits, which otherwise would accrue to consumers, are passed on to producers and landowners--generally as increased values of farmland and other farm assets. But, there is some loss of economic efficiency. Production asset values adjust to prices higher than indicated by market forces, passing much of the program benefits from the producer on to the asset owner--not always the same person.

Current commodity programs require more flexibility to permit price and resource adjustments to technical change. Milk prices are presently supported by CCC direct purchases of butter, cheese, and nonfat dry milk and, at levels of recent years, adjust only after substantial removals occur. Wheat prices are allowed to adjust in the marketplace above the loan level, but producers receive a deficiency payment to compensate for the difference between the target price and the farm price. With such programs and the present supply/demand balance, every additional unit of output is associated with additional cost to the taxpayer. Without them, the domestic market could not absorb the prospective increase in food production without larger price decreases.

At current production and price levels, every additional hundredweight of milk produced under current programs requires an additional hundredweight of Government removals at a total cost of $15 to the taxpayer, of which the producer receives about $12.10. The variable expenses of producing that hundredweight of milk in 1983 were $9.60 in the region with the highest costs--Appalachia.

Every additional bushel of wheat costs its purchaser about $3.65 and costs the taxpayer an additional $2.00 (of which about $0.75 is that producer's deficiency payment and about $1.25 goes to all other wheat producers as a result of storage payments and the widened level of deficiency payments). Yet, the variable expenses (22) for producing all U.S. wheat in 1983 averaged $1.41, and ranged between $0.98 for hard red winter wheat in the Northern Plains and $1.95 for soft red winter wheat in the Northeast. The variable expenses for white wheat (the major variety in the Pacific Northwest) were $1.16 per bushel.

The margin between price and variable costs 6/ for most commodities provides an adequate return to the producers of the median unit of output (generally those with sales greater than $100,000), but leaves the median producer of that commodity (generally having sales of less than $30,000) with limited net farm income. Price enhancement policies and deficiency payments have little effect

6/ Variable costs are incurred as a result of producing that commodity in that year. Land and machinery ownership costs and the operator's labor and management input are part of the farm overhead and are incurred whether or not a particular commodity is produced. The margin between price and variable costs provides the return to the entire overhead, but cannot be unequivocally allocated to the individual items.

on the incomes of the smallest producers and convey the largest benefits to the largest producers. Government farm policies and price support programs have substantial budget cost at the margin and are quite sensitive to the supplies brought forth by new technologies. Less costly, more flexible means may need to be found to accomplish the objectives of assuring adequate returns and stability in agricultural production, while accomodating the technological change and increased production efficiencies necessary for a competitive position in world markets.

Technological change is difficult, if not impossible, to forecast. It cannot be controlled easily--even if control were deemed socially desirable. Almost two-thirds of all R&D expenditures on agricultural technology are made by the private sector, and research and development continues in other countries regardless of U.S. policies. Technological change affects consumers, producers, asset holders, and taxpayers, and it affects the various regions of the country differently. Government farm policies and programs were originally designed to ease the adjustment by the agricultural sector to structural change, including technological advances. To remain viable, the policies themselves need to take on added flexibility to adapt and adjust to the consequences of changing technology. Flexible commodity policies could insure that the benefits of technological change are shared more broadly among producers, consumers, and taxpayers, enhancing the efficiency and productivity of the food and agricultural system and the U.S. economy.

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World Agricultural Markets and U.S. Farm Policy

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and Philip L. Paarlberg*

ABSTRACT

Agricultural exports are important both to the U.S. farm economy and the nonfarm economy. Future export volume will depend on growth in global agricultural trade and the U.S. share. U.S. policy can have a major influence on both. The United States, for example, has the resources and technology to be competitive in global grain and oilseed markets, but farm policy will play an important role in determining the evolution of U.S. agriculture and its competitiveness on world markets. U.S. policies that support producer incomes are in conflict with strategies to expand exports. The policy choice is between support for today's producers and expanded markets for tomorrow's producers.

KEYWORDS: Agricultural trade, exports, farm policy, imports, market share.

INTRODUCTION

The value of U.S. agricultural exports increased more than fivefold in the seventies and the proportion of farm cash receipts coming from exports increased from less than 15 percent to almost 30 percent. This recent internationalization of U.S. agriculture has been driven by income and population growth, which have caused import demand for food grains and feedstuffs to surge--especially in developing and centrally planned countries. U.S. producers of wheat, feed grains, and soybeans have been major beneficiaries of this growth in import demand.

The growth of exports has serious implications for current U.S. agricultural policy. Present agricultural commodity policy has its roots in the depression era of the thirties when high trade barriers and slow income growth worldwide made trade only a minor consideration in policy formulation. The majority of U.S. crop farmers can no longer rely on the U.S. market--protected and supported by taxpayers--as the only outlet for their produce. They must compete on a world level and they must have a policy framework that encourages them to respond to the rigors of that broader market. This report examines the tradeoffs between traditional objectives of stabilizing and supporting domestic producer incomes and the objectives associated with an agricultural sector which is both competitive on world markets and is responsive to the dynamic forces shaping international trade.

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Agricultural exports are important to both the U.S. farm economy and the nonfarm economy. In recent years, agricultural exports have grown to account for one-fifth of total U.S. exports. The main sources of export revenue are food grains, feed grains, oilseeds, and oilseed products, which accounted for over 60 percent of the value of U.S. agricultural exports in calendar year 1984. Most of the remaining value was livestock, livestock products, fruit, vegetables, cotton, and tobacco (table 1).

The resurgence of interest in agricultural trade issues and policies has occurred since 1972 as the real value of agricultural exports in 1975 dollars increased from $12 billion in that year to over $27 billion in 1980 (fig. 1), before declining to $19.7 billion in 1984. In the fifties, little attention was paid to agricultural trade issues, in part because the United States was a net importer of agricultural products (fig. 1). Agricultural exports relative to the size of the agricultural sector are now regaining the level they had reached in the early twenties, that is, about one-fourth of the cash receipts from all farm products (fig. 2). 1/

Commodity Composition of U.S. Exports

Some American farmers have always depended on world trade as a source of income. Cotton and tobacco producers exported between one-quarter and one-half of their crops through most of the nineteenth and twentieth centuries and the United States has exported significant quantities of wheat and rice since the mid-1800's. It was not until the early seventies, however, that corn and soybean exports exceeded 10 percent of domestic production. The inclusion of these two crops in the group of major U.S. agricultural exports has greatly increased the importance of trade issues to the feed-livestock sector--a portion of the agricultural economy which had heretofore focused on production for domestic consumption.

1/ The export value includes some processing and transportation.

Table 1--Value of U.S. agricultural exports and imports in current dollars by product category, calendar year 1984

Item	Exports	Imports
	Billion dollars	
Livestock and products	4.2	4.0
Food grains	7.5	0
Feed grains	8.2	.6
Fruits, nuts, and vegetables	2.8	3.8
Oil crops and meal	8.4	.8
Cotton and tobacco	3.9	.6
Other	2.8	10.1
Total	37.8	19.3

Source (6).

Figure 1

Real value of U.S. agricultural trade

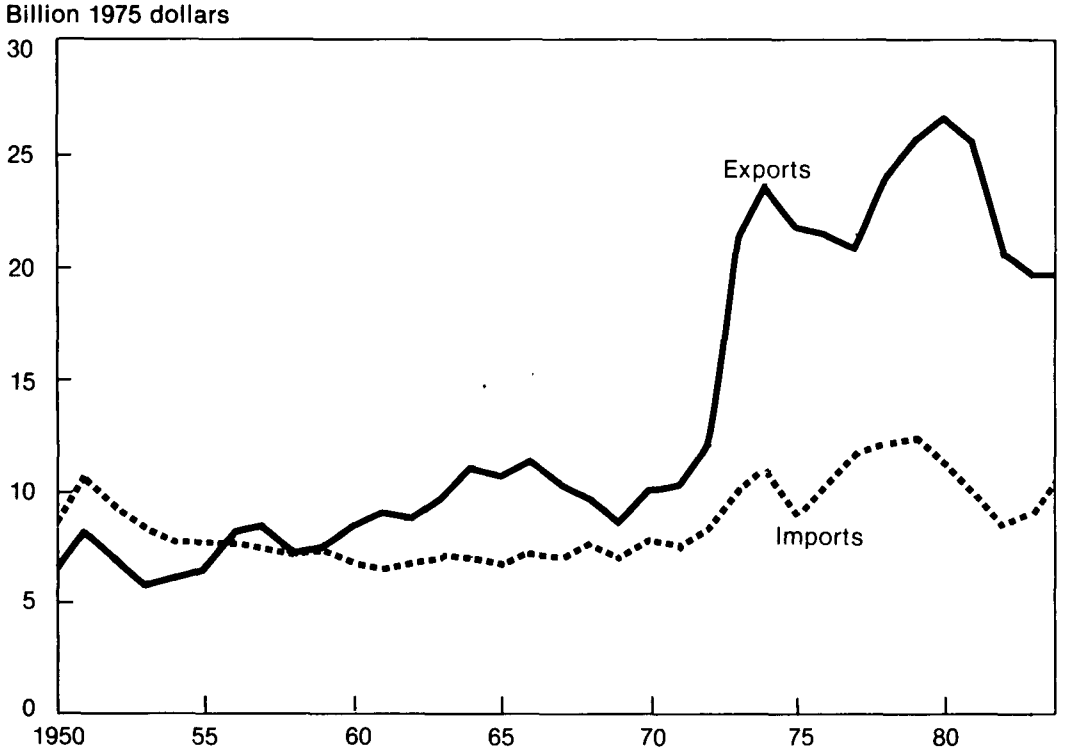
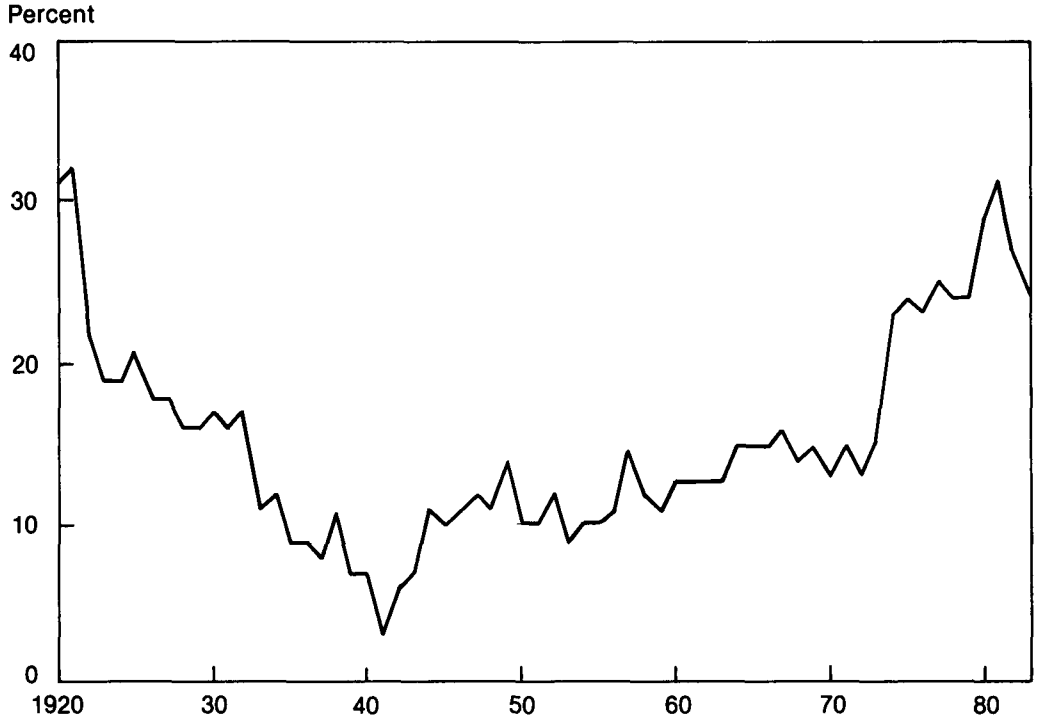


Figure 2

Agricultural exports as a percentage of cash receipts



The shift in the commodity composition of U.S. agricultural exports in the past 30 years is shown by figure 3. Although the values of all commodity exports have increased, there has been a substantial shift in the relative importance of major groupings. Wheat and rice as a proportion of the value of U.S. agricultural exports have changed little since 1950, although wheat has shown considerable variability. Tobacco and cotton have declined sharply, falling from a combined total of 30 to 40 percent of U.S. agricultural exports in the early fifties to 10 percent or less currently.

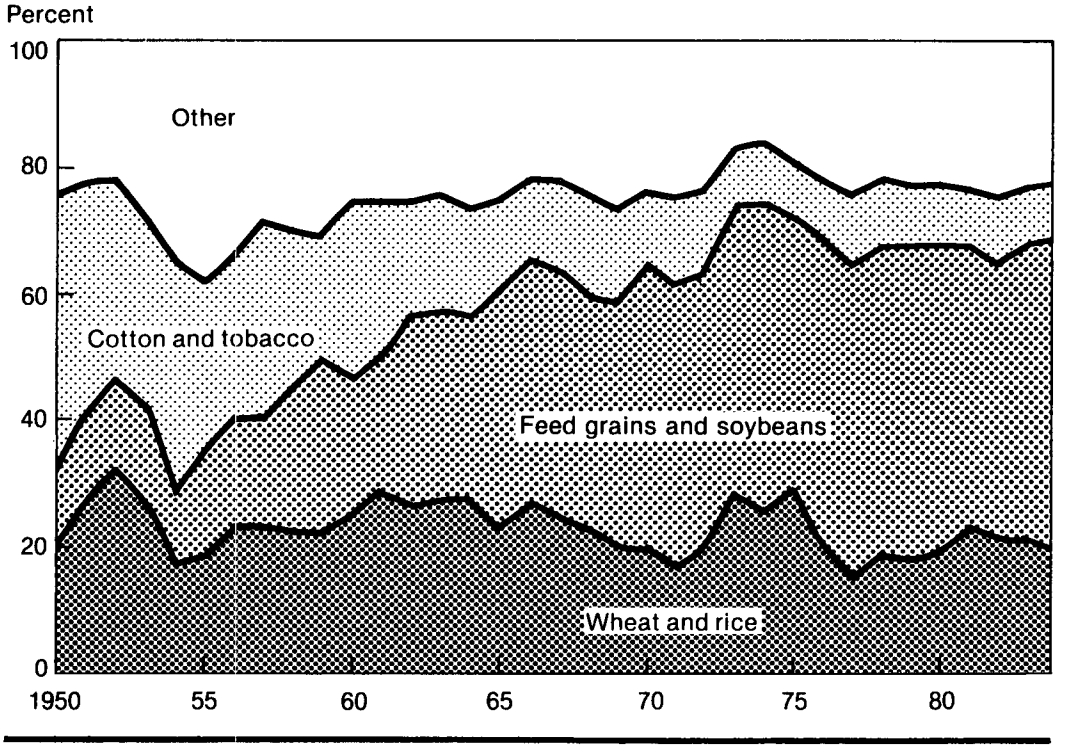
The dramatic change--as mentioned--has come in feed grains and soybeans, which together accounted for 12 percent of the value of agricultural exports in 1950 but 46 percent in 1983. Over the same period, U.S. agricultural exports tripled in real value. The shift in commodity composition has helped make possible the recent rapid growth in agricultural exports and represents a massive new source of income to the agricultural sector.

The emergence of corn and soybeans as major exports has also had a significant impact on how U.S. policymakers view foreign markets. Demand for traditional U.S. agricultural exports such as wheat, rice, and cotton increases relatively little with an increase in per-capita incomes. Hence, global income growth has a smaller effect on trade in these products than it does on trade in soybeans and feed grains for which demand is linked closely to changes in income levels. These commodities are major inputs in the production of meat and livestock products--products whose demand is very sensitive to changes in consumer incomes. This suggests that U.S. agricultural exports are now much more sensitive to changes in global income than they were 15 or 20 years ago.

Figure 3

Changes in the commodity composition of U.S. agricultural trade

Commodity shares of U.S. agricultural export value



Factors Affecting Total World Demand for Imports

Growth in any country's import demand is largely the interaction of four major forces: population growth, income growth, income levels, and the growth and productivity of agriculture. Population growth is frequently the key variable in determining long-term food needs of a country or region. In the seventies, annual average population growth rates (table 2) were 1 percent or less in most developed countries but were 2 percent or more in most developing countries. Although population growth is important over the long term, these growth rates are relatively stable over a 1- to 5-year period. Population growth is not usually a source of short-term variability in import demand. Population distribution across rural and urban sectors, however, can have an effect on food demand in the short to medium term. Urbanization in developing countries is frequently associated with a change in food consumption habits as urban consumers switch from traditional foods, with long in-house preparation times, to processed wheat or rice products.

Food needs must be distinguished from food demand. Population levels determine food needs, but the rate at which needs are translated into demand depends on the availability of income to purchase food. Income growth rates in the seventies differed widely across countries (table 2). The OPEC countries, as expected, had extremely high rates of growth (averaging 7.7 percent per year), but even the poorest developing countries had an average growth rate of 4 percent. Much of this growth was financed with petro-dollars recycled through Western banks to non-OPEC developing countries. The global recession that began in 1980 has reduced real income growth, leading to reduced trade and a decline in prices for many commodities and manufactured

Table 2--Factors affecting the growth in food demand in developed and developing countries

Item	Developed		Developing			
	Total	U.S.	Total	OPEC	Newly industrialized	Low income
			Percent			
Average annual growth, 1970-80:						
Population	0.90	1.00	2.40	2.60	2.30	2.30
Urban population	1.60	1.50	4.20	4.50	4.00	4.20
GDP	3.30	3.00	6.10	7.70	6.40	4.00
			Value			
Income elasticities: 1/						
Total calories	.07	-.01	.35	.48	.19	.38
Animal calories	.21	.02	.70	.85	.63	.93
			1969/71 = 100			
Index of food production per capita, 1980	111	115	102	99	115	99

1/ These elasticities, while dated, provide a indication of the relative magnitude of the differences in food demand response to income changes across countries.

Sources: (7, 2).

goods in world trade. Many developing countries are faced with huge debts denominated in U.S. dollars (which have appreciated by more than 40 percent relative to other currencies over the past 4 years) and financed at variable interest rates (which have risen substantially since 1980). Prospects for a return of a boom in U.S. agricultural exports, fueled by import demand by developing and centrally planned countries such as occurred in the seventies, are remote for the next several years.

The third force driving import demand is income levels. The level of income is the major determinant of the income elasticity of food demand, which is a measurement of the responsiveness of consumer food purchases to a change in income. Table 2 shows that doubling per-capita income would increase the demand for food measured in calories by only 7 percent in developed countries, but would result in a 35-percent increase in the demand for food in developing countries. Not only are the major driving forces of food demand--income and population growth--much higher in developing countries than in developed countries, but the income elasticities are also much greater. When incomes grow rapidly, food demand may outpace food production from the agricultural sectors of many developing countries. It also means, however, that a decline or slowdown in income growth will have a much greater impact on food demand growth than will a similar change in income in the developed countries.

The final force affecting import demand is the growth and productivity of the agricultural sector. The index of food production (table 2) shows that developing countries as a group lagged well behind developed countries in agricultural output per capita in the seventies. Among the country groupings shown, only the newly industrialized countries were able to increase food production faster than population. Developed countries were increasing food output faster than their growth in food demand, while developing countries were unable to keep pace with their food demand growth in the seventies.

U.S. GRAINS IN WORLD MARKETS

U.S. grain and oilseed exports were the primary beneficiaries of the surge in agricultural trade during the seventies. Hence, much of the concern about the relationship between U.S. domestic farm policy and international trade policy is centered on these products. Both grain and soybean trade are shaped by changing demographics, economics, global stocks management, unique commodity characteristics, and global politics. Each needs to be understood in order to evaluate U.S. grain policy.

World Food and Feed Grain Trade

The emergence of the United States as a leader in world grain trade is a recent phenomenon (fig. 4). Grain trade patterns in the thirties resembled those of colonial empire days. Most regions of the world produced an exportable surplus that went to the grain-deficit countries in Western Europe. Japan and China also imported some grain. The United States was an insignificant grain exporter.

Thirty years later a new trade pattern emerged. Western Europe imported slightly less grain in the sixties than in the thirties, but many other countries, formerly grain exporters, became significant importers. The United States, Canada, and Australia emerged as principal exporters. By the late seventies, the United States established its dominant position as a grain exporter. Dependence on grain imports by the Soviet Union, Eastern Europe,

Japan, and the developing world also emerged as an important world trade pattern.

An examination of the world grain markets in which the United States has been a significant factor---wheat, rice, and feed grains---for the past 30 years helps to put the events of the seventies into perspective and provides a backdrop against which future policy proposals can be judged.

Wheat

Figure 5 shows U.S. exports of wheat since 1950 as a proportion of U.S. wheat production and as a share of world trade on a volume basis. The proportion of U.S. wheat production sold on foreign markets has gradually trended upward but has varied substantially from year to year. This variation has resulted from fluctuating U.S. production and large U.S. wheat stocks which allow the United States to respond to short-term changes in world import demands. Between 1971 and 1972, for example, a drawdown of U.S. wheat stocks allowed the United States to almost double exports.

The U.S. share of the world market shows very little long-term trend, with U.S. exports varying between 30 and 45 percent of world trade during the past 30 years. Except for the early fifties, there is relatively little variability in the U.S. market share. These trends indicate that U.S. wheat exports kept pace with the expansion of world wheat trade--which increased from 21 million tons in 1950 to 105 million tons in 1982.

Figure 4

Annual world grain trade, selected periods

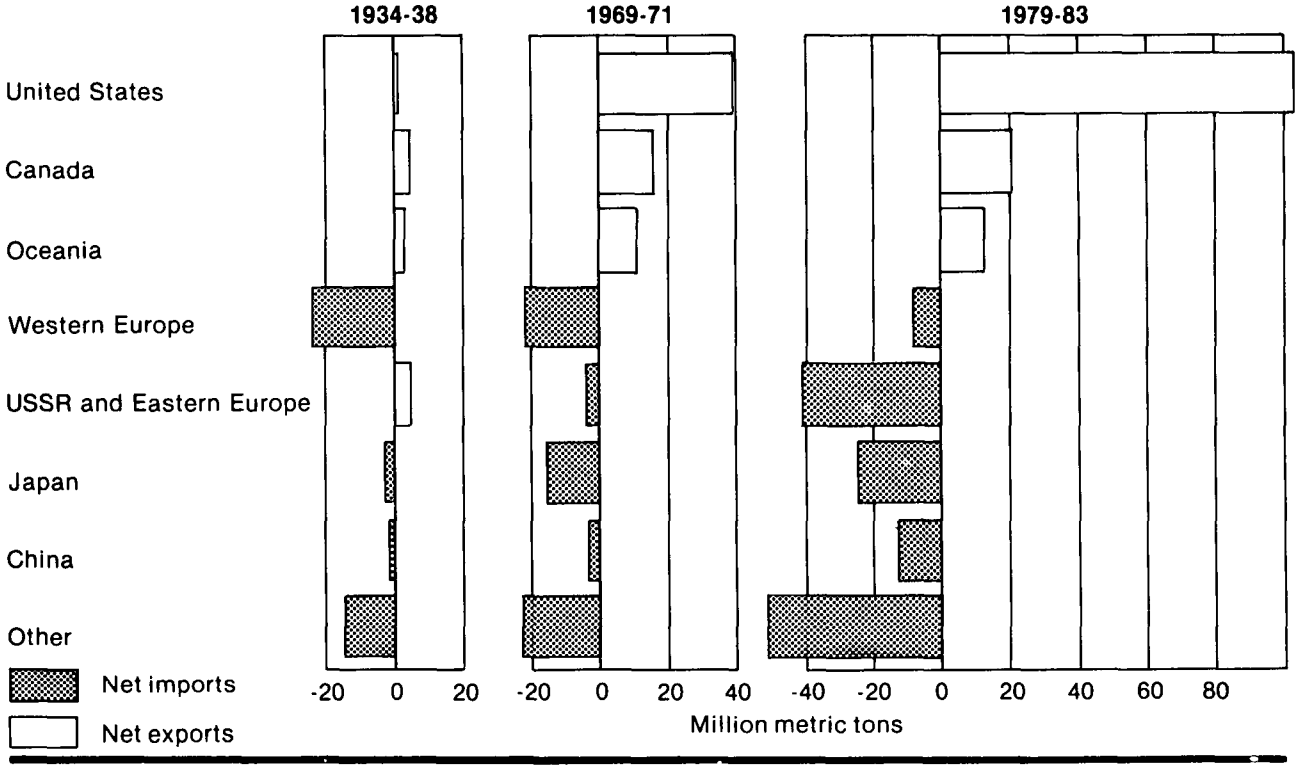
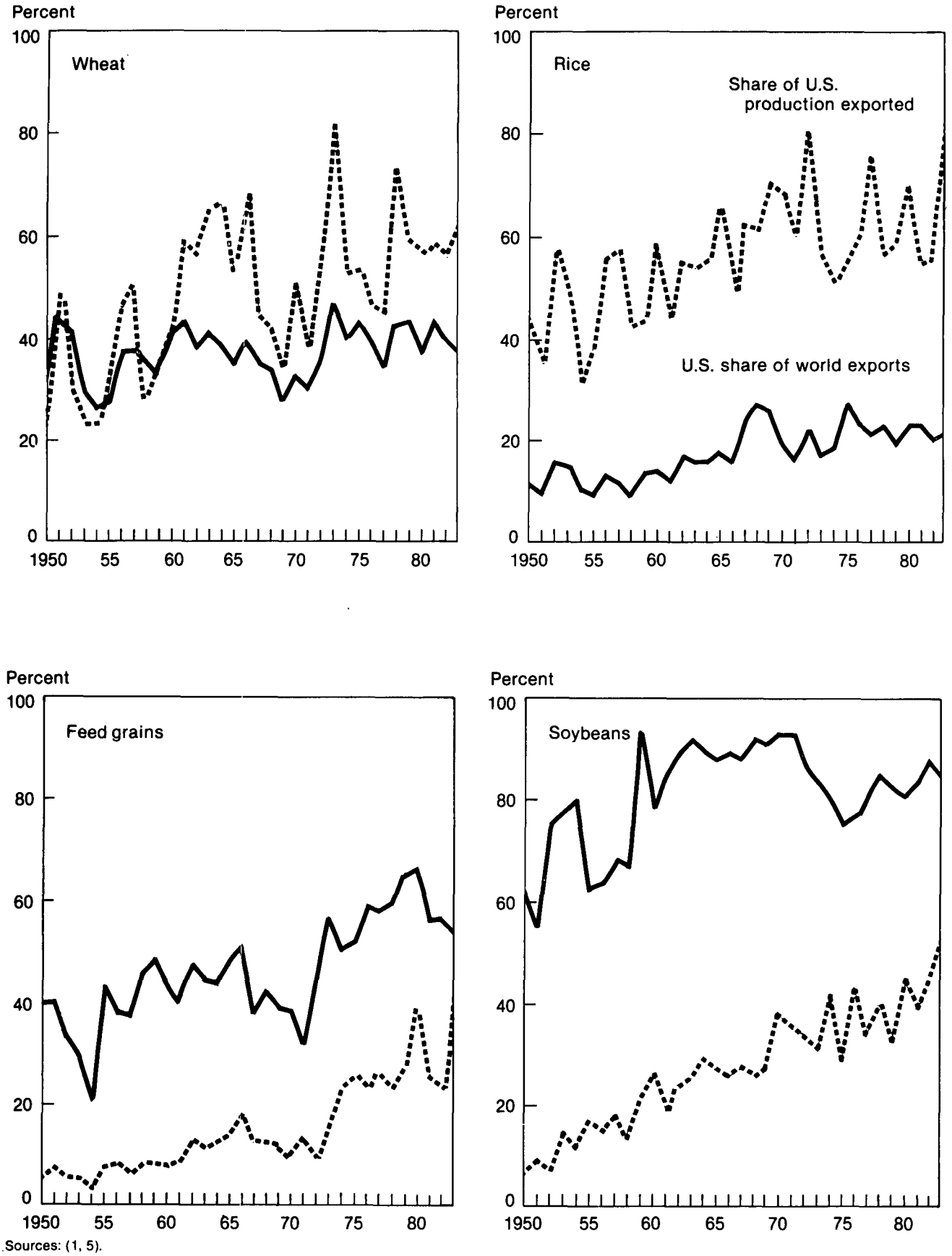


Figure 5

U.S. exports as a share of world exports and U.S. production



Sources: (1, 5).

Rice

U.S. rice exports comprise a much smaller share of world rice trade (10 to 25 percent). Also, the world rice market is much smaller than the world wheat market and it has been growing at a slower pace (from 4.3 to 12 million tons between 1950 and 1982). Rice variety differences have a much greater influence on trade flows and market shares than do variety differences for other grains.

Despite these factors, figure 5 shows an upward trend in the U.S. share of world rice trade. The proportion of U.S. rice production exported increased from 46 percent in 1950 to 68 percent in 1970, but this trend is less apparent in succeeding years. Concessional sales of rice under P.L. 480--which accounted for more than half of U.S. rice exports in the early seventies--now comprise only 15 to 20 percent of rice exports. Although the United States likely will continue to export more than one-half of its rice production, the slow growth of the world rice market is likely to preclude a rapid increase in U.S. exports.

Feed Grains

Feed grain production in the United States over the past 30 years has been more than 3 times the combined U.S. production of wheat and rice. Until the early seventies, 90 percent of this production was destined for domestic use. Beginning in 1972, with the Soviet grain purchase growth in world feed-grain import demand increased the proportion of U.S. production exported from 7.4 percent in 1971 to more than 30 percent in 1980 (fig. 5). The volume of U.S. feed-grain exports increased from 14 to 65 million tons over the same period.

Feed-grain exports subsequently fell to 50.3 million metric tons in 1982, but still equaled 20 percent of U.S. feed grain production and 56 percent of the world export volume.

It is apparent, given their volume and recent growth, that U.S. feed-grain exports have been a major factor in the recent internationalization of U.S. agriculture. It is also significant that the demand for feed grains is closely linked to the demand for meat and livestock products. Economic conditions and business cycles have a much larger impact on the demand for livestock products--and hence on the demand for feed grains--than on the demand for food grains such as wheat and rice. Closer links between U.S. agriculture and the world market in the seventies have therefore meant a closer link between U.S. agriculture and world economic conditions. These economic conditions represent a source of variability which has gained new significance for U.S. agriculture.

Grain Stocks

The United States plays an important role in world agricultural markets by holding large quantities of grain. Between 1979 and 1983, about one-third of the world's total wheat stocks and 60 percent of the world's total coarse grain stocks--consisting of corn, grain, sorghum, barley, oats, and other grains--were held by the United States (table 3).

It is useful to divide stocks into two functional categories--working stocks and caryover stocks. Working stocks are those normally in the grain and food industry pipeline. Carryover stocks are those in excess of working stocks. Countries that hold the world's carryover stocks hold the world's insurance

against future expected shortages. In recent years the United States held most of that insurance. From 1979 to 1983, the United States held nearly one-half of world wheat carryover stocks and 80-85 percent of world coarse grain carryover stocks.

World grain stock levels have shown considerable variation over time (fig. 6). Relative to consumption, stocks were at record low levels after poor harvests in the early seventies. Global stocks at the end of the 1983 marketing year again approached record low levels. The combined effects of a drought and acreage reductions under the payment-in-kind program sharply reduced 1983 U.S. harvests, drawing down stocks precipitously. Figure 6 shows, however, that U.S. stock levels were back up at the end of the 1984 season. Over time, changes in the U.S. stock level have accounted for most of the variation in global stocks, while Canada and the Soviet Union, which have had large stocks periodically, have been most important in accounting for the residual variation.

The global pattern of grain stocks illustrates a curious interdependence that has evolved among the world's grain trading nations. The United States has provided much of the world's carryover stocks of grain as an often unwanted byproduct of its domestic policy. Most other countries carry minimal stocks at no cost to their taxpayers. They rely instead on the world market to absorb much of their production variability. In other words, they rely on U.S. stocks. The success of their domestic grain policies rests upon the willingness of the United States to continue to hold stocks. From a global perspective, grain stock levels of the early eighties appear about optimal. Smaller stocks would be inadequate to prevent against normal fluctuations in trade; but the cost of holding substantially more stocks likely would exceed the benefits of added protection. The high interest costs of the early eighties make stockholding especially expensive. The location of global stocks--mainly in the United States in low-cost storage near low-cost transportation routes--also appears to be near-optimal for the mass of the world's consumers who depend on trade for part of their grain supplies. But the allocation among countries of the costs, benefits, and risks associated with that global distribution of stocks is cause for dissatisfaction in both the United States and in importing countries. There is a sentiment within the United States that the U.S. Government bears too much of the burden of holding

Table 3--Stocks of wheat and coarse grain held by leading stockholding countries, 1979-83 average 1/

Country or region	Wheat	Coarse grains
	Million metric tons	
United States	30	62
Canada	11	6
European Community	9	6
Soviet Union	7	3
Other	30	27
World	87	104

1/ Quantity of grain held at the end of the marketing year. Some rice stocks also are held, but data are not available for some of the most important producers, especially China.

grain stocks while many importing countries feel insecure about the concentration of world grain stocks under U.S. control. Yet, as long as U.S. commodity policy continues to rely heavily on stock management to achieve income redistribution objectives, private traders in the United States and abroad are unlikely to shoulder the high costs of carrying stocks--particularly at the high level of current interest rates. Until U.S. policy changes, the global distribution of grain inventories is likely to remain the same.

Substitution among Grains

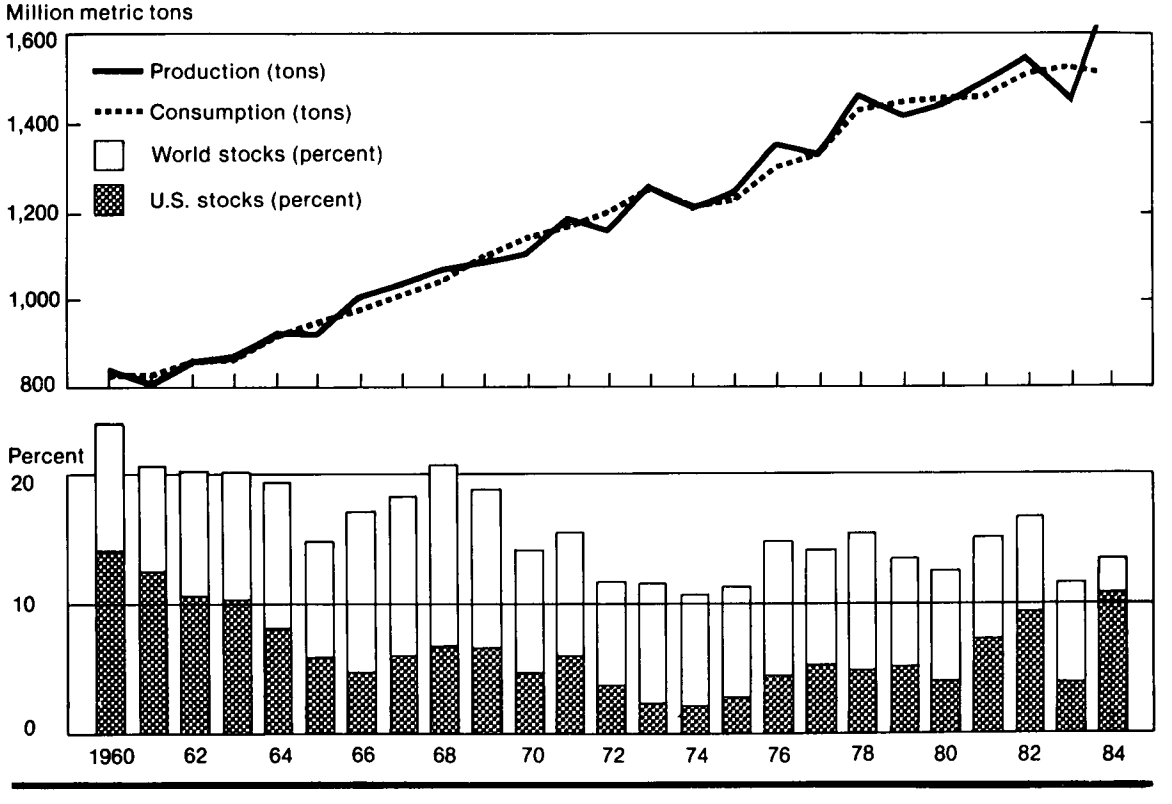
There are many varieties of grain, each with its unique characteristics. Some are used primarily for human food and others for livestock feed. For an individual person or animal, these differences might be important. But in global markets there is substantial substitutability. 2/ Some wheat is fed to livestock. Some corn goes directly to human consumption. Technology now allows marginal substitution of different types of wheat in the production of various feedstuffs. Argentine wheat substitutes for Canadian wheat. Wheat substitutes for corn on the margin. Sorghum and corn substitute in feed rations. All this means that grains are particularly interchangeable. Consequently, prices of all grains tend to move up and down together over time.

Substitution increases competition in the grain trade. The United States does not have as much power in international grain markets as its stock and

2/ There is less short-term substitution among varieties of rice and between rice and other grains than there is for wheat and feed grains and various feedstuffs.

Figure 6

World grain production and consumption, and stocks as a percentage of world consumption



production levels might indicate. This is illustrated with two examples. First, although the United States accounts for 75 percent of the global exports of corn, a shortage of U.S. corn in world markets would tend to be offset by supplies of barley, sorghum, or even wheat. U.S. corn exports represent about 50 percent of world coarse grain trade but only 25 percent of total grain trade.

As a second example, consider U.S. exports as a share of foreign production. U.S. wheat exports are equal to only 11 percent of wheat production in the rest of the world. The equivalent value for feed grains is 13 percent; all grains, including rice, 10 percent. This means, for example, that the rest of the world would only have to increase grain production 5 or 6 percent to offset half of U.S. grain exports. Policies that make U.S. grain more expensive on the world market thus run the risk of eventually reducing U.S. exports.

History has shown that it is difficult for countries to manipulate grain trade because of grain's interchangeable nature. Embargoes tend to fail, or are at most successful for only a short time. Likewise, it would be very difficult for exporting countries to enforce a grain export cartel.

Agricultural Policy and Grain Trade

Grain trade patterns shown in figure 3 are only partly determined by the global distribution of productive capacity, population, and wealth. Government policies also play an important role. Although there are exceptions, one can make some generalizations about grain policy by dividing the world into four groups: the Soviet Union, the United States, other developed countries, and developing countries.

Developed Countries (Excluding the United States and Soviet Union)

The developed countries including most of Western Europe and Japan generally support prices of domestic farm commodities well above prices in the world market. The policy mechanism most often chosen in these countries to support prices tends to stabilize domestic prices at the expense of destabilizing the world market.

Over the last 50 years, agriculture has been viewed in developed countries as a sector with a high concentration of low-income families with limited alternative employment opportunities. Citizens of Western European countries and Japan emerged from World War II with vivid memories of food shortages and with a strong desire to achieve national food self-sufficiency. The food and agricultural policies which have emerged during the past 3 decades in the developed countries have therefore emphasized support of the rural farm sector--often at the expense of taxpayers and consumers who are concentrated in urban areas.

A side-effect of domestic agricultural policy in most developed countries is that adjustments to variations in domestic grain production are forced onto the world market, increasing the instability. All countries seek to stabilize domestic food supplies, but they face unpredictable variation in domestic crop production. Given the variation in domestic production, a country can add stability to the domestic food supply by either managing domestic buffer stocks to offset production variability or by using the world market--importing more when domestic production is down and exporting when it is in surplus.

Most developed countries hold small stocks of grain and rely on trade to stabilize the domestic market. This destabilizes the world market in two ways: the market impacts of domestic crop shortfalls or surpluses are transferred to the world market and domestic producers and consumers do not have to adjust to world shortages or surpluses that may exist in the rest of the world. The quantity imported is determined by the gap between domestic production and consumption at the stabilized domestic price, regardless of the world market price. If grain supplies are low in the rest of the world and world prices are high, developed countries can bid grain away from the poorer countries--which cannot afford the high-priced grain--and from consumers and livestock producers in countries such as the United States and Canada where domestic grain markets are linked closely to the world market. In other words, developed countries with insulated markets export the effects of shocks to their markets while protecting themselves from world shocks.

This description is also appropriate for the policy impacts of most of the developed grain-exporting countries. Few countries, other than Canada in this group (and the United States, which is considered separately), hold significant grain stocks. These exporting countries also tend to stabilize domestic markets and let the export market absorb most of the variation in domestic production.

Developing Countries

Developing countries generally set domestic grain prices below world price levels. They are less successful than the developed countries in stabilizing domestic grain supplies, but their grain policies still tend to destabilize the world market.

The agricultural policies of the developing countries, as a group, tend to favor urban consumers at the expense of agricultural producers by holding down the prices of major foods. This discourages food production, increases the income disparities between the urban and rural sectors, and increases the already strong incentives to migrate to urban areas. Initially, a cheap food policy pays high political dividends for a relatively modest outlay of government revenues. Resources are transferred to large, diverse, politically vocal, and influential urban groups. In the longer term, however, urban population growth (which is in part a result of this policy) places an ever-increasing burden on government revenues. This, coupled with falling domestic food production, requires larger food imports (or reduced food exports). A cheap food policy, once initiated, is difficult to remove because of the sensitivity of the politically powerful urban sector to an increase in food prices.

Policies of developing countries tend to increase their demand for grain imports, thereby strengthening world grain prices. As with developed countries, these policies also have the side effect of destabilizing the world grain market. Developing countries are less successful, however, in using trade to offset variations in domestic production. The lack of foreign exchange prevents them from completely offsetting a poor harvest with increased imports. Likewise, they cannot afford to hold more than minimum working stocks of grain from one year to the next because of high storage costs and lack of facilities. Internal transportation is also typically expensive and inadequate. Thus, a large share of domestic production variability is absorbed directly by the population, with the remainder offset by trade. As a result, developing countries export their domestic production shocks.

The newly industrializing countries (NIC's) are an important subgroup of developing countries. These countries--including, among others, Taiwan, South Korea, Mexico, Brazil, and Argentina--have experienced rapid economic growth as well as many of the structural transformations associated with that growth. Price stability for food staples is still likely to be important, but these countries can afford price stability at higher prices because they have higher income levels . Importing countries can move toward producer price support policies which promote food self-sufficiency and exporting countries devote government revenues to promoting agricultural exports. Taiwan and South Korea greatly increased price support payments for rice production in the past decade while Brazil and, to a lesser extent, Argentina, have pursued programs to diversify and expand their agricultural exports. The NIC's are therefore likely to become a more frequent source of agricultural trade disputes.

The Soviet Union

The Soviet Union deserves special mention because of the magnitude of its impact on the world grain market. It accounts for 14 percent of the world's production and 17 percent of the world's consumption of wheat and coarse grain. Prior to 1970, the Soviet Union was a net exporter of grain, but 10 years later it was the world's largest grain importer.

The Soviet Union has larger annual variation in grain production than any other country. Historically, the variation was mostly offset internally with adjustments in stocks and consumption. In recent years, however, the Soviet Union has relied more on the world market (especially the coarse grain market) to offset domestic production variability. Policy decisions were made to provide more stability of grain supply for consumers and also to let stock levels dwindle. These actions had the effect of transferring a larger share of their production variability to the world market. Consequently, the Soviet Union has become the largest single source of instability in world grain markets. Some analysts contend that the variability of Soviet grain import demand may actually increase over the next 10 years. Kogan (5), for example, argues that new high-yielding varieties are more sensitive to fluctuations such as weather, insects, and disease and, given past patterns in Soviet weather, this could lead to grain losses of up to 25 percent of normal production.

The United States

Grain policy in the United States, as in other developed countries, supports producer prices and incomes. The major differences are that world and domestic prices are linked and move up and down together as long as world prices are above the U.S. loan rate. U.S. price supports and stocks, as a result, have added substantial stability to the world market.

Grain policy in the United States took shape during the thirties--a time when agricultural exports had fallen sharply (fig. 2) and had little relevance to policy. As in other developed countries, one of the main objectives of the policy had been to support producer incomes. In recent years, the United States has become a dominant force in world grain trade and trade has become much more important to U.S. agriculture. But, policy conflicts have developed. Policies that support producer incomes have tended to thwart trade. This conflict has yet to be resolved.

The major components of U.S. grain policy for many years have been (a) price support, (b) storage of excess grain stocks, (c) production control, using

cropland diversion, and (d) various methods for disposing of surplus stocks, mainly abroad. Each year, the Government, through the use of nonrecourse loans, is a buyer of last resort of eligible farmers' grain at the loan rate. 3/

Because of price supports and accumulated Government stocks, the United States has provided substantial price stability for the world market over many years. The United States acts as a shock absorber--accumulating excess grain by increasing stocks and allowing livestock production to expand when the world market is oversupplied and making stocks available and reducing livestock production when supplies run short. But, certain U.S. policies such as embargoing exports, massively reducing production and stocks, or making major changes in price support levels can be destabilizing.

THE WORLD SOYBEAN MARKET

Soybean exports, in conjunction with feed grain exports, were the dynamic growth sector of U.S. agricultural trade in the seventies. World trade in soybeans grew from 800,000 tons in 1950 to 28.9 million tons in 1982, with U.S. exports commanding 80 to 90 percent of the market over this period (fig. 6). U.S. soybean production has expanded rapidly to meet both domestic and foreign demand, increasing from 8.1 to 62.0 million tons over the same period. The growth in foreign import demand, however, has been more rapid than the growth in U.S. domestic demand. Hence, the volume of soybean exports has increased from 6 percent of U.S. production in 1950 to over 40 percent in 1982. Most of the world's soybeans are produced in the United States, China, Brazil, and Argentina. Although some soybeans are used directly for human food, most are processed into soybean meal (a high-protein animal feed) and soybean oil (used for human consumption). Even though the United States dominates trade in soybeans, U.S. dominance of the world soybean meal market has eroded with the emergence of Brazil and Argentina as major exporters.

The U.S. share of world soybean meal market fell from 80 to 90 percent in the sixties to less than 35 percent in 1981. In spite of this decline, a growing share of U.S. meal production is being exported. Meal exports have increased from 2 to 3 percent of U.S. production in the early fifties to 28 percent in 1981.

Brazil's domestic tax structure, which encourages domestic crushing of beans and the export of meal and oil, has been a major factor in the emergence of that country as a meal rather than a bean exporter. Brazilian meal exports accounted for 44 percent of the world market in 1981. The European Community (EC) accounts for another 20 percent of the world soymeal market, but most of this is from imported beans which are crushed and reexported as meal. Thus, within the total product market of whole beans, meal, and oil, the United States contributes about 65 percent of the world's trade in "soymeal equivalent."

Unlike grains, soybeans are relatively freely traded. The major importers--Japan and the EC--have no quotas or duties on soybean imports. Although the United States has a commodity program for soybeans, loan rates are set at levels which have seldom taken effect. Soybeans are not included in the farmer-owned reserve and the U.S. Government does not hold significant stocks of soybeans.

3/ The operation and consequences of U.S. farm programs are discussed in the following article of this publication.

As with grains, there is substantial substitution among protein meals and between grains and soybeans in both production and consumption. In production, a large area of the United States is equally adapted to producing corn or soybeans. Slight changes in price ratios can stimulate a shift in production from one crop to the other. On the consumption side, other protein meals--for example, fishmeal, cottonseed meal, sunflowerseed meal, and rapeseed meal--can substitute for soymeal. Although many of these protein meals are imperfect substitutes because of economic or technical factors, new varieties and improvements in processing technology may improve their substitutability in livestock feeds. More important, soybean meal can substitute for other nonprotein meal feeds in livestock rations. In the EC, the high price of grain relative to soybean meal encourages livestock producers to substitute soybean meal for corn.

These substitution possibilities cause the world price of soybeans to rise and fall over time in proportion to the rise and fall in grain prices. Factors influencing grain prices affect soybeans. Some analysts argue that soybeans compete effectively in the world market and earn their producers reasonable profits without Government storage and production control programs. Others suggest that Government price support programs for grain indirectly support soybean prices. High support prices for corn, for example, tend to increase the corn area planted--some of which would have been planted in soybeans. This reduces U.S. soybean production and strengthens prices.

Prospects for continued growth in U.S. soybean exports are linked closely to the same factors affecting world import demand for feed grains. Global income growth drives the demand for livestock products, of which soybeans (and feed grains) are a major input. Income growth will be slower in the next decade if for no other reason than much of the income growth in rapidly expanding developing country markets was financed in the seventies with loans that now must be repaid. Slower expansion in world trade will increase domestic pressures for higher trade barriers for all products. Even if soybeans are not affected directly, measures affecting the total quantity or the feed mix of livestock rations in major importing countries could have a substantial impact on U.S. soybean exports.

POLICY IMPLICATIONS

The future of U.S. agricultural export earnings will depend on the rate of growth in global volume of agricultural trade and the U.S. share of that volume. These factors will be determined by many forces--some outside U.S. control and others under U.S. control. The former include global disorders of the magnitude of past oil embargoes, the rise and fall of trade barriers, and new technology in crop or livestock production.

U.S. policy can have a major influence on the rate of growth in global volume of agricultural trade. For example, macroeconomic, trade, and aid policies can influence the rate of growth of developing countries and, consequently, their volume of agricultural imports. The United States can also influence the global environment towards trade liberalization. Reduced trade barriers should expand agricultural trade.

U.S. policy can also have a major impact upon the U.S. share of global agricultural exports. The United States has abundant land resources and the technology to compete effectively in the growing global market, especially for land-intensive agricultural commodities such as grains and soybeans. As a

result, regardless of world prices and other countries' policies, the United States has the basic ingredients to be competitive. But, actual competitiveness will depend upon U.S. domestic policies--macroeconomic policy, trade policy, and farm policy. These are discussed below.

Macroeconomic Policy

The last 10 years have shown how macroeconomic forces, such as interest rates and exchange rates, can influence agricultural exports. As the value of the dollar fell throughout the seventies, both the volume and price (in dollars) of exports went up. During the early eighties, the value of the dollar went up, while the volume and dollar price of exports dropped. Between the first quarter of 1980 and the fourth quarter of 1984, the inflation-adjusted value of the dollar increased 42 percent. Thus, while grain prices were falling in the United States, they were rising in terms of the currencies of importing countries. For example, the farm price of corn, corrected for U.S. inflation, decreased 10 percent over that period, but the typical importing country had to pay 32 percent more in its currency, corrected for inflation, to buy U.S. corn. U.S. macroeconomic policy has a substantial influence on the value of the dollar, and directly affects agricultural exports.

The serious debt situation in many developing countries compounded the dampening effects on food demand of macroeconomic forces in the past 5 years. The debt crises in the eighties was in part generated by the loose monetary policies of industrial countries--especially the United States--in the wake of OPEC's unilateral increase in the price of petroleum in 1973. Many developing countries took advantage of the easy credit to avoid adjusting to the increased price of energy. Subsequent increases in interest rates and appreciation of the dollar--the currency in which much of the debt is denominated--have increased the real burden of the original obligations and have reduced the amount of foreign exchange earnings available for import purchases. There have been direct and indirect effects on food imports.

The direct effect has been to reduce food imports. But this effect is probably much smaller than the indirect and longrun effects that the reduction of all imports by these countries have on global trade and income growth. Income growth was the driving force behind world agricultural trade growth in the seventies and it is the decline in that rate of growth that is a major source of the current decline in trade.

Trade Policy

As in recent years, much of the growth in grain and feed imports likely will be in the developing world. These countries need foreign exchange from export sales to purchase U.S. farm products. Their main exportable products tend to be agricultural, some that compete with U.S. products and some that do not.

As shown in tables 1 and 2, the United States is a major importer of some agricultural products. By keeping our own trade barriers down--for both agricultural and nonagricultural products--we help to enable these developing countries to purchase U.S. exports.

Farm Policy

U.S. farm policy in the past had two broad impacts on grain and feed markets, world price stability, and world price support. These two impacts, stability

and support, need to be examined separately because they are independently related to U.S. export volume.

Stability and Trade

Much of the future growth of imports of grain and feeds will occur in developing countries. The growth rate may depend on their confidence in the availability of grain on the world market. The political consequences of food shortages can be severe in many developing countries. If these countries feel there is a high risk that grain will not be available on the world market when needed, they will have a strong incentive to maintain trade barriers, to invest extra resources in agriculture, and to push for self-sufficiency, even though the diversion of resources into grain production may be uneconomical given their resource endowments and expected world prices. If the world grain market appears reliable, then they might be more willing to increase grain imports and use their scarce resources to produce and trade other goods. U.S. agricultural policy can generate longrun growth in global trade by enhancing world market stability. 4/ This would benefit all grain and feed exporting countries, but the United States would gain the most because of its large market share.

The United States, however, pays a price for providing greater world grain market stability. This price includes the cost of Government outlays to subsidize the maintenance of large grain reserves or a willingness of U.S. producers and consumers to make short-term adjustments which will mitigate world grain market variability. U.S. policies have supported world grain prices with a commitment to purchase stocks when prices are low and have dampened price increases by releasing stocks and by allowing high world prices to be transmitted to the domestic market where additional supplies are generated from the adjustments of producers and consumers. From a policy perspective, we must decide whether the benefits have been worth the economic and social costs of this policy.

Loan rates are used by the U.S. Government to insure a minimum return to producers who agree to fulfill the conditions of receiving program benefits. The price support guarantee associated with the loan rate also has a trade impact. If the world price is above the loan rate, the world market is not affected. If world price falls below the loan rate, the U.S. Government will purchase enough of the U.S. crop to raise prices to the loan rate. Foreign producers benefit as well. Once prices fall to the loan rate, other countries no longer have the incentive to increase utilization or to reduce supply. The U.S. Government is committed to making the adjustments by purchasing stocks. The world wheat market illustrates this point. Since 1981 the wheat loan rate has provided a floor under the U.S. price. Between 1981 and 1983 marketing years, U.S. wheat exports dropped 10 million metric tons (20 percent) and ending stocks increased 11 million tons (40 percent), even though production dipped in 1983 due to the Payment-in-Kind program. At the same time, other wheat exporting countries increased wheat production 10 million tons (20 percent) and increased exports 8 million tons (24 percent).

A lower wheat export price by the United States would have forced more of the adjustment on exporting countries and less of the adjustment on U.S. taxpayers

4/ Research on this linkage is limited, but there is some evidence that a developing country can justify emphasizing a greater degree of self-sufficiency in food-grain production when facing a highly variable world grain price (2).

who have to finance the purchase and holding of U.S. Government wheat stocks. U.S. producers would have faced lower prices, but so would have foreign producers. A broader sharing of the cost of adjustment worldwide would lower the cost of adjustment to be borne by any one country. Prices will fall without the loan rate support commitment of the United States, but by less than one would expect if U.S. producers had to make the entire supply adjustment to compensate for the loss of price supports.

Farm Policy Tradeoffs

Looking to the future, it is clear that our choice of farm policies will have a big effect on exports. Certainly the policies of other nations and the effects of factors outside the control of policymakers--such as droughts, civil strife, and technological changes--will have a significant impact on U.S. grain and soybean exports. But many of the most important choices lie within the realm of U.S. farm policy. Perhaps the most important is the level and structure of grain price supports.

A reduction of price supports implies that the U.S. agricultural sector will be more closely linked to price changes on the world market and will depend less on intervention by the U.S. Government. It means that U.S. producers will have to accept lower prices for their crops when world market prices fall but, with reduced U.S. Government intervention to purchase stocks, foreign producers will also have to accept lower prices. The adjustment to lower prices will fall on producers or taxpayers in all countries, rather than primarily on U.S. producers and taxpayers.

A key issue is how other countries would react. Some countries may allow lower world prices to be passed along to producers and consumers, but others would maintain or increase trade barriers to prevent domestic adjustments. Although government outlays in countries with high domestic grain support prices would have to increase (to maintain the same nominal level of support) while taxpayer costs in countries with consumer subsidies will fall (given the same nominal consumer prices), most of these countries are not likely to change their food and agricultural policies. If policies remain as they are today, most of the adjustment to lower U.S. support prices would likely take place in the major grain-exporting countries.

There are both long-term and short-term implications of lower U.S. support prices. In the short run, less U.S. Government intervention--including smaller Government-owned or subsidized stocks--means greater grain price variability on world and U.S. markets. The increase in price variability would depend, in part, on how much the private sector and foreign countries would increase stockholding, but certainly there would be greater uncertainty associated with grain producers' annual incomes. Livestock producers would also experience greater price variability. This would increase the risk associated with livestock production and could result in somewhat higher as well as more variable consumer meat prices.

CONCLUSIONS

The longrun outlook seems promising for growth in world trade of grain and soybeans. World trade should continue to grow for the same reasons it grew in the past--more people with more income are living in countries with limited agricultural resources. Many forces outside U.S. control will help determine

the rate of growth in world agricultural trade and the share captured by the United States. But the most important forces are under U.S. control.

How well the United States competes will largely be determined by U.S. policy. Farm policy will play a most important role. Relatively high grain price supports could cause a gradual decline in the U.S. share of the world export market. That market share could be maintained or increased with lower price supports. High price supports help today's producers. Lower price supports help tomorrow's producers by expanding exports. One of many policy challenges is to reconcile this tradeoff of gains and losses between farming generations.

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The U.S. Competitive Position in World Commodity Trade

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ABSTRACT

The decline in U.S. agricultural exports and the U.S. share of world markets since the late seventies, as well as the adjustments presently occurring in U.S. agriculture--lower incomes and lower land values--are not due to the United States becoming a high-cost producer. Rather, they are due to a decline in relative prices of agricultural commodities caused by U.S. and foreign agricultural policies, a rising dollar, the global recession, and debt problems in some importing countries. U.S. farmers remain low-cost producers.

KEYWORDS: Agricultural exports, competitiveness, cost of production, market share, returns to resources.

INTRODUCTION

U.S. agricultural exports fell from $43.8 billion to $38.0 billion between fiscal years 1981 and 1984, a decline of over 13 percent. During these same years, export volume dropped 11 percent. These declines partly stemmed from world recession as world agricultural trade fell or growth stagnated (table 1). World trade in both coarse grains and soybeans was lower in marketing year 1983 than in 1981. World trade in wheat and soybean meal was slightly higher. However, the United States has also lost market shares in several of its major export commodities. Table 1 also shows that the United States has experienced a loss of market share relative to Canada and Argentina since marketing year 1979/80. The U.S. market share of world coarse grains trade dropped from 72 percent in marketing year 1979/80 to 56 percent by 1983/84. Over that same period, the Canadian market share rose from 4 percent to 6 percent and the Argentine market share rose from 5 percent to 11 percent. Similar changes in market shares occurred for wheat, while the U.S. share of the soybean market remained strong through marketing year 1982/83. For soybean meal the U.S. share fell from 42 percent in 1979/80 to 24 percent in 1983/84.

These declines in export volume, value, and market share have prompted many to argue that U.S. agriculture is no longer competitive in world agricultural trade and that the United States has lost its comparative advantage in agriculture. This issue is very difficult to analyze, but this paper argues that the comparative advantage of U.S. agriculture appears to remain, but several factors have inhibited the ability of the United States to compete in world markets. These factors include the global recession, developing-country

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Table 1--Market shares of major U.S. agricultural exports, 1979/80-1983/84

Marketing years	World exports	Export shares				Import shares			
		United States	Canada	Argentina	OC 1/	DCI 2/	LDCI 3/	USSR	Eastern Europe
	Million m. tons	Percent							
Coarse grains: 4/									
1979/80	99.5	72	4	5	10	42	28	14	12
1980/81	108.8	70	6	14	8	38	31	24	10
1981/82	97.9	59	7	10	12	41	28	21	6
1982/83	91.1	54	7	12	6	41	35	11	5
1983/84 5/	90.7	56	6	11	10	42	36	12	4

	World exports	Export shares					Import shares			
		United States	Canada	Argentina	EC 6/	Australia 2/	DCI 3/	LDCI	USSR	Eastern Europe
	Million m. tons	Percent								
Wheat: 4/										
1979/80	86.0	44	17	6	12	17	15	50	14	7
1980/81	94.1	44	18	4	16	11	14	43	17	6
1981/82	101.6	47	17	4	15	11	13	44	19	6
1982/83	98.6	42	22	8	16	8	12	44	21	5
1983/84 5/	103.2	38	21	9	16	11	11	49	20	4

	World exports	Export shares				Import shares			
		United States	Brazil	Argentina	EC 6/	EC 6/	Japan	USSR	Spain
	Million m. tons	Percent							
Soybeans: 7/									
1979/80	28.3	84	4	8	46	15	5	11	
1980/81	25.3	78	7	11	40	17	6	11	
1981/82	29.3	86	3	6	42	15	5	11	
1982/83	28.6	86	5	5	41	17	4	11	
1983/84 5/	26.0	77	6	11	35	18	4	10	

	World exports	Export shares				Import shares			
		United States	Brazil	Argentina	EC 6/	EC 6/	Japan	USSR	Spain
	Million m.tons	Percent							
Soybean meal: 7/									
1979/80	17.3	42	31	2	22	56	2	2	22
1980/81	18.9	33	41	2	20	50	2	5	23
1981/82	20.7	30	40	4	21	57	1	5	16
1982/83	23.3	28	35	7	23	51	1	12	14
1983/84 5/	20.8	24	37	10	20	54	1	3	17

1/ Other competitors: Australia, Republic of South Africa, and Thailand.
2/ Developed-country importers: Japan and Western Europe.
3/ Less-developed-country importers.
4/ Excludes intra-EC trade.
5/ Preliminary.
6/ European Community-10.

debt problems, the appreciation of the U.S. dollar in world currency markets, U.S. farm programs, and policies followed by foreign importers and exporters. These factors have lowered the real price for U.S. agricultural commodities, which have, in turn, reduced U.S. input prices, land values, and farm income.

To understand these conclusions, it is first necessary to understand that comparative advantage is not the same as competitiveness. A country can experience a loss in competitiveness, while retaining its comparative advantage. Further, a country can be competitive without having a comparative advantage.

Comparative advantage is a statement about the pattern of trade which would arise in an undistorted world. 1/ If there were no domestic or trade policies in any sector of the economy, what would world trade patterns be like? Assume that countries are not permitted to trade and each country produces two goods--an agricultural good and a composite good consisting of all other products. Each good requires the use of some inputs; hence it has an associated cost of production. The cost of producing a unit of the good is the sum of the prices of the inputs times the amount of the inputs per unit of the output. In a competitive economy total unit cost equals price (6). If in one country the price (cost) of the agricultural good relative to the price (cost) of the composite good is low, while in the other country the relative price of the agricultural good is high, the first country has a comparative advantage in the production of the agricultural good. The second country has a comparative advantage in the production of the composite good. If trade were permitted, consumers in the country with the high relative agricultural price would want to buy the agricultural good in the country with the low relative agricultural price. Consumers in the country with low relative agricultural prices (high relative composite good price) would want to buy the composite good overseas. Thus, the agricultural product would be exported by the country with the low relative agricultural price and the country would import the composite good in return. Both countries benefit from trade.

To illustrate the discussion of the previous paragraph, consider a simple case of job specialization for two people performing two tasks--gardening and surgery. Assume that the first person is a doctor and an award-winning gardener. The second person is a mediocre gardener and has no medical training. Thus, in this example the first person has an absolute advantage in both tasks since that person is a better doctor and a better gardener. The contribution of the theory of comparative advantage is that it shows that there is a benefit for each person to specialize in one task and then trade their services despite the fact that the first person is better at both tasks. Because of the medical training, the first person is relatively more efficient at being a doctor than a gardener. Consequently, the first person specializes in being a doctor. The second person, despite inefficiency in both tasks, is relatively more efficient at gardening and specializes in that task. Since the doctor needs a gardener and the gardener needs a doctor, they trade services to the benefit of both individuals. Such examples of comparative advantage in job specialization abound, and are the basis for much of the economic activity of modern society. People tend to specialize in jobs at which they are relatively better, and hire the services of others.

Consequently, comparative advantage is a statement about the trade patterns which would arise in an undistorted world based on differences in relative prices (costs) between countries in the absence of trade. These prices equal

1/ For a complete, technical discussion see Deardorff (5).

the "true" relative social costs of producing the outputs. A country will export the good which it produces relatively efficiently and in which it has a relatively lower price in the absence of trade. Further, comparative advantage does not depend on absolute cost comparisions. As in the doctor/gardener example, this means that even if a country has higher absolute costs in both industries, it still may be relatively more efficient in one industry, and thereby have a comparative advantage in that good.

Unfortunately, the world is not free of distortions. Governments enact policies--both domestic and trade--which alter relative prices. Markets do not always operate efficiently, and there are rigidities which inhibit adjustments. Competitiveness is a statement about differences in market prices. These prices are influenced by policies, exchange rates, institutions, and adjustment costs. An export subsidy or price support policy can turn a country which, according to comparative advantage should be importing, into an exporter. Changes in exchange rates can affect market prices, thereby reducing exports of a relatively efficient country. Thus, concepts of comparative advantage and competitiveness are not always linked because of distortions in markets.

The first section of this article discusses factors which affect comparative advantage. It examines changes in relative agricultural input productivity in the United States and the rest of the world, and considers the issue of international cost-of-production comparisons. Following cautions on the use of cost-of-production measures, some data for major exporters are presented. The second section analyzes the factors responsible for the loss in U.S. competitiveness, and the final section discusses the linkage between real price changes for agricultural goods and changes in returns to inputs, land, and management in the United States.

COMPARATIVE ADVANTAGE

The recent declines in export value, volume, and market share are sometimes cited as evidence of a loss of U.S. agriculture's comparative advantage.

Relative Efficiency

As discussed previously, one way for a nation to lose agricultural comparative advantage is to become less efficient, raising the "true" relative social cost of producing agricultural goods. Examining changes in average product for major types of agricultural inputs provides a better understanding of changes in the efficiency of U.S. agriculture (table 2). The data show that the increase in the average product for land, machinery, and labor in the United States is greater than for the rest of the world (ROW). The average product for land in the United States increased 39 percent between 1970 and 1982 compared with 27 percent in the ROW. The average product of U.S. agricultural labor over the same time period increased 97 percent compared with 22 percent in other countries. The U.S. average product for machinery rose while the ROW average product fell. The 1982 U.S. index of 94.6, compared with a ROW index of 65.6, indicates that the average product for fertilizers and agricultural chemicals fell at a slower rate in the United States.

The data presented in table 2 suggest that the technology component of U.S. agricultural unit costs fell at a faster rate than its foreign counterpart over the 1970-82 period. Thus, the United States appears to have improved its absolute advantage during the seventies. These data do not make a statement about comparative advantage. Data on the average products of various inputs

in the nonfarm sector in aggregate are not readily available, except for labor productivity. Table 3 compares indices of average product for labor in the U.S. farm and nonfarm sectors. Although the use of only labor productivity limits the robustness of any conclusions, the average product for U.S. agricultural labor nearly doubled from 1970 to 1982, while that for nonagricultural labor rose 15 percent. Nonfarm labor productivity data are available for most industrialized countries, but not for all countries. Except for New Zealand, the United States showed the least growth in aggregate labor productivity among developed countries between 1970 and 1982 (table 4). 2/ Productivity growth in Japan, Europe, and Australia was well above that experienced by the United States, while Canadian productivity growth was slightly higher.

Because developing and centrally planned economies are omitted, any conclusions are tentative. Growth rates in the middle income countries were rapid during the seventies; hence, labor productivity growth would be expected to be strong. Likewise, slow growth in the low income countries implies low labor productivity growth. Since developed and middle income countries dominate production in the nonfarm sectors, it is likely that nonagricultural labor productivity grew faster abroad than in the United States.

2/ The data for the United States in table 4 differ from those in table 3 because different data were used to calculate labor productivity. The data in table 4 are comparable to one another but not to data in table 3.

Table 2—Indices of average products for selected agricultural inputs for the United States and the rest of the world (ROW), 1970-82

Year	Land		Machinery		Fertilizer		Labor	
	U.S. 1/ 3/	ROW 2/	U.S. 1/	ROW 2/ 4/	U.S. 1/ 5/	ROW 2/	U.S. 1/	ROW 2/
				1970 = 100				
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	111.1	101.4	106.7	99.2	101.0	96.0	112.7	6/
1972	114.6	99.5	107.8	95.0	95.7	88.0	118.1	6/
1973	115.5	106.8	105.6	98.8	93.8	86.6	123.3	6/
1974	111.6	104.8	96.2	93.2	86.2	85.9	119.7	6/
1975	118.8	105.0	100.8	89.6	102.3	84.9	132.2	104.0
1976	120.6	115.7	99.0	87.5	91.9	83.6	141.2	113.9
1977	122.2	116.1	101.5	85.3	91.2	79.0	150.1	114.6
1978	127.1	128.2	101.5	87.7	88.7	78.6	164.4	119.6
1979	135.7	131.0	105.3	82.6	85.9	71.9	179.2	116.8
1980	124.6	121.3	100.6	79.6	78.4	69.2	168.1	115.4
1981	142.8	122.0	116.3	79.5	89.0	68.1	196.8	117.5
1982	138.7	126.9	120.0	78.4	94.6	65.6	197.4	122.4

1/ U.S. data from (16).
2/ ROW data from (8).
3/ Agricultural real estate.
4/ Tractors only.
5/ Agricultural chemicals.
6/ Not available prior to 1976 Yearbook.

Table 3--Indices of average product for labor, agricultural and nonagricultural, United States

Year	Agricultural	Nonagricultural
	1970 = 100	
1970	100.0	100.0
1971	112.7	103.3
1972	118.1	107.1
1973	123.3	109.8
1974	119.7	107.0
1975	132.2	109.1
1976	141.2	112.7
1977	150.1	115.2
1978	164.4	115.9
1979	179.2	114.2
1980	168.1	113.4
1981	196.8	115.6
1982	197.4	115.2

Sources: (4, 16).

Table 4--National productivity indices for selected countries (GDP per employed person) 1/

Year	United States	Canada	Japan	Europe	Australia	New Zealand	South Africa
				1970 = 100			
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	102.9	105.1	104.0	103.9	103.2	102.6	103.3
1972	105.5	108.2	113.1	107.6	105.3	106.3	105.4
1973	107.7	110.9	120.1	112.2	108.9	109.2	107.7
1974	104.8	110.6	119.3	113.9	108.1	111.2	111.4
1975	105.2	110.0	122.4	114.2	111.0	108.9	112.2
1976	107.2	114.5	127.7	119.5	113.4	109.3	108.8
1977	109.1	115.0	132.6	122.0	113.4	102.9	108.6
1978	109.8	115.5	137.6	125.3	117.8	104.3	130.8
1979	109.4	114.6	142.8	128.5	120.2	101.1	133.9
1980	108.5	112.9	148.2	130.0	119.0	103.9	140.3
1981	110.1	113.5	153.2	130.9	121.3	107.3	143.5
1982	108.8	111.8	156.4	132.8	121.3	108.2	141.2

1/ Gross domestic product includes agriculture.

Source: (19).

The data in tables 2-4 suggest that:

- o agricultural productivity growth in the United States exceeded that in the ROW,
- o labor productivity growth in the U.S. agricultural sector exceeded that in the remainder of the economy, and
- o nonagricultural labor productivity growth in the United States was probably slower than that experienced overseas.

These three observations suggest that the relative efficiency of U.S. agriculture grew compared to the relative efficiency of ROW agriculture. The changes in productivity observed in the seventies suggest declining relative unit costs for agriculture in the United States compared to those overseas. Therefore, the general statement of comparative advantage presented in the introduction suggests a tendency for the pattern of trade based on comparative advantage to move in favor of exporting U.S. agricultural goods.

Relative Cost of Production

Another reason given for the loss in U.S. agricultural comparative advantage is that costs of production for agricultural commodities in the United States are higher than costs overseas. U.S. farmers sometimes argue that they cannot obtain a "fair" return to their labors compared to their foreign counterparts.

International cost-of-production data comparisons are especially difficult. The data are generally unavailable, and what data do exist are frequently too weak to use for analysis. Even when the data are available and reliable, tremendous problems remain before meaningful analysis can be obtained. Perhaps most important, it is a mistake to talk about a single cost of production for a commodity (11). Each farmer has a different cost structure and there are numerous cost concepts for each farmer. For one purpose and time period one cost measure will be appropriate; another purpose requires a different measure.

Two methods have traditionally been used to calculate production costs. 3/ The first involves a survey of costs actually incurred by farmers while the second involves a budget for the typical production unit. The farm survey approach has the advantage that actual farm data are collected. Less obvious disadvantages include sample selection, incompleteness of farmers' accounting and production information, and the high cost of data collection and analysis. The farm budget approach has the advantage of being relatively inexpensive. Once the basic cost budget has been prepared, it can be updated by inserting current input price data. A disadvantage is that there is no precise way of knowing whether the budget reflects annual changes in input use and technology between survey periods.

Cost-of-production estimates are subject to several measurement and conceptual errors. First, data from surveys may be subject to sampling errors. Typically, surveys have also been taken at the end of the crop year to insure availability of cost data for the entire production and harvesting period. For producers who do not keep or use detailed records, some error may result

3/ The authors would like to thank the staff of the Economic Indicators and Statistics Branch, National Economics Division, Economic Research Service, and especially James Johnson, for the discussion of U.S. cost-of-production data.

from inaccurate recall. Second, technical or engineering data used to estimate components of enterprise costs must be reviewed periodically to reflect improvements in machinery efficiency.

Aside from measurement problems, there are several conceptual issues that affect estimates of costs of production. A wide range of cost estimates can be developed for a given crop depending on how costs associated with more than one enterprise and farm overhead costs are allocated, how operator and family labor are priced, how the services of durable inputs such as farm machinery, land, equipment, and buildings are priced, and how farm-produced inputs such as feed are priced. A portion of production costs can be directly observed and allocated without any imputation process. In particular, direct cash costs are defined in this way. But, some costs are almost totally imputed and to this extent are arbitrary. Notable noncash items such as the pricing of durable inputs, land, and operator labor, mentioned above, are defined this way. Many choices are available for valuing these costs or allocating them to a particular enterprise. These conceptual issues illustrate the need to understand assumptions and procedures that have been used in arriving at estimates of enterprise costs of production before costs can be compared over time, across commodities, or among regions.

Using cost-of-production data to analyze the comparative advantage of a particular country has four additional problems. First, the methods of calculating cost data must be comparable. That is, if real interest rates and salvage values are used in one country, any comparison to other countries should use the same method. Secondly, comparisons of cost data for an agricultural commodity only show absolute advantage, not comparative advantage. Consideration of the alternative uses for the resources in each country is required for comparative advantage. Third, there is considerable difference between the factors which determine national production and those which determine output of an individual farm. The former include technology and infrastructure associated with research, education, and transportation. Fourth, exchange-rate changes affect the international cost comparisons. As an illustration, assume that the national average cost of production for a commodity was $1 per bushel in the United States and DM1.80 per bushel in Germany. At an exchange rate of DM1.80 per U.S. dollar, both farmers have an identical cost of production of $1 per bushel. Suppose the U.S. dollar appreciates suddenly to DM2.30 per dollar. The U.S. farmer's costs are still $1 per bushel, but the German farmer's cost in U.S. dollars becomes only 78 cents per bushel, even though neither farmer experienced a change in actual costs. Consequently, ranking countries on cost per bushel depends on how exchange rates are changing. A falling dollar improves the U.S. position, while a rising dollar lowers it, even though actual costs in each country are unchanged.

Having noted the problems associated with cost-of-production comparisons across countries, we can examine average variable costs per bushel in the major grain and soybean exporting countries during 1980-82. At first inspection, national average costs tend to be the highest for the United States (table 5). However, U.S. costs average all regions while data for other countries are generally only for good agricultural regions.

Average variable production costs 4/ vary widely among U.S. regions, as can be seen in table 6. For example, the average variable cost of wheat production

4/ Variable costs exclude land, management, taxes, depreciation, interest, and insurance costs.

ranges from a low of $1.23 per bushel in the Northern Plains States to a high of $2.26 per bushel in the Northeast. Similar deviations occur for corn and soybeans. Within each region, the costs of production for many individual producers are distributed on both sides of the average.

Comparing Saskatchewan with the Northern Plains States shows that U.S. costs were lower for 1981 and 1982, but were higher in 1980. The 3-year average shows variable costs to be nearly identical. Australian costs appear to be a national average, and do in fact exceed the U.S. average data.

Average Australian variable costs were lower than U.S. costs in 1980, but higher in 1981 and 1982, partly due to droughts which reduced Australian yields. 5/ The 3-year averages are similar, with the Australian figure slightly higher. The data in table 5 do not suggest that any of the three major wheat exporters has a variable cost-of-production advantage.

The soybean production costs in table 5 are similar to those for wheat. Compared with Southeast Brazil and the Pergamino region of Argentina, the U.S. national average variable cost is higher. However, if only the Corn Belt and Lake States data are used to adjust for land quality, the United States has lower costs in all 3 years. Thus, the inclusion of high-cost Delta and Southeast regions in the U.S. soybean production costs distorts the comparison if the Brazilian data are from only the Southeast.

5/ A drought reduces yields per acre, which, in turn, raises per-bushel costs.

Table 5--Average variable production costs per unit, selected countries

Crop and region	1980	1981	1982	1980-82 average
		U.S. dollars per bushel		
Wheat				
United States 1/	1.52	1.61	1.55	1.56
Corn Belt/Lake	1.50	1.68	1.78	1.65
North Plains	1.44	1.20	1.22	1.29
Central Plains	1.06	1.54	1.25	1.28
Canada (Saskatchewan)	1.29	1.31	1.24	1.28
Australia 2/	1.47	2.45	2.25	2.06
Soybeans				
United States 1/	2.06	2.01	1.83	1.97
Corn Belt/Lake	1.42	1.51	1.46	1.46
Brazil (Southeast)	1.66	1.66	2.20	1.84
Argentina (Pergamino)	1.73	1.76	1.70	1.73
Corn				
United States 1/	1.29	1.20	1.16	1.22
Corn Belt/Lake	1.18	1.12	1.09	1.13
Argentina (Pergamino)	.63	.96	1.01	.87

1/ National average; see table 6.
2/ Sample farm; appears to be a national average.

For corn, the only foreign data available are for the Pergamino region of Argentina. For all 3 years, there appears to be an advantage for the Argentines, but the difference is narrowing, not widening, despite the rising U.S. dollar. Further, Argentine use of nitrogen fertilizer may be less because their corn is a different variety.

Another measure of costs of production among countries are indices of prices paid for inputs. Table 7 shows indices of the prices paid for inputs by farmers in the United States, Canada, and Australia from 1976 to 1982. The percentage increases in prices paid by farmers over the period are similar for all three countries. Australian prices paid rise by more than Canadian and U.S. prices paid. U.S. and Canadian prices paid rise by the same amount between 1976 and 1982. These data suggest that the United States has not experienced increases in costs of production relative to two of its major competitors.

The data presented in this section argue that the United States has retained its comparative advantage in agriculture and remains a relatively low-cost producer of grains and oilseeds. Data on changes in the average product of

Table 6--Regional variable costs of production estimates for wheat, corn, and soybeans, 1980-82

Crop and region	1980	1981	1982
		Dollars per bushel	
All wheat: National average	1.52	1.61	1.55
Hard red winter, U.S.	1.32	1.69	1.49
Central Plains	1.06	1.54	1.25
Northern Plains	1.44	1.20	1.23
Southern Plains	1.79	2.12	1.95
Southwest	1.43	1.48	1.69
Soft red winter, U.S.	1.66	1.80	1.96
Lake States/Corn Belt	1.50	1.68	1.78
Northeast	2.09	2.39	2.26
Southeast	2.02	1.93	2.11
White	1.12	1.21	1.36
Hard red spring	1.94	1.47	1.35
Corn: U.S.	1.29	1.20	1.16
Lake States/Corn Belt	1.18	1.12	1.09
Northeast	1.49	1.36	1.32
Northern Plains	1.36	1.23	1.26
Southeast	2.33	1.94	1.47
Southwest	1.54	1.44	1.60
Soybeans: U.S.	2.06	2.01	1.83
Delta	3.77	3.46	2.66
Lake States/Corn Belt	1.42	1.51	1.46
Northern Plains	1.56	1.28	1.36
Southeast	4.63	3.39	2.90

Source: (17).

major inputs between 1970 and 1982 show U.S. productivity growth exceeding that overseas in every input category, except fertilizer. In the case of fertilizer, average products have been falling worldwide, but the U.S. decline is slower than overseas. Labor productivity growth in U.S. agriculture has greatly exceeded that in the rest of the economy, while foreign labor productivity growth has been higher than in the United States. In aggregate these data suggests that the U.S. agricultural comparative advantage is intact.

Indices of prices paid for inputs in the United States, Canada, and Australia show that U.S. prices paid have not increased more rapidly than those of our competitors. Despite the danger of international comparisons of cost of production, limited data on average variable costs show little difference between Canada, Australia, and the United States for wheat, some advantage for the Corn Belt and Lake States versus Southeast Brazil for soybeans, and a slight advantage for the Argentine Pergamino on corn. In aggregate, these data do not suggest that U.S. average variable costs are significantly higher than those of our competitors.

COMPETITIVENESS

If the declines in U.S. export value, volume, and market shares are not related to a loss in comparative advantage, the explanation must lie in factors which affect competitiveness but not comparative advantage. The inability of the United States to maintain its market shares of the late seventies into the early eighties can be traced to several recent changes in the world market: the slowdown in world commodity trade and the effects on U.S. exports relative to those of other exporters, the appreciation of the U.S. dollar, policy decisions by other nations, and the impacts of domestic U.S. commodity policies on trade.

Reduced World Import Demand and U.S. Market Share

The demand for agricultural imports in total fell partly because of the global recession and debt problems of some major importing countries. A decline in world import demand does not affect all exporting countries equally; rather it changes the market shares of competing exporters.

Table 7--Prices paid by farmers for all production inputs

Country	1976	1977	1978	1979	1980	1981	1982
				1976 = 100			
United States	100.0	105.0	114.1	131.2	146.7	173.4	178.6
Canada 1/	100.0	102.6	116.1	136.0	149.6	173.4	178.6
Australia	100.0	111.9	123.7	132.2	147.5	169.5	188.1

1/ Western Canada only.

Sources: (16, 14, 1).

A decline in world import demand reduces world agricultural trade. At the reduced level of world trade, commodity prices fall to clear the market. If there were perfect price transmission among the exporting countries, all exporters would see the same decline in agricultural commodity prices. However, all of the exporting countries do not react to this uniform price decline in the same way. The elasticity of excess supply (EES) of an exporting country is a measure of the change in exports in response to a change in the export price. 6/ This elasticity is a positive value since as export prices rise, exporting countries expand production and lower use, increasing exports. Thus, the price decline due to the recession tends to cause all exporting countries to reduce exports. This is how price changes equilibrate world demand and supply. All exporting countries do not reduce exports at the same rate. The rate of reduction depends on each country's EES. A high value for this elasticity means a large percentage reduction in exports in response to a price decrease, while a small elasticity implies a small percentage reduction in exports for the same price decrease.

Thus, exporting countries with a high EES reduce exports at a faster rate than nations with low elasticities. The rate of reduction in total world trade will be somewhere in between. As a result, countries with a large EES reduce exports faster than the rate at which world trade falls, and thus lose market shares in the short term.

The EES of a country depends on several factors--domestic demand and supply elasticities, the importance of trade, and effects of domestic agricultural programs on producer and consumer behavior. The smaller exports are relative to supply and use, the larger will be that country's EES. Relative to Canada and Australia, the United States exports less of its grain, thus the EES's for U.S. wheat and for coarse grains tend to exceed those for Canada and Australia (18). But there are two other factors which affect this value. Studies comparing the United States, Canada, and Australia suggest that domestic demand and supply may be more price-responsive in the United States than in the other countries, especially when stocks are included in the calculation (2, 12, 13).

This is especially true when the impacts of U.S. commodity programs such as the price-support loan are considered (10). When the U.S. loan rate supports the price, the Government buys all the eligible grain that is offered; hence, total U.S. demand at the loan rate is extremely elastic. Thus, farm programs act to raise the EES and thereby contribute to the loss in U.S. market share. Consequently, a reduction in world import demand due to a recession will reduce the U.S. market share for grains relative to those of competing nations.

Recent estimates (7) suggest that debt problems reduced U.S. wheat exports by about 4 million tons between 1980/81 and 1982/83. U.S. coarse grain exports were reduced nearly 10 million tons, while U.S. soybean and soybean meal exports were reduced about 1 million tons.

Another factor causing the import demand facing the United States to fall during the early eighties was increases in foreign crop production. In the case of wheat, increased foreign production, holding other factors constant, had the effect of reducing the import demand facing the United States nearly 15 million tons. Foreign demand for U.S. soybeans was reduced about 1 million tons (7). Lower foreign production of coarse grains had a positive effect on U.S. exports.

6/ See (3) for a discussion of trade elasticities.

The global recession reduced foreign income growth below trend and consequently reduced the growth in import demand for U.S. commodities from that expected. For wheat the effect was to lower U.S. exports by 2.8 million tons (7). For coarse grains the difference between actual and trend foreign income growth resulted in a 7-million-ton reduction from 1980/81 to 1982/83, while soybean and meal exports were only 60,000 tons lower.

Appreciation of the U.S. Dollar

The sharp appreciation of the U.S. dollar since 1980 has also helped reduce the U.S. share of world exports in several ways (table 8). First, a stronger dollar increases the price of U.S. commodities in the importer's currency. Higher prices in importing countries reduce imports, and world prices of the commodity in dollars fall. Because the U.S. excess supply is more price-sensitive than excess supplies for other exporters, U.S. market share would decline even if the dollar did not appreciate against other exporters' currencies. But, the U.S. dollar has also been rising relative to the currencies of other exporting countries--the Canadian and Australian dollars, the Brazilian cruzeiro, and the Argentine peso (table 8).

This means that prices faced by producers in competing exporting nations rise compared to prices faced by U.S. producers. Production in other exporting countries is encouraged relative to the United States and use is discouraged; hence, other nations' exports rise relative to U.S. exports. Other nations expand their market shares, while that of the United States declines.

Table 9 reports the results of a study which measured the impact of an appreciation in the value of the U.S. dollar. The minus sign indicates that a rising dollar reduces a variable. Thus, a 10-percent appreciation of the U.S. dollar reduces wheat, corn, and soybean prices by 5.6, 6.2, and 5.9 percent, respectively. The result that U.S. prices are affected more or less equally

Table 8--Indices of the U.S. dollar exchange rate, foreign currency per U.S. dollar, 1980 = 100

Currency	1980	1981	1982	1983	1984
Nominal:					
MERM 1/	100.0	112.7	125.9	133.2	143.7
Argentina 2/	100.0	239.1	1,408.7	5,722.8	36,765.8
Australia	100.0	98.9	111.4	126.1	129.5
Brazil 2/	100.0	176.7	340.6	1,094.7	3,506.0
Canada	100.0	102.6	105.1	105.1	111.1
Japan	100.0	97.3	109.8	104.8	104.8
Real:					
Argentina	100.0	129.1	304.7	287.9	276.5
Australia	100.0	99.5	107.0	113.6	117.1
Brazil	100.0	94.9	97.9	134.4	151.3
Canada	100.0	100.8	98.8	96.4	101.9
Japan	100.0	102.4	119.4	115.6	117.9

1/ International Monetary Fund's Multilateral Exchange Rate Model (MERM) Index.

2/ Nominal reflects rapid inflation in Brazil and Argentina.

by a change in the exchange rate is due to the inclusion of cross-commodity substitution effects.

The results in table 9 also show that the rising U.S. dollar lowers U.S. agricultural exports. Wheat exports by the United States fall the least--a decline of 1.9 percent--while U.S. soybean exports fall the most--a decline of 3.1 percent. The differences in export declines among the crops is a result of foreign trade policies which reduce the transmission of world price changes to internal prices. As a result, these nations' import demand is not affected much by the change in the value of the U.S. dollar. Foreign wheat markets tend to be more heavily insulated than other markets, and soybean markets are relatively free of price-insulating policies. Thus, wheat is affected the least by the exchange-rate change, and soybean exports are affected the most.

The results in table 9 also show that the decline in U.S. farm exports results in stock accumulations. These stocks will affect the market in future years. Thus, even if the dollar were to rise only in a single year, the effects would be felt in successive years as well because carryin stocks would be higher.

Policies in the United States

Policies followed by the United States have also contributed to the loss in U.S. market share. 7/ During the late seventies, prices in the United States were generally between the target price and the loan rate. Since farmers receive a deficiency payment, there is an incentive to increase production, unless land must be idled to receive the payment. Market prices are free to allocate supply and demand, and with additional supply due to the deficiency payment, prices to domestic and foreign consumers must fall to increase the quantity demanded. In this manner, domestic and export use is implicitly subsidized by a target price policy, and exports increase. In the late seventies, when land retirement programs were not in effect, U.S. commodity programs implicitly subsidized U.S. exports and encouraged the United States to expand its market share.

Increased U.S. production and the decline in world import demand in the early eighties resulted in U.S. prices falling to the loan rate. When U.S. loan rates are set above the market-clearing level of world prices, U.S. exports are priced higher than they would be otherwise and foreign producers are put in a better position to undercut the U.S. price in world markets. The U.S.

7/ For the discussion of the trade effects of U.S. policy, see (10).

Table 9--Simulated impacts of a 10-percent appreciation in the value of the dollar

Commodity	U.S. price	U.S. exports	U.S. stocks
		Percent change	
Wheat	-5.6	-1.9	4.8
Corn	-6.2	-2.5	6.4
Soybeans	-5.9	-3.1	5.8

Source: (9).

loan rate acts as a price floor, which raises the world price. Importing nations buy less because of the higher price. Thus, the U.S. loan rate operates like an export tax. Farmers in other exporting countries respond to the higher price by increasing production. As is shown in table 10, other exporting countries have increased their share of world production, especially for wheat. This increased share is partially a result of the U.S. loan rate. It does not pay these nations to absorb the additional production by holding stocks, but instead they export it at a price just below the U.S. price umbrella. The result is that the United States loses market share to other exporting nations and the U.S. share of world stocks rises (table 10).

For most years between 1950 and 1973, U.S. loan rates supported world prices for grains and cotton. To remain competitive, the United States paid direct export subsidies on wheat until 1973 and used export payment-in-kind programs for other commodities. Thereafter, target prices were used to support U.S. farm income. With the recent decline in U.S. prices to loan levels, U.S. policy is again implicitly taxing exports, but direct export subsidies are no longer paid to offset the implicit tax. Thus, part of the recent loss in the U.S. market share could be attributed to U.S. policy, which sometimes implicitly subsidizes U.S. exports, giving the United States a larger market share, and sometimes implicitly taxes them, reducing the U.S. market share.

Table 10--Share of world grain stocks held in the United States and shares of world grain production for major U.S. competitors, 1979-83

Marketing years	U.S. share of world stocks	Production shares				
		Canada	Australia	Argentina	EC	Thailand
		Percent				
Coarse grains:						
1979/80	56.7	2.5	0.8	1.4	9.3	0.5
1980/81	41.5	3.0	.7	2.9	9.5	.5
1981/82	60.8	3.4	.9	2.4	8.8	.6
1982/83	71.4	3.4	.5	2.3	9.1	.5
1983/84	39.5	3.1	1.4	2.8	9.3	.6
Wheat:						
1979/80	30.3	4.1	3.8	1.9	11.5	0
1980/81	33.4	4.3	2.5	1.8	12.5	0
1981/82	37.1	5.5	3.6	1.8	12.1	0
1982/83	43.2	5.6	1.9	3.0	12.4	0
1983/84	37.1	5.5	4.4	2.4	12.1	0
Rice:						
1979/80	3.4	0	.2	.1	.3	4.2
1980/81	2.3	0	.2	.1	.3	4.4
1981/82	7.6	0	.2	.1	.2	4.3
1982/83	13.7	0	.1	.1	.3	4.0
1983/84	8.1	0	.2	.1	.3	4.1

Source: (18).

Estimates of the extent of implicit taxation of U.S. exports by the current set of commodity programs are presented in table 11. This analysis is for the 1986 crop year assuming that the price is the same in 1985 and 1986. For wheat, the net effect of U.S. programs is an export tax of between $0.49 per bushel and $1.33 per bushel, depending on whether foreign import demand is strong or weak. In the case of corn, the net effect of U.S. policies is still to tax exports, but the range of the tax is narrower. If foreign import demand in 1986 is high, current programs imply an export tax of $0.27 per bushel. If foreign import demand is weak, the net effect of U.S. programs is an export tax of $0.43 per bushel.

A major reason that the implied tax effects for wheat are large and the range is wide is that wheat prices are expected to be at the loan rate. As prices become supported by the loan rate, an appreciation in the U.S. dollar results in larger reductions in U.S. exports than if U.S. prices were free to fall below loan levels. The larger decline in export volumes causes U.S. stocks to increase more (9).

Table 12 compares the first-year impact of a 10-percent appreciation in the U.S. dollar when prices of wheat and corn are at the loan rate with the impact at prices above the loan rate. The U.S. loan rate stops the decline in U.S. prices due to the rising U.S. dollar. Wheat and corn prices decline only 1.22 and 1.60 percent with the program in contrast to declines of 4.35 and 4.39 percent without support. Even though soybeans are not directly affected by the loan rate, they are indirectly affected by the loan rates for grains. U.S. soybean prices fall 4.25 percent without the program, but decline only 3.14 percent with the supports offered.

Halting the U.S. price declines through the loan program means that foreign prices rise further as the dollar appreciates. Consequently, U.S. grain and soybean exports fall more. With prices supported by the loan rate, U.S. wheat exports decline 6.15 percent. If prices were not supported, the dollar appreciation would have lowered U.S. wheat exports by 2.82 percent. A similar pattern occurs for corn as exports fall much more when U.S. prices are supported. Because the decline in exports is larger with the loan program, U.S. stock increases due to the rise in the dollar are about 4 times as great.

The results in table 12 demonstrate the implicit double taxation effect of a rising U.S. dollar in conjunction with prices supported at the loan rate. Present U.S. commodity programs are an implicit net export tax which magnify

Table 11--Projected net export tax effect of U.S. commodity price-support programs on trade, 1986

Export level	Implicit export tax	
	Wheat	Corn
	Dollars per bushel	
High exports	0.49	0.27
Moderate exports	.91	.35
Low exports	1.33	.43

Source: (21).

the effects of an appreciating U.S. dollar. When these factors operate together, U.S. exports fall more and U.S. stocks--mostly CCC stocks--rise more. The results for soybeans demonstrate that even commodities not directly affected by their loan rate are impacted by other commodity loan rates.

Export Policies of Major Competitors

The major U.S. competitors in the grains and oilseeds markets also use pricing and export marketing policies which affect their competitive positions relative to the United States. Some of these policies erode U.S. competitiveness while others actually work to the net benefit of U.S. exports. The policies of importing countries are also important, but because these are policies faced by all exporters, they are less important as a determinant of relative competitiveness and are not discussed here.

Canada

Canadian wheat and barley producers market their grain through the Canadian Wheat Board (CWB). The CWB does not directly influence world prices, but the system of guaranteed initial prices and price pooling reduces uncertainty and provides interannual price stability. Greater price certainty may have enhanced production. Producers can also voluntarily join the producer- and government-supported Western Grains Stabilization Program (WGSP), which is an insurance program to protect producers against wide year-to-year changes in incomes. Canada has recently reformed a system of low fixed rail rates for grain which had slowed investment in rail transport infrastructure and led to shipping delays. The reforms should improve Canada's capability to ship grain but will probably lower producer prices slightly. Overall, the assistance Canadian grain producers do receive tends to be important primarily for

Table 12--Simulated effect of a 10-percent real appreciation of the U.S. dollar when wheat and corn prices are at the loan rates

Item	Prices at loan	Prices above loan
	Percent change	
Prices:		
Wheat	-1.22	-4.35
Corn	-1.60	-4.39
Soybeans	-3.14	-4.25
Exports:		
Wheat	-6.15	-2.82
Corn	-8.54	-4.38
Soybeans	-3.97	-3.97
Stocks:		
Wheat	12.15	3.91
Corn	16.22	4.47
Soybeans	2.78	4.17

Source: (9).

stabilizing producer prices, with very little long-term impact on the price level.

Australia

Australian wheat producers market their grain through the Australian Wheat Board (AWB), and in the past were protected from sharp year-to-year changes in world market prices by a stabilization fund. When prices in export markets were high, exports were taxed and the proceeds were placed in a fund for years when export prices were low. Australia has recently revised the formulas under which its domestic prices and initial payments are set and has begun to phase out the financing fund. The new policy will allow these prices to be more closely linked to export prices than in the past. This may mean slightly more price variability for Australian wheat producers. Australian barley producers export through state marketing boards which perform a function similar to the AWB. Like Canada, the primary objective of Australian grain policy is to provide stability rather than long-term price support.

Argentina

Argentina competes with the United States in three major agricultural markets--wheat, coarse grains, and soybeans. Export taxes lower the prices Argentine producers receive for these commodities. As of March 1985, the tax was 18 percent on wheat, 25 percent on corn and soybeans, and 12 percent on soybean meal and oil. In addition, exporters are required to convert their dollar earnings to pesos at about 70 percent of the market rate for the dollar. This lowers producer returns even further. The differential export tax rates on soybeans and soybean products have stimulated Argentine exports of the processed products. Argentine grain policy has largely discouraged growers from producing larger quantities of wheat, corn, and soybeans for export.

Brazil

Brazil's role in the world soybean market has been shaped by a set of rapidly changing policies--subsidies (input, crushing-plant construction, export financing), currency adjustments, taxes, quotas, and licenses. The principal objectives of the government have been to assure adequate domestic supplies at a reasonable price, expand domestic crushing capacity, and to increase export earnings of the processed products--soybean meal and oil. The net effect has been a reduction in Brazil's share of the soybean market but a sharp increase in its share of both the meal and oil markets. Brazil has recently announced plans to discontinue market intervention through quotas on beans, meal, and oil and will rely on differential export taxes, higher on beans (13 percent) than for meal (11.1 percent) and oil (8 percent). This differential is not enough by itself to maintain the current mix of soybean product exports; that is, soybean exports are likely to increase and meal and oil exports are likely to fall.

Thailand

Thai export controls--once an impediment to the expansion of Thai corn exports--were removed in 1981. Further, heavy taxes and government control of the cattle and swine slaughter industry restrict the growth potential in domestic feed use. For rice, Thailand has used policies in the past 15 years which have restricted Thai rice exports. These include rice reserve requirements for exporters, export taxes, an *ad valorem* tax, and a specific

tax known as a rice premium which can fluctuate with the level of world prices. Since 1982 the reserve requirements have been abolished, export taxes and the rice premium have been reduced and there are proposals to abolish the ad valorem tax. Devaluation of the Thai currency (baht) by 14.8 percent against the dollar in November 1984 provides a further stimulus to Thai rice and corn exports. As a result of these recent policy changes, returns to Thai grain producers will increase, which should stimulate growth of Thailand's exports.

Burma

Burma has a managed economy. Rice is marketed exclusively through government agencies which establish procurement prices and prices of major inputs. None of these prices have been changed since 1975, when the Government increased production incentives with subsidies on credit, seed, and fertilizer inputs. In the 9 years between 1975 and 1984, rice yields have doubled and exports increased from 193,000 to 750,000 tons.

Pakistan

The Rice Export Corporation of Pakistan (RECP) is the exclusive agent for Pakistani rice exports, which comprise about 40 percent of combined basmati and IRRI rice production. Rice support prices are set below international price levels to enable the RECP to earn a profit--a major source of revenue for the Government. Fertilizer and irrigation subsidies help offset the production disincentive of low producer prices. The rupee was delinked from the U.S. dollar in 1982, which has permitted a 13-percent real effective depreciation of the currency to take place in the last 2 years. Pakistan has considerable scope for expanding rice production through higher prices.

European Community

The European Community (EC) is both a competitor and a trading partner of the United States for agricultural products. Wheat and coarse grain producers in the European Community, unlike producers in the United States and most other major grain exporters, are not directly linked to the world market. High support prices, protected with a variable levy, completely insulate domestic EC wheat and coarse grain country markets from changes in world prices. Export restitutions have permitted the EC to sell its growing net surpluses of wheat and barley production on the world market. As the U.S. dollar has appreciated, however, restitutions have fallen. The only link EC grain producers have to the world market is through the constraint on the budget for the Common Agricultural Policy (CAP). Sources of revenue to finance high support prices are limited and budget pressures have resulted in administrative measures which have lowered effective prices.

The EC is a net importer of soybeans and soybean meal, and a net exporter of soybean oil. Production aids in the EC allow a farmgate price for oilseeds significantly above prevailing world prices. A payment is usually made to the crusher to compensate for the higher prices paid for domestic seed. The subsidy is calculated to slightly exceed the difference between the prevailing world price and the internal target price. This assures that all domestic seeds will be sold before oilseeds are imported. Domestically produced oilseeds (rapeseed, sunflower seed, and soybeans) account for only 12 percent of all oilseed meal consumed. Soybeans represent only about 2 percent of domestic oilseed production. There are no tariffs, duties, or quotas on imported oilseeds and meal, and a 10-percent ad valorem tariff on oil. High

internal grain prices have encouraged soybean meal consumption, while feed subsidy programs for wheat and skim milk powder have had a negative effect on meal use.

Among competitors in world grain markets, EC policies have had the most significant impact in reducing U.S. wheat and corn exports and reducing world prices of these commodities. At the same time, however, these policies have probably resulted in a net increase in world soybean demand. The recent acceptance of Spain and Portugal into the EC will spread the revenues available for agricultural price supports even more thinly across countries and commodities. Effective EC support for agriculture is likely to decline in the next decade.

Comparison of Assistance to Agriculture

The net effect of government policies is difficult to measure. However, some indication of how much the United States assists its agricultural sector compared to other countries can be provided by 1) an examination of government agricultural budgets and 2) by a comparison of internal producer prices with export prices for grains in the major exporting countries.

Government expenditures on agriculture can be used as a measure of the assistance a country is giving its agricultural sector from taxpayer revenues. Table 13 shows average annual agriculture expenditures over the 1978-80 period for 18 countries, some of which are competitors and some of which are trading partners of the United States in world grain and oilseed markets. Countries are ranked in order of total government expenditures on agriculture (column 1). Japan ($15.8 billion) and the United States ($8.5 billion) are ranked at the top and Sudan ($154 million) and Pakistan ($91 million) at the bottom. Government expenditures alone, however, do not provide a very clear picture of assistance to agriculture because agricultural sectors differ widely in size, composition, and number of people employed. The remaining three columns in table 13 give a better indication of government budget assistance to agriculture as it relates to the economic size and employment of the sector.

Government agricultural expenditures in the United States averaged 12 percent of agricultural GDP annually in 1978-80. Most of the major U.S. competitors spent the same or less by this measure. The major exceptions are, of course, Japan and EC members. The United States ranks relatively low in terms of expenditures per capita of total population, but on the basis of expenditures per capita of farm population, the United States ranks third, spending $1,774 per person compared with Belgium ($4,655 per person) and Germany ($1,942 per person). Non-EC major competitors spend from $2 per person (Pakistan) to $1,005 per person (Canada). This result reflects the much smaller rural population in the United States relative to the size of its agricultural sector.

Budget expenditures, however, tell only part of the story. Much of the support for agriculture is through nonbudget expenditures. Countries such as the EC and Japan can raise prices to producers simply by restricting imports. The budget costs of this are negligible but the implicit subsidy can be tremendous. Table 14 shows producer prices as a percentage of export prices in selected countries. In the absence of trade barriers, producer prices should be less than the export price by the amount it costs to assemble, store, and ship grain to port. A producer price share greater than 100 percent indicates that producers are benefiting from trade restrictions or

subsidies. This gives a rough approximation of some of the nonbudget market distortions which result from government policies.

As with the comparison of budget expenditures, the producers' shares of export prices show that, apart from the EC, U.S. competitors are providing relatively little assistance to their producers in the form of subsidies or price supports. Producers in Argentina, Thailand, and Brazil in particular, have received a much smaller share of their export prices in most years than have U.S. producers. Part of this may be the result of higher transportation costs in these countries, but policies which tax grain exports, no doubt, have also been significant.

Budget expenditures and comparisons of producer and export prices are crude measures, at best, of assistance to agriculture, but they do provide an indication of how agricultural sectors are treated across countries. The EC appears to be the only major competitor which has clearly provided more assistance to its producers than has the United States. It is worth emphasizing, however, that this does not mean that the EC is the major source of the decline in U.S. exports and market share in the eighties. U.S.

Table 13--Country comparisons of measures of government assistance to agriculture, 1978-80 average 1/

Country	Total	Share of agriculture GDP	Per capita (total population)	Per capita (agricultural population)
	Million dollars	Percent	Dollars	
Japan	15,888	37.5	137.14	1,083.09
United States	8,507	12.4	37.79	1,774.51
Mexico	2,620	20.5	38.84	106.28
France 2/	2,546	22.8	107.79	1,259.60
Brazil	1,925	7.5	16.56	52.86
Spain	1,605	11.4	43.23	281.72
India	1,475	3.2	2.23	3.20
Indonesia	1,259	7.9	8.81	15.69
Canada	1,231	13.6	51.93	1,005.00
German, Fed. Rep. 2/	1,147	27.7	79.20	1,941.93
Korea, Rep of	684	6.4	18.20	51.20
Australia	529	6.5	36.65	630.13
Belgium 2/	518	56.6	142.52	4,655.27
Thailand	461	6.3	10.05	13.14
Argentina	301	2.8	11.01	82.09
Philippines	275	3.7	5.85	12.52
Sudan	154	5.9	8.48	11.60
Pakistan	91	1.6	1.14	2.00

1/ Includes agriculture, hunting, forestry, and fishing.
2/ Includes Total European Agricultural and Guarantee Funds (EAAGF).

Source: World Bank data tapes.

Table 14--Producer's share of export price, 1967-82

Year	Wheat				
	United States	Argentina	Australia	Canada	European Community
	Percent				
1967	79	57	86	94	122
1968	81	67	73	90	136
1969	81	74	70	82	121
1970	78	68	82	96	124
1971	77	61	90	95	110
1972	69	44	89	88	128
1973	82	60	23	80	105
1974	93	44	95	84	97
1975	86	24	63	91	103
1976	90	49	55	91	107
1977	74	86	66	92	104
1978	77	08	09	91	102
1979	80	79	13	86	110
1980	78	75	85	88	99
1981	79	79	72	92	113
1982	79	79	82	89	115

	Corn				Soybeans		
	United States	Argentina	South Africa	Thailand	United States	Argentina	Brazil
	Percent						
1967	84	68	84	78	90	—	61
1968	83	61	93	68	90	56	64
1969	82	84	94	67	85	—	65
1970	85	70	79	62	89	--	77
1971	81	61	90	58	87	—	64
1972	72	57	91	76	64	--	66
1973	82	54	78	62	87	61	65
1974	89	60	61	76	03	24	75
1975	85	22	67	69	87	34	68
1976	84	58	62	71	90	20	100
1977	77	75	75	75	87	64	68
1978	78	91	80	74	88	84	71
1979	81	77	98	75	90	76	67
1980	86	64	91	73	96	70	65
1981	86	63	89	68	91	66	59
1982	73	69	89	73	89	76	67

-- = Not available.

Sources: (8, 15).

policies, a slowdown in economic growth, an appreciating U.S. dollar, and policies of importing nations have been very important as well.

COMPETITIVENESS AND ADJUSTMENTS IN U.S. AGRICULTURE

The previous section argues that the changes in export volume, value, and market share reflect changes in the price of U.S. agricultural exports relative to the prices of its major competitors. These relative price changes are due to factors such as the world recession, the debt crisis, the appreciation of the U.S. dollar, U.S. loan-rate levels, and policies of other nations. In a competitive economy, unit cost will equal unit revenue (price) for each commodity (6). 8/ When competitive nations are linked through trade, unit costs for a commodity in one nation must equal unit costs for the same commodity in another because trade equalizes the prices of the traded goods--except for differences in transportation and transaction costs (6). Thus, if the wheats of different exporting countries are priced the same in a world market, then the total unit costs of production for those commodities in the different countries will be the same, although the returns to the individual inputs--including management--may differ considerably among countries. Although nominal unit costs for wheat may be identical in the different exporting countries, changes in relative output within and between countries, and changes in the returns to inputs depend on changes in real internal agricultural prices.

This discussion establishes several linkages among the price changes caused by the previously mentioned factors, changes in returns to inputs, and changes in relative outputs within and between countries. These linkages can be used to interpret some data on prices and costs in the United States, Canada, and Australia.

The first linkage examined is between prices and costs. Figure 1 shows internal price indices for U.S., Canadian, and Australian wheat over 1976 to 1983. Indices are used because there is a direct correlation between changes in price as measured by the indices and changes in cost. The changes in world wheat prices for U.S. and Australian wheat are similar to one another between 1977 and 1980, with the difference in level reflecting quality and transportation. Thereafter, as the dollar strengthens, the U.S. price index levels off and then declines, while the Australian price index falls and then resumes its rise.

The price index for Canadian wheat follows a slightly different pattern than the Australian and U.S. price indices over these years. Initially it follows the U.S. price index, but is slower to start its rise. From 1978 to 1981 it rises at a more rapid rate than the other indices--again reflecting the appreciation of the U.S. dollar against the Canadian dollar. By the end of the period the Australian index is in excess of 170, the Canadian index is just under 140, and the U.S. price index is about 120. These indices suggest that unit costs for producing agricultural commodities in Australia over the 1976-83 period should rise the most, followed by Canada and the United States in that order. 9/

8/ Unit costs are total costs and include returns to all inputs, including land and management.

9/ This analysis uses wheat prices as indicative of all agricultural prices in each country. Obviously that is not strictly true, but agricultural prices tend to be highly correlated.

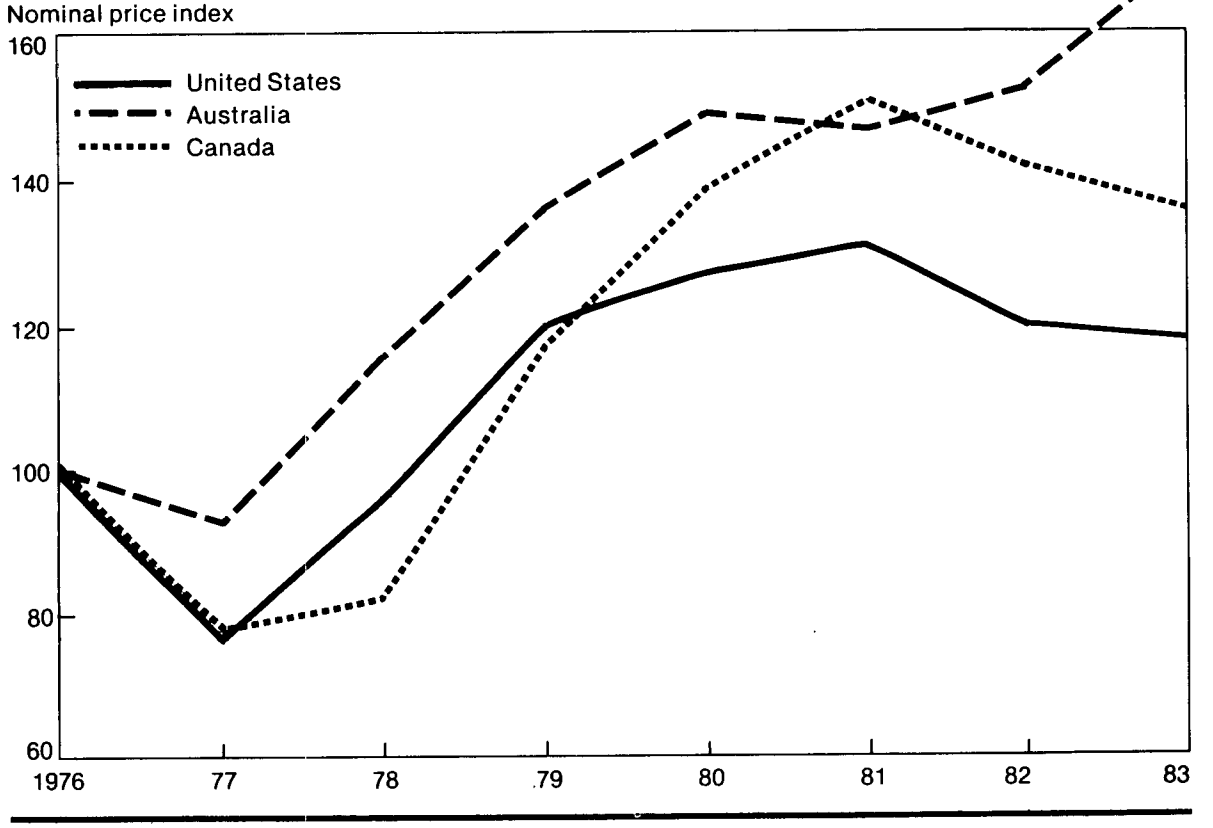
In terms of the relationships developed above, the decline in the U.S. price after 1981 suggests that the return to inputs specific to agriculture in the United States would fall. The inputs specific to agriculture are land, farm machinery, farm buildings, and farmers. Thus, U.S. owner-operator farmers would experience a decline in the value of their farm assets and in their returns to management.

Table 15 measures changes in the nominal returns to some relatively fixed inputs in U.S. agriculture--asset values for real estate and farm machinery, and returns to management (net farm income). Although the nominal value of real estate assets in 1983 was still 18 percent higher than in 1979, it fell 6.7 percent in 2 years and more recent data would probably show even larger declines. The value of farm machinery assets did not decline in nominal terms over the 1979-83 period, but the growth rate slowed between 1982 and 1983. Returns to farmers themselves, net farm income, fell dramatically. For 1982 and 1983, returns to farmers were about 30 percent lower than in 1979.

Changes in relative output between the exporters depend on changes in real agricultural prices in these countries. The appreciation in the U.S. dollar relative to the Canadian and Australian dollars raises nominal wheat prices in Canada and Australia and lowers them in the United States. Marketing policies in world markets, the global recession, and the greater price responsiveness of U.S. agricultural exports compound the exchange-rate effect on nominal prices. The U.S. loan rate provides a price umbrella for Canadian and Australian producers as well as for U.S. farmers. The structure of non-

Figure 1

Wheat: Nominal price indexes: 1976-82



agricultural markets--oligopolies, contracts, and so forth--suggests that these prices are less flexible than commodity prices, especially downward.

Therefore, during a recession, such as in the early eighties, and as a result of exchange-rate appreciation, the price of agricultural commodities relative to other goods will tend to fall. Such changes in real agricultural prices between countries affect returns to inputs within a country and the relative output of goods within and between nations.

Figure 2 shows indices of real wheat prices in Canada, Australia, and the United States. While real wheat prices in the United States and Australia in 1983 were much lower than in 1976, real Canadian wheat prices in 1983 were almost the same as in 1976. Thus, U.S. wheat output and exports would be expected to fall relative to Canada. The U.S. share of the wheat market would be expected to decline and Canada's to rise. Since Australia's relative price changes for wheat are similar to those of the United States, Australia should also be losing market share to Canada.

Information in table 1 confirms the loss of market share by the United States and Australia, and the gain for Canada. The U.S. market share dropped from a high of 44 percent in 1980/81 and 1981/82 to 38 percent in 1982/83 and a preliminary 38 percent for 1983/84. Although the Australian market share was quite variable due to drought, it had a slight downtrend. The Canadian market share rose over this same period from 17 percent to 21 percent.

In terms of purchased input costs in agriculture, the United States has remained competitive (tables 5-7). Because U.S. real agricultural prices are falling, returns are declining. Further, the real wheat price changes in Canada suggest that at least through 1982, returns to Canadian farmers and land values should not show similar decreases. Table 16 compares indices of nominal land values in Canada and the United States. The data for Canada show increases in land values through 1983, although values fell in 1983 from the levels of 1982. Of the regions shown in the table, the smallest increase is for the Calgary region where the index rises from 100 in 1980 to 110.7 in 1983. In contrast, over 1980 to 1983, nominal U.S. land values rose only 2 percent. Although inflation as measured by the consumer price index was higher in Canada, the difference is not great enough to change the results in table 16. Real land values in Canada rose from 1980 through 1983, while real land values in the United States fell. Table 17 presents indices of real net farm income from 1979 to 1983 in Canada and the United States. Over the entire period

Table 15--Changes in factor returns for U.S. agriculture

Factor	1979	1980	1981	1982	1983
			1979 = 100		
Value of farm real estate	100.0	115.4	126.5	125.0	118.0
Value of farm machinery	100.0	113.7	120.4	127.4	130.4
Return to farm management 1/	100.0	66.6	93.2	68.4	70.0

1/ Net farm income.

Source: (4).

Figure 2

Wheat: Real price indexes: 1976-82

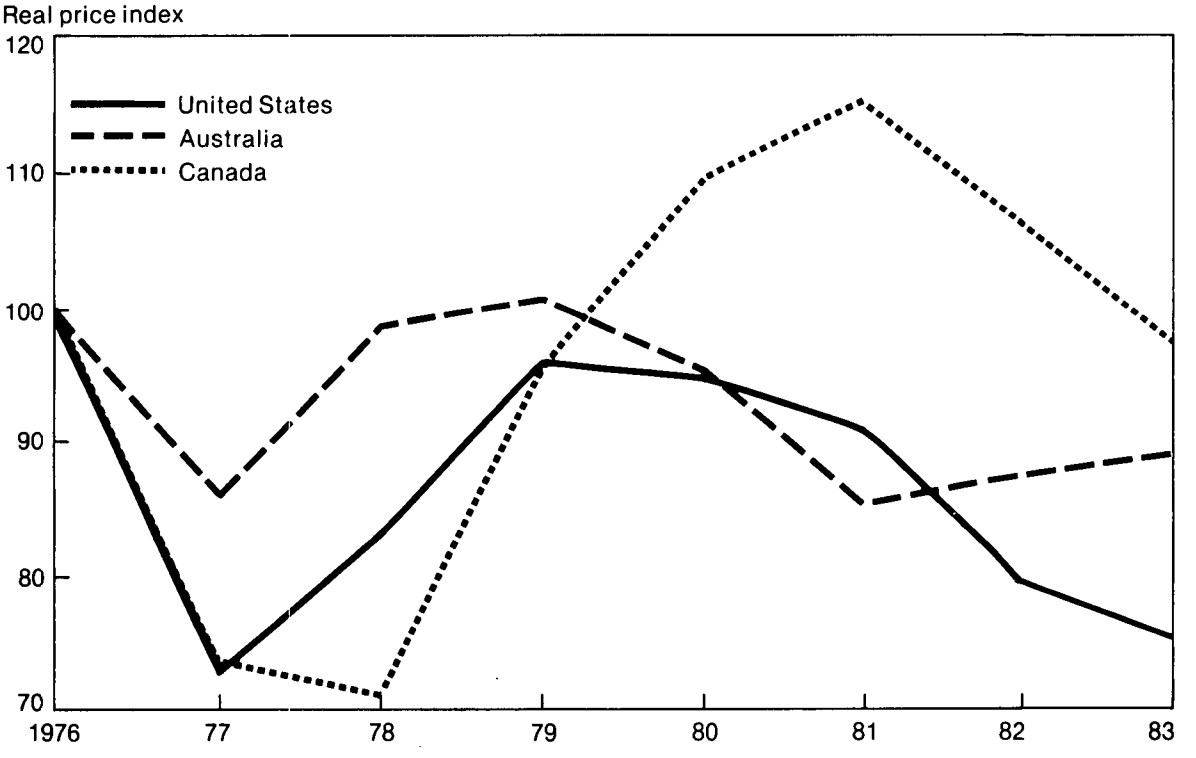


Table 16--Indices of nominal land values in the United States and for selected regions in Canada

Country and region	1980	1981	1982	1983
		1980 = 100		
United States	100	109.0	108.3	102.1
Canada:				
Edmondton	100	117.1	138.6	110.7
Calgary	100	139.7	119.7	108.9
Saskatoon	100	118.3	121.4	120.9
Regina	100	121.7	123.8	120.0
Winnipeg	100	124.1	122.2	130.8

Sources: United States (4); Canada (20).

Table 17--Indices of real net farm income for Canada and the United States

Country	1979	1980	1981	1982	1983
			1979 = 100		
Canada	100	95.0	113.5	101.4	93.2
United States	100	57.7	76.5	51.7	36.2

Sources: Canada (14); United States (4).

the index for Canadian real net farm income fell from 100 to 93.2, while that for the United States fell from 100 to 36.2. In Canada real net farm income for 1981 and 1982 was higher than in 1979, while U.S. real net farm income was significantly lower. This is why total unit cost in Canada as measured by wheat prices can increase by more than U.S. total costs, while costs for purchased inputs increase the same. Thus, returns of Canadian producers are not declining to the same extent as are returns to U.S. farmers.

These changes in relative returns to land and management in U.S. and Canadian agriculture have led some to suggest that the U.S. agricultural sector in general is less able to compete, particularly since these losses are accompanied with a loss in U.S. market share and a gain in the Canadian share. This analysis suggests that the adjustments presently occurring in U.S. agriculture--lower incomes, lower land values, and a loss in market share--are not the result of the inability of the United States to compete on a cost basis with other nations. Rather, they are expected from a decline in the relative price of agricultural commodities due to the appreciation of the U.S. dollar, U.S. and foreign policies, the global recession, and debt problems in some importing countries.

CONCLUSIONS

Many observers argue that the decline in U.S. agricultural commodity export volume, value, and market share and the subsequent decline in land values and net farm income have occurred because the United States has lost its ability to compete and its comparative advantage. This analysis suggests that the United States retains its comparative advantage in agriculture and remains a low-cost producer of agricultural commodities. However, the United States does suffer marketing difficulties because of the global recession, developing-country debt problems, an appreciating U.S. dollar, U.S. farm programs, and policies followed by other nations. These factors have caused real U.S. agricultural prices to fall, resulting in reduced land values and net farm income, and reduced U.S. agricultural output relative to the rest of the economy and other exporters. Data for Canada suggests that similar adjustments did not occur--at least through 1982.

Analysis of changes from 1970 through 1982 suggests that:

- o U.S. agriculture has increased output per unit in all major agricultural input categories compared to the rest of the world.
- o U.S. agricultural labor productivity has increased compared with the rest of the economy, and

- o U.S. nonagricultural labor productivity has fallen compared to the rest of the world.

These three conclusions suggest that U.S. agriculture retains its comparative advantage in terms of productivity.

Use of cost-of-production data for international comparisons is fraught with problems, including different methods of constructing costs, use of national average data, and exchange-rate changes. Exchange-rate changes alone can alter the cost rankings of producers from year to year. Nevertheless, average variable cost data for 1980-82 show that the primary U.S. growing regions have lower or nearly equal costs compared with those of major competitors.

Since productivity changes and costs do not underlie the U.S. experience of the early eighties, an examination of the ability of the United States to market abroad was made. Several factors have inhibited the U.S. position in world agricultural trade. The global recession, developing-country debt problems, the appreciation of the U.S. dollar, U.S. policies, and policy changes in importing and competing nations have reduced agricultural import demand and lowered real U.S. agricultural prices. U.S. competitors have benefited from increased prices for agricultural goods. Because of the structure of U.S. agriculture, its exports are more sensitive to world price changes than are exports of other countries. Whereas in the late seventies these factors increased the U.S. share of world agricultural trade, in the eighties these same factors working in reverse caused a reduction in the U.S. market share.

Although it appears that the United States retains its position as a low-cost producer of agricultural commodities, the returns to the different components of unit cost have changed in response to declines in real agricultural prices. Returns to land and management have fallen. Owner-operators have experienced a loss in wealth and income. Because real wheat prices in Canada rose slightly between 1976 and 1982, returns to land and management in Canadian agriculture have not fallen to the extent that returns have in the United States. Comparison of U.S. and Canadian data confirms these results.

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II. COMMODITY PROGRAM PERSPECTIVES

Commodity Price and Income Support Policies in Perspective

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James A. Zellner, and Frederick J. Nelson*

ABSTRACT

This article examines the objectives, performance, effects, and interaction of nonrecourse loans, Government and farmer-owned stock management activities, and target prices and deficiency payments. Setting loan rates above market-clearing prices increases farm income more than would loan rates used solely for price stabilization. However, relatively high loan rates also increase Government stocks, reduce the quantity of domestic and export demand, and increase program costs and food prices. Using the farmer-owned reserve to support farm income has often led to large stock accumulation. Target prices are intended to separate income support from price stability objectives, but deficiency payments also compensate farmers for reducing acreage.

KEYWORDS: Agricultural policy, commodity programs, Commodity Credit Corporation, deficiency payments, farmer-owned reserve, nonrecourse loans, price and income stabilization, stocks, target price.

INTRODUCTION

This article examines crop price and income support programs that have been the core of Federal farm policy since the thirties. The stated purpose of U.S. farm policy legislation, most recently stated, has been: "To provide price and income protection for farmers, assure consumers an abundance of food and fiber at reasonable prices, continue food assistance to low-income households, and for other purposes" (39). Justification for Government intervention in the domestic agricultural sector includes perceptions that farmers are an economically hard-pressed group, a principal reason for this is their relatively disadvantaged position in the marketplace, and, in the absence of Government intervention, there would be intolerable instability in commodity markets, adversely affecting both farmers and consumers (11).

In part, farmers' perceived disadvantages compared with other participants in the economy stem from agriculture's organizational and biological characteristics. A large number of farms produce homogeneous commodities and each farm accounts

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for a very small part of total production. Production tends to be variable because of the weather, which causes wide swings in farm prices and income. In addition, continued technological advances in agriculture have resulted in fewer resources being needed to supply the market.

The Government has used an array of price and income support and stabilization programs to ease resource adjustments in the farm sector. These programs include nonrecourse loans and direct purchases of excess commodities, Government and farmer-owned stock management activities, acreage reduction and other supply control measures, and direct payments to farmers. The increasing exposure of farmers to fluctuations in the farm economy and in the world marketplace, as well as the long-term effects of the programs themselves, have raised fundamental questions:

- How well do price and income support programs serve their intended purposes?
- How have they affected resource use and values in agriculture?
- Has the profile of farming been altered by these programs, including the number and size of farms, their financial organization, or the crop mix of farm output?
- What are the costs and benefits of these tools to farmers, consumers, and taxpayers, and, how equitably are they distributed?

This paper explores the objectives, performance, impacts, and interaction of three price and income support programs: nonrecourse loans, Government and CCC stock management activities, and target prices and deficiency payments. Acreage reduction programs are addressed in a separate article in this report. The appendix describes the criteria used over the years to set levels of price and income support.

PRICE AND INCOME SUPPORT PROGRAM OPERATION

This section describes the evolution and operation of price and income support programs. Nonrecourse loans, stock programs, and target prices and deficiency payments are discussed.

Nonrecourse Loans

Nonrecourse loans were initially authorized by the Agricultural Adjustment Acts of 1933 and 1938 for corn, cotton, peanuts, rice, tobacco, and wheat. Commodity coverage has since been extended to include sorghum, barley, oats, rye, soybeans, and sugar. Current programs are carried out under authority of the Commodity Credit Corporation (CCC) Charter Act of 1948, the Agricultural Act of 1949, and the National Wool Act of 1954. The authorizing legislation has been substantially amended over the past 50 years through 12 major and numerous minor acts of Congress. The latest major revision was the Agricultural Programs Adjustment Act of 1984.

Under the nonrecourse loan program, eligible producers may obtain a loan at a specific rate per unit of the commodity by pledging crops in storage from the current year's production as collateral. These loans are called "nonrecourse" because the CCC has no alternative but to take title to the stored commodity as full payment for the loan if the farmer chooses not to repay the loan principal

plus interest. Thus, CCC becomes a guaranteed source of demand for farm commodities. The loan may extend for 1 to 18 months depending on the commodity, but is typically for 9 months. 1/ Eligibility for the loan and other program benefits may require participation in any announced acreage reduction or other production control program.

Nonrecourse loans differ from commercial loans in several ways. The interest rate on CCC nonrecourse loans is usually below those offered by commercial banks. Farmers' credit ratings are unaffected by defaulting their collateral (the crop) to the CCC. And, the loan rate may at times be above the full market value of the collateral.

Nonrecourse loans effectively support prices through the option to forfeit. If market prices are above the loan rate plus interest charges during the regular nonrecourse loan period, the producer has an incentive to repay the loan and sell the crop in the open market. But, because program participants always have the option of forfeiting their crops to the CCC whenever market prices do not exceed the loan rate plus interest charges, the loan rate places a minimum (floor) under the price received by participating producers. If enough farmers participate in the program, the market price will tend to be maintained at or above the loan level. In such a case, the CCC loan program tends to benefit all producers, not just those participating in the program. Thus, nonparticipants become "free riders" who receive higher prices as a result of the actions of program participants. However, if participation is low, there may not be enough of the commodity eligible to enter CCC stocks as a result of nonrecourse loan defaults to maintain prices for everyone at or above the loan rate.

The nonrecourse loan also serves as a marketing tool, which allows farmers to obtain cash to satisfy immediate obligations to other creditors while retaining control of the commodity they produce. Rather than sell at depressed prices during the harvest season, the producer stores the commodity until later in the marketing year when prices are usually higher. This evens out marketings throughout the year. Some producers use the cash-flow and marketing-tool aspects of nonrecourse loans even when market prices are well above the loan rate.

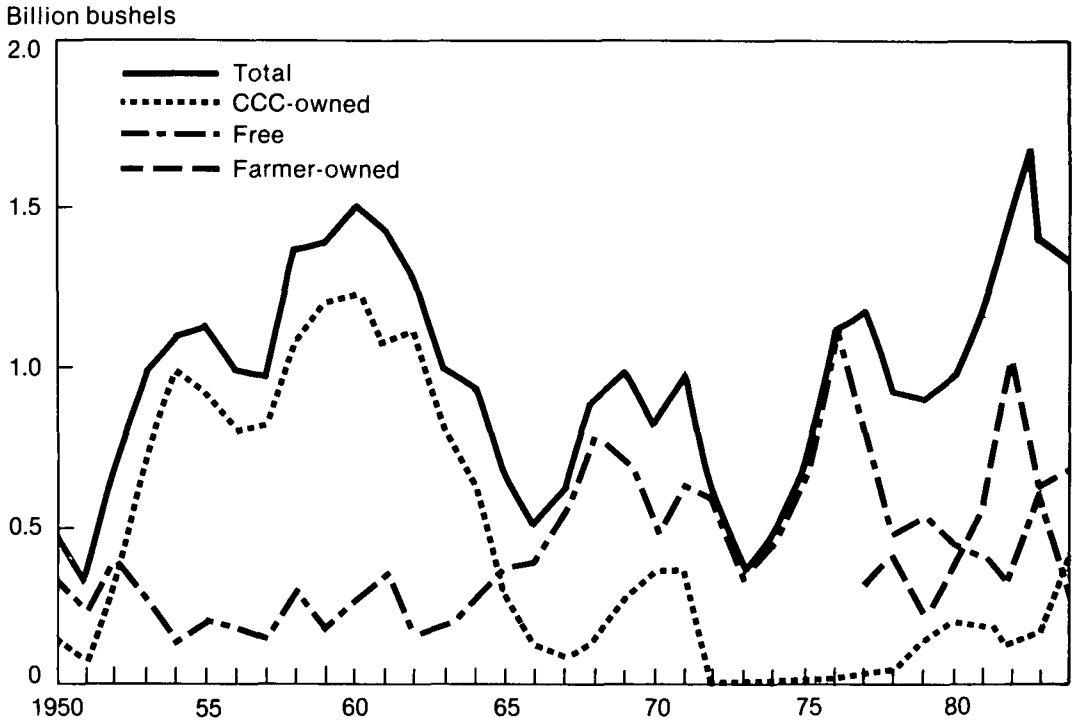
Commodity Stock Management

The accumulation and dispersal of commodity stocks has long been an integral part of U.S. agricultural programs. Major objectives of U.S. stock management programs have been to assure adequate supplies of farm commodities and to reduce market price and income variability, whereas other programs, such as land retirement, acreage diversion, and target prices have been intended to provide income and price support. In practice, the stock management and loan programs have also frequently been used to meet the support objective, although this has often led to excess stock accumulation. U.S. stock management programs are commodity oriented--existing for wheat, corn, sorghum, barley, oats, rye, upland cotton, extra-long staple cotton, rice, soybeans, sugar, tobacco, peanuts, honey, and dairy products. In terms of the volume of stock activities, wheat, feed grains, rice, and cotton predominate (figs. 1-4). Present stock management

1/ The loan period for cotton is 10 months, with a possible 8-month extension if the average spot market price for SLM 1-1/16" upland cotton during the ninth month of the original contract does not exceed 130 percent of the average for that price for the preceding 36 months. All rice loans come due on April 30. Since a rice producer has until March 31 to take out a loan, it is possible to have only a 1-month loan for rice. The appendix describes the various criteria used to set nonrecourse loan rates since the thirties.

Figure 1

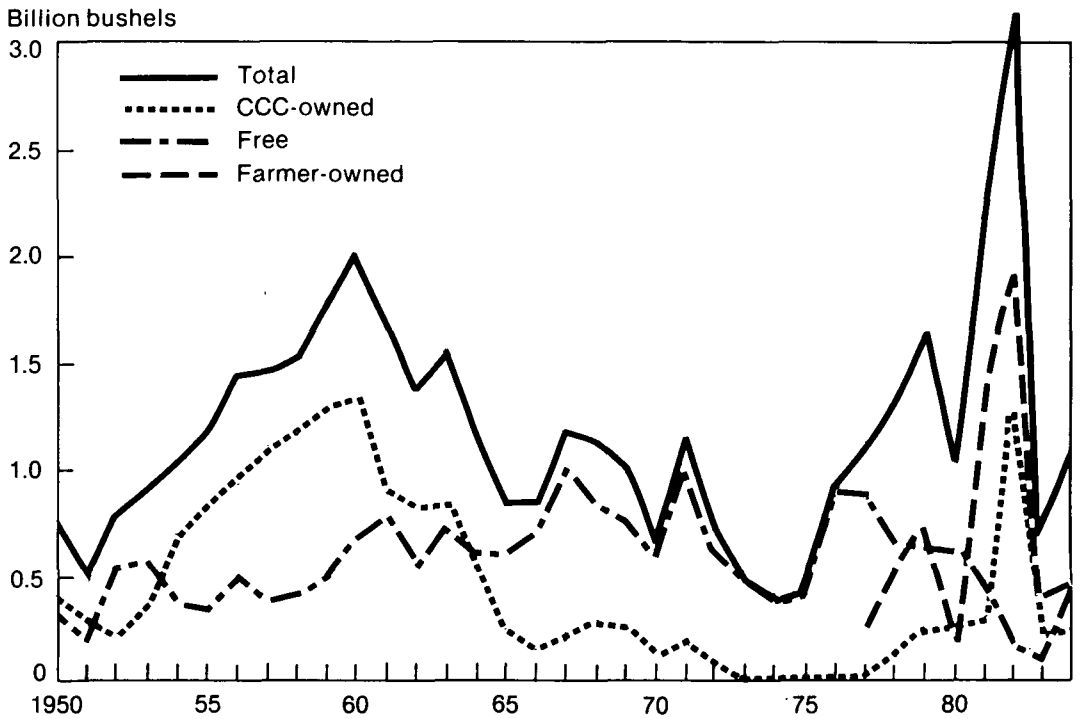
U.S. ending wheat stocks



"Free" stocks include commercial stocks and stocks held as collateral for CCC loans.

Figure 2

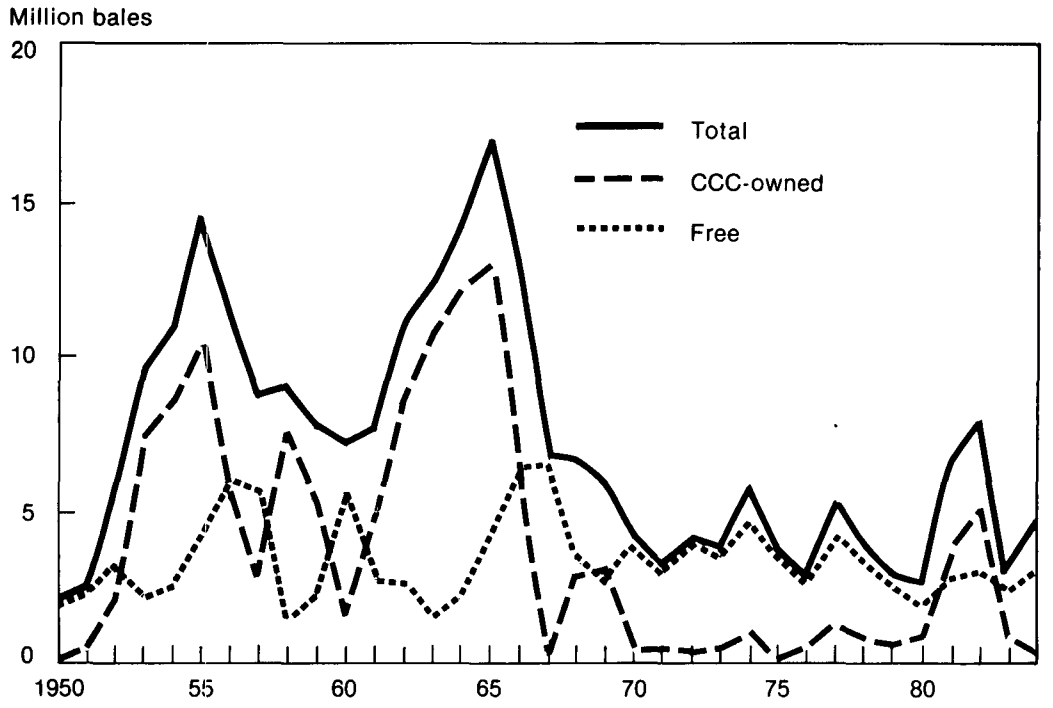
U.S. ending corn stocks



"Free" stocks include commercial stocks and stocks held as collateral for CCC loans.

Figure 3

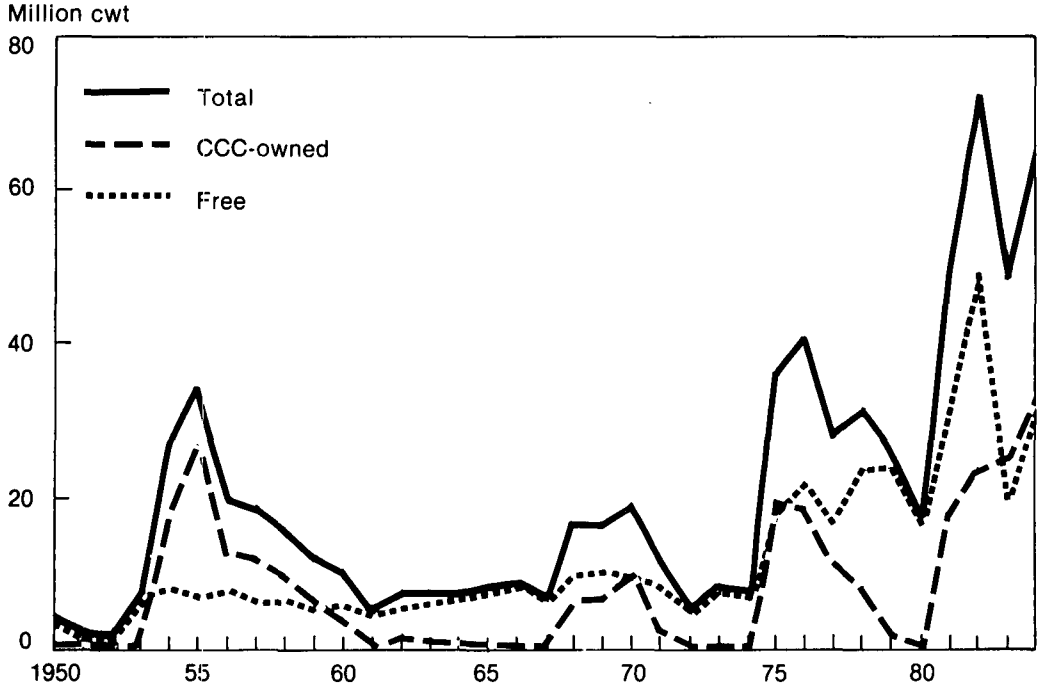
U.S. ending cotton stocks



"Free" stocks include commercial stocks and stocks held as collateral for CCC loans.

Figure 4

U.S. ending rice stocks



"Free" stocks include commercial stocks and stocks held as collateral for CCC loans.

programs include CCC stocks (both loans outstanding and CCC-owned) and farmer-owned reserve (FOR) stocks.

The CCC acquires stocks of grains, soybeans, and cotton as a direct consequence of its price support activities, either when producers default on nonrecourse loans or by direct purchases of program commodities. In the case of tobacco, peanuts, and honey, cooperative marketing associations handle certain phases of the price support programs with funds guaranteed by the CCC.

Prices of dairy products are supported by purchases of butter, Cheddar cheese, and nonfat dry milk from manufacturers and handlers. This, in turn, supports prices for milk and cream at the farm level. Domestic food and export donation programs are the most common outlets for surplus dairy stocks acquired under price support activities. CCC dairy stocks may be resold on the domestic market at 110 percent of the purchase price or the market price, whichever is higher.

There are several restrictions on the use of CCC-owned stocks. Legislation prohibits domestic "bargain sales" of CCC-owned commodities. The minimum domestic sales price of CCC-owned grain stocks was 115 percent of the current national average loan rate plus carrying charges for the 1974-77 crops, 150 percent of the loan rate for the 1978-80 crops, and, it is 110 percent of the FOR release price for the 1981-85 crops. However, under certain conditions, the CCC is authorized to donate, or sell at reduced prices, its excess commodity stocks on the domestic and international markets. 2/

Payment-in-kind (PIK) programs have also been used to reduce CCC stock levels and to limit further accumulation of stocks. Under most PIK programs, producers are paid for idling acreage with units of a particular commodity instead of cash. In 1961, farmers took approximately 25.2 million acres of corn and grain sorghum out of production in return for PIK certificates that could be converted to a cash payment from the CCC. The Congress renewed the PIK program for corn and grain sorghum in 1962 and kept it in effect until 1970; however, it was seldom used. The most recent example of payment-in-kind was in 1983, which was the largest acreage and stock reduction program in the Nation's history. Under an export PIK program initiated in 1956, exporters have occasionally been issued certificates redeemable in wheat from CCC stocks. Wheat thus obtained has been restricted to the export market.

CCC-owned inventory reductions also occur by donations of food commodities to needy individuals and institutions, or by making stocks available for use in relieving economically distressed or major disaster areas. The Secretary of Agriculture can sell CCC-owned feed stocks, at not less than 75 percent of the current loan rate, to eligible owners in areas where an emergency exists for foundation herds of cattle, sheep, and goats. Sale is authorized only to livestock producers who cannot obtain enough feed without undue financial hardship. Surplus dairy products are also available to the armed forces at no charge except for the cost of packaging.

In the early seventies, pressure arose to create a means of stock management more oriented towards stability than the CCC program. Regular CCC loans may mature too soon to allow farmers to carry their crops over into subsequent years when supplies may be smaller and prices higher. When low prices persist through a crop year, producers with crops under a maturing loan must either default, thereby foregoing potential price increases, or refinance the loan commercially

2/ See the article on export market programs for a more complete review of CCC sales on the international market.

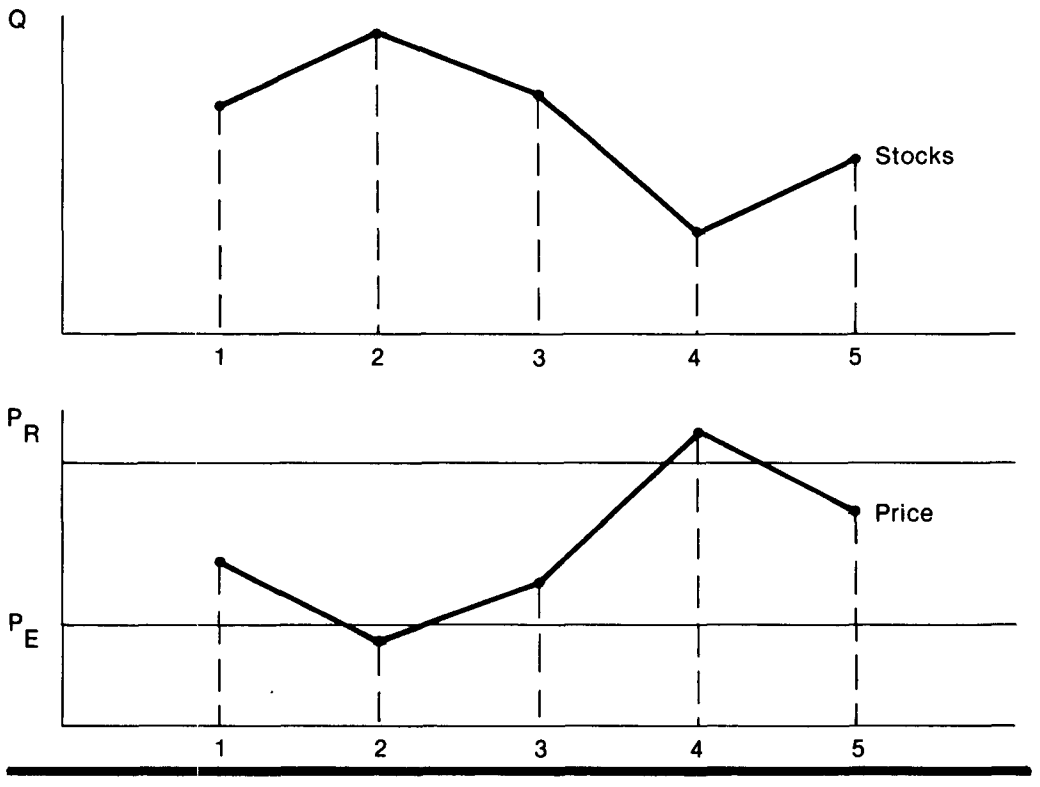
at less attractive terms. To provide extended nonrecourse loans to wheat and feed grain farmers, the farmer-owned reserve program was authorized by the Food and Agriculture Act of 1977. While CCC reseal programs occasionally allow farmers to extend their loans past the usual 9-month maturity date, the FOR provides a 3- to 5-year continuing program to address the problem of stabilizing grain prices across marketing years.

The FOR was designed as a type of buffer stock, encouraging farmers to accumulate stocks of wheat and feed grains when supplies are relatively large and price expectations are low, and to sell grain when free stocks are reduced and prices rise. Figure 5 illustrates the operation of a hypothetical buffer stock program. Stocks accumulate when the market price (P_M) is at or below a reserve loan rate or entry price (P_E), such as in period 2. Stocks are released onto the market when prices rise above a release price (P_R), such as in period 4. By attempting to control the quantity of grain on the market, a buffer stock helps to keep prices within the entry-release price band.

The FOR program in concept helps stabilize commodity prices by offering producers incentives to hold stocks for 3 to 5 years without penalty, unless market prices rise to an announced release price. To encourage participation in the FOR, farmers are offered advanced storage payments (currently 26.5 cents per bushel per year, 20 cents for oats), low interest charges (which may be waived after the first year), and sometimes higher rates for reserve loans than for regular CCC loans. Once market prices equal or exceed the release price, storage payments are discontinued, encouraging producers to repay their loans and market

Figure 5

Operation of a hypothetical buffer stock program



their grain. Thus, the FOR is intended to control price variability within a price corridor defined by the reserve loan rate (which was higher than the regular CCC loan rate during 1980-82) and the release price. Since the sale price for CCC-owned stocks is currently 5 to 10 percent above the FOR release price, farmers are not forced to compete directly against the Government in the release of stocks to the marketplace.

Target Prices and Deficiency Payments

Experience with high loan rates and ineffective supply control in the fifties eventually led in the sixties to the extensive use of direct payments. These payments were intended to supplement lower price supports and to encourage participation in voluntary acreage reduction programs that were employed to deal with the problem of excess production capacity. The deficiency payment program, adopted in 1973, refined existing payment programs but differed from previous approaches in several ways: For the first time, the amount of the payment varied inversely with price to make up the difference between the target support level and actual prices; the basis of the support level was shifted away from the parity price concept and toward cost of production; rules were established to adjust the target support level annually; and deficiency payments were made for any year in which the average farm price for a portion of the year was below the target price, even when acreage reduction or set-aside programs were not implemented. With the exception of wool and mohair, direct payments resulting from the use of target prices represent one of the most recent measures to support prices and incomes (deficiency payments for wool and mohair were authorized by the National Wool Act of 1954). The target price and deficiency payment program began with the 1974 crops of wheat, corn, sorghum, and upland cotton. Barley, oats, rice, and extra-long staple cotton were added later.

The target price for any crop is used to calculate deficiency payments, so called because the payments would make up the difference (or deficiency) between an established target price and the higher of: (1) the average market price during the first 5 months of the marketing year or (2) the national average loan rate. The cotton deficiency payment is based on the farm price received during the calendar year which contains the first 5 months of the marketing year. No payment is made if the market price exceeds the target price. Eligible producers are assured of receiving, in addition to a loan rate, any announced deficiency payment per unit of output. Thus, the Government assumes the risk of making deficiency payments at an undetermined rate, whereas in earlier direct payment programs, payment rates were fixed in advance. However, the maximum deficiency payment per unit of production--the difference between the target price and the loan rate--is known in advance.

To the extent that market price is allowed to vary between the target price and loan rate, there is some basis for saying that the loan and target price programs "separate" price support from income support. That is, separate programs are used to accomplish these two objectives, with the deficiency payment program supplementing income provided by the loans (or by market prices supported by the loans). The gap between the target price and loan rate, in concept, allows market prices to vary more with supply and demand conditions and reduces the likelihood of accumulating excessive stocks, while maintaining income support through direct payments.

Eligibility for Program Benefits

Eligibility for price and income support benefits requires compliance with announced acreage reduction or other supply control programs. When acreage

control programs are in effect, a portion of cropland must be placed in an approved conserving use, and this land is not used in computing total payments. Also, a producer cannot receive both disaster payments and deficiency payments on the same bushel or unit of production.

Since 1977, production eligible for payment has been based on the permitted planted acreage and program yields. The acreage base for deficiency payments to individual producers has been the average of acres planted to a particular crop on their farm over the previous 2 years, plus any diverted or set-aside acres. Prior to 1977, payments were based on a system of acreage allotments tied to historical planting patterns. Acreage allotments were continued for rice until the 1981 farm legislation, which converted them to a current plantings concept.

A farm's program payment yield for a given year is an average of yields per harvested acre for recent years, adjusted for low yields caused by natural disasters. In some cases, yields can be assigned based on regional averages. However, a "proven yield provision" in the law ensures that no reduction in yield can be forced on farmers who can prove their yield was higher than the program yield.

RELATIONSHIPS AMONG PRICE AND INCOME SUPPORT MEASURES

A complication in evaluating farm programs is that the impacts of nonrecourse loan rates, stock management activities, and target prices on the farm sector change over time as particular program parameters are adjusted to fit current economic or political conditions. To get an idea of how price and income support measures have been used, it is instructive to view their development over five periods--prior to 1952, 1953-60, 1961-71, and 1972 to the present. A detailed description of U.S. agricultural programs since the thirties is beyond the scope of this study. Historical reviews of farm programs may be found in (2, 3, 4, 14, 17, 18, 34, 35, 36, 40).

Pre-1952 Period

Farm production had been encouraged during World War II and the value of exports increased more than tenfold between 1940 and 1948. Price supports, which had been implemented in 1933, were increased to 90 percent of parity (see appendix) and remained at those levels for 2 years following the War. There were also attempts, albeit unsuccessful, at direct payments to farmers in an effort to ease the adjustment of resources in agriculture to a peacetime economy. However, a drop in demand and maintenance of supply incentives (in the form of high price supports) began to result in an accumulation of CCC-owned commodity stocks.

1953-60

Between 1953 and 1960, agriculture experienced an unprecedented growth in technology and productivity. In the early fifties, flexible programs were enacted to lower price supports from the 90-percent-of-parity level. During this period, more emphasis was placed on demand expansion with programs such as P.L.-480 than on supply control to deal with excess production.

However, the rapid adoption of hybrid corn and other improved production practices led to increased production and declining farm prices and incomes. Because producers could not sell their products at a price above the loan rate, nonrecourse loans were forfeited, and stocks held by the CCC accumulated.

The relationships between stocks, the loan rate, and the price received by farmers are illustrated in figures 6 and 7 for wheat and figures 8 and 9 for corn. The wheat and corn loan rates exceeded their respective farm prices every year from 1952 to 1960. In 1951-54, the loan rate for wheat was approximately 90 percent parity (table 1). During this period wheat stocks increased from 320 million bushels to over 1.1 billion bushels (fig. 6). Export sales were also reduced because of these relatively high loan rates. Although the support level was reduced to 75 percent of parity by 1960, wheat stocks continued to accumulate to over 1.5 billion bushels. The situation was similar for corn (table 2 and figs. 8 and 9).

Table 1--Wheat parity prices, loan rates, market prices, and variable costs

Year	Parity price	Loan rate	Market price	Average variable cost per bushel
		Dollars per bushel		
1951	2.40	2.18	2.11	NA
1956	2.42	2.00	1.97	NA
1961	2.38	1.79	1.83	NA
1966	2.58	1.25	1.63	NA
1971	2.91	1.25	1.34	NA
1974	3.95	1.35	4.09	1.15
1976	4.87	2.25	2.73	1.36
1981	7.07	3.20	3.65	2.05
1982	7.26	3.55	3.50	2.00
1983	7.39	3.65	3.54	1.73

NA = Not available.

Table 2--Corn parity prices, loan rates, market prices, and variable costs

Year	Parity price	Loan rate	Market price	Average variable cost per bushel
		Dollars per bushel		
1951	1.77	1.57	1.66	NA
1956	1.76	1.50	1.29	NA
1961	1.61	1.20	1.10	NA
1966	1.62	1.00	1.24	NA
1971	1.99	1.05	1.08	NA
1974	3.04	1.10	3.02	1.17
1976	3.45	1.50	2.15	1.08
1981	5.04	2.40	2.50	1.45
1982	5.06	2.55	2.62	1.36
1983	5.17	2.65	3.30	1.36

NA = Not available.

Figure 6

Wheat ending stocks

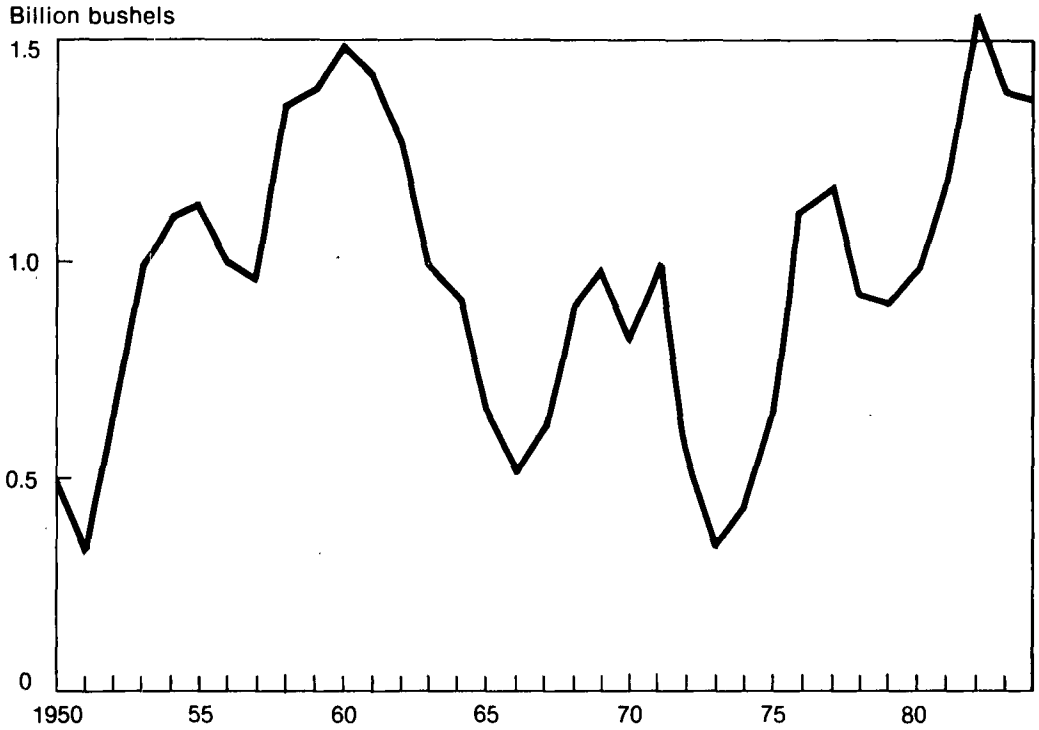


Figure 7

Ratios of wheat loan rate to farm price and diverted to harvested acres

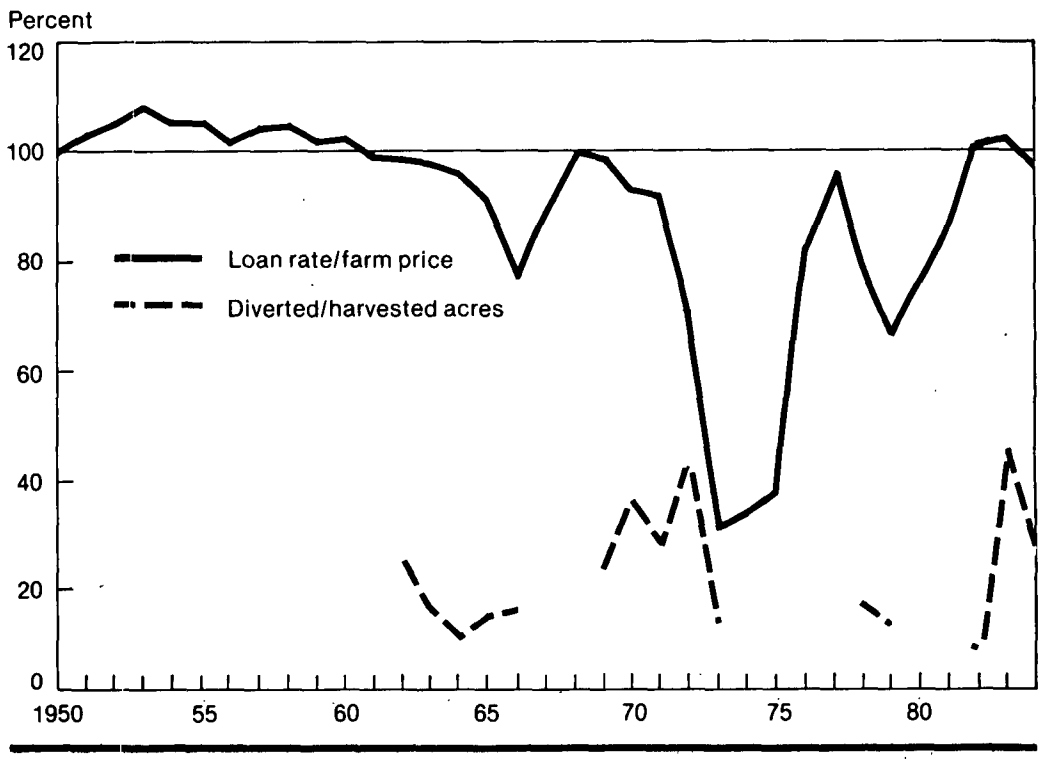


Figure 8

Corn ending stocks

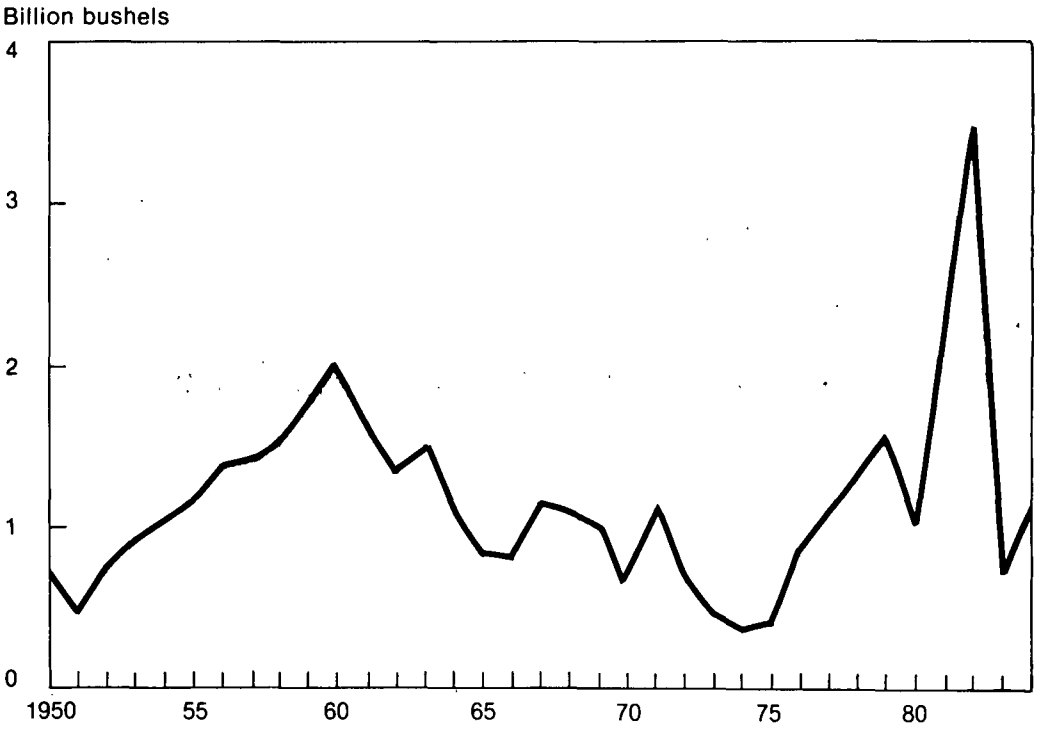
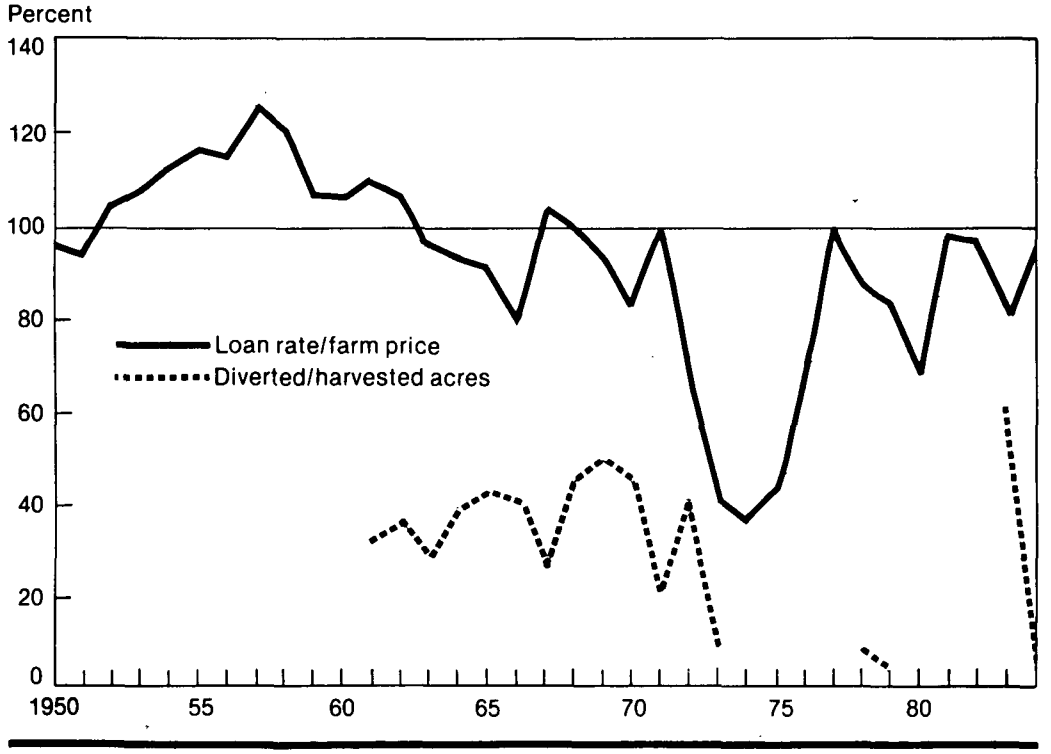


Figure 9

Rates of corn loan rate to farm price and diverted to harvested acres



1961-71

Steps were taken during 1961-71 to reduce the accumulation of CCC stocks. Prior to the sixties, nonrecourse loans were the primary means of guaranteeing returns to producers. Farm legislation in 1961 and 1962 provided the initial separation of loan rates and income support payments. Support prices were reduced to be more in line with world market levels. Income was supported by direct per-unit support payments to producers. However, to receive price support payments, producers were required to comply with voluntary acreage retirement (set-aside) provisions. These payments above the loan rate were, in effect, partial compensation for reducing production. Since the supply control programs were voluntary, it was necessary that complying farmers be made no worse off than noncompliers (by means of paid land diversion or price support payments) if sufficient participation was to be realized to achieve price support objectives.

The wheat and corn examples in figures 7 and 9 show that acreage diversion and set-aside programs have often been associated with market prices above loan levels and, hence, reduced stock accumulation. The acreage control programs, along with continued reductions in the support price for wheat during the early sixties, resulted in a decrease in wheat stocks to about 500 million bushels by the end of 1966. Corn surpluses were also erased by the early seventies. However, payments for acreage and price support for corn producers increased from $300 million in 1963 to over $1.1 billion in 1972. Diversion and support payments for wheat ranged between $243 million and $859 million during 1963-72. Cotton payments over the same period were between $39 million and $807 million. No payments were made for rice.

1972 to the Present

Beginning in 1972, there was a sudden, large increase in exports of U.S. agricultural products because of drought-reduced foreign harvests, economic growth in developing countries, credit subsidies, and devaluation of the U.S. dollar. A combination of large sales to the Soviet Union and a world food crisis left virtually no reserves after 1973. The emphasis began to shift towards greater market orientation. Indeed, there was more concern with how to supply the increased demand for U.S. farm products than with price and income support, since farm income was beginning to climb rapidly.

The Agriculture and Consumer Protection Act of 1973 authorized use of target prices and deficiency payments. In concept, the target price-deficiency payment program was to provide income support while the loan rate provided a price floor. In practice, deficiency payments, as with price support payments of the sixties, also acted as an incentive to participate in voluntary acreage reduction programs. The escalation of export demand during the seventies brought record farm incomes, but it also increased exposure to the greater uncertainty of international markets. As a means of dealing with the widening swings in prices and incomes, the Food and Agriculture Act of 1977 authorized the FOR program.

The Secretary of Agriculture has broad discretionary authority to determine most of the incentives for FOR participation. Eligibility requirements for entry into the program, reserve entry and release prices, storage payments, waiver of interest charges, and the maximum size of the reserve are left to the Secretary's determination, with only minimal restrictions placed by the Congress. In contrast to the provisions for the FOR, the Congress specifies in legislation minimum CCC nonrecourse loan rates, target prices, and the conditions under which CCC stocks can be released.

Just as U.S. agriculture began to gear up for an era of expanding production and trade, several events began to cast doubt on such prospects. In response to the Soviet invasion of Afghanistan, an embargo was placed on exports to the USSR in January 1980. Other grain producing countries began to expand their production and went after Soviet and Eastern Bloc trade. With this drop in export demand and the inflexibility of other program options, there were few alternatives to deal with the potentially price-depressing production except to make the FOR more attractive for stock accumulation. For the 1981/82 crop year, the Secretary eased producer eligibility requirements for the FOR, offered reserve loan rates higher than regular CCC loan rates, and waived interest charges on reserve loans. The effect of these decisions was a sizable increase in FOR stocks of wheat and corn, as shown in figures 1 and 2.

As the FOR accumulated grain, foreign producers expanded their output in response to the price incentives provided by the U.S. loan rate and the strengthening of the U.S. dollar against other currencies. A worldwide recession also hindered U.S. exports. Favorable weather conditions prevailed around the world, and a global grain glut emerged. The Agriculture and Food Act of 1981, in response to anticipated continued inflation, legislated higher loan rates and target prices for the next 4 years than those that prevailed in 1980. These program incentives continued to encourage global production, while U.S. exports continued to decline. In 1982, farm income fell and once again the flexibility of the reserve was used for price support and as a substitute for production controls. For example, the reserve loan rate for the 1982 corn crop was set 35 cents per bushel above the regular loan rate and 20 cents above the target price. Thus, because of the use of FOR for income enhancement, and to encourage program participation in 1982, large quantities of grain stocks accumulated. Accumulation of large supplies eventually led to the 1983 Payment-in-Kind (PIK) program. During 1983/84, FOR stocks of corn fell by more than 1.1 billion bushels and FOR stocks of wheat decreased by over 0.4 billion bushels. Virtually all of the decline in wheat stocks and much of the decline in corn stocks were attributable to the PIK program. Corn prices exceeded FOR release prices because of the 1983 drought, causing the rest of the decline in FOR corn stocks.

Recent experience indicates that using grain reserves to support farm income in the face of excess productive capacity results in large stock accumulation, especially when market forces and other program provisions tend to encourage increased production and progressively lower real prices. Other problems associated with long-term storage--quality deterioration, cost of storage payments and interest waivers, the possibility of eventual forfeiture to the Government, and the restriction of exportable supplies--have raised further questions about whether grain reserves are a cost-effective means for achieving farm income support.

This overview of the interrelationships between loan rates, stock management programs, and target prices and deficiency payments indicates that the impacts of these programs depend upon the relative levels at which each is set. As a direct result of large Government stock accumulation caused by relatively high and rigid nonrecourse loan rates, additional policy tools have had to be used to limit production, such as paid diversion and voluntary acreage set-aside and reduction programs. In addition, many other factors beyond the control of the domestic farm sector, such as war, export variability, world weather patterns, rapid technological advancement, and actions in the macroeconomy, influence how price and income support program tools interact with each other and collectively how they affect the farm sector.

MEETING PROGRAM OBJECTIVES

A review of price and income support programs suggests that their stated objectives are multiple and occasionally conflicting. These objectives can be summarized as being an attempt to maintain farm prices and income at a reasonable and relatively stable level compared to the nonfarm economy, to assure consumers an adequate supply of inexpensive farm commodities, and to ease the adjustment of resources in and out of agriculture. This section reviews the available evidence on how well price and income support programs have met these policy objectives.

Price and Income Support

One means of evaluating the degree of price and income support provided by farm programs is to estimate what difference these programs made in the farm sector compared to what might have happened in their absence, that is, in a free market. Studies have used a wide variety of research methods for such comparisons (15, 28, 29, 37, 38). Results of these studies indicate that in the absence of farm programs, prices received by farmers would have been between 10 and 25 percent lower and that aggregate net farm income would likely have been 20 to 60 percent lower during 1955-72.

During the seventies, market prices were generally above price support levels and acreage diversion for supply control was not used very often. Also, no significant deficiency payments were made before 1977. Hence, the farm sector, in effect, operated in a free market during the midseventies. During the late seventies and early eighties, loan rates began to act more frequently as a price floor, and deficiency and diversion payments were made more often. Elimination of farm programs during the last few years would most likely have led to at least shortrun declines in farm prices and incomes.

Commodity programs apply mainly to crops. There are essentially no direct price and income programs for livestock products except dairy. However, crop programs significantly affect livestock feed costs and programs which raise feed prices and can lower livestock returns, at least in the short run. Some fruits and vegetables are affected by a different set of programs, marketing orders.

So, Government programs appear to have increased the average income of commercial grain, oilseed, and fiber producers above what would likely have been the case in a free market. But, another major goal of farm policy has been to help move the incomes of farm operators to a level comparable with that of nonfarm people. There are many ways of measuring relative income of farm and nonfarm people, and the size of the income gap depends significantly upon which groups are included and excluded. 3/ The coverage of farmers can include: all persons living on farms; farm operators living on farms; all farm operators, regardless of where they live; farm operators whose principal occupation is farming; and, farm operators whose principal occupation is farming and who are not retired. There is also the question of what income is to be included: only income from farm operation; income of farm operators from all sources; income of farm operators and other members of their families from all sources; only money income; money income plus perquisites such as home-produced food and the rental value of farm dwellings; or, income before or after taxes.

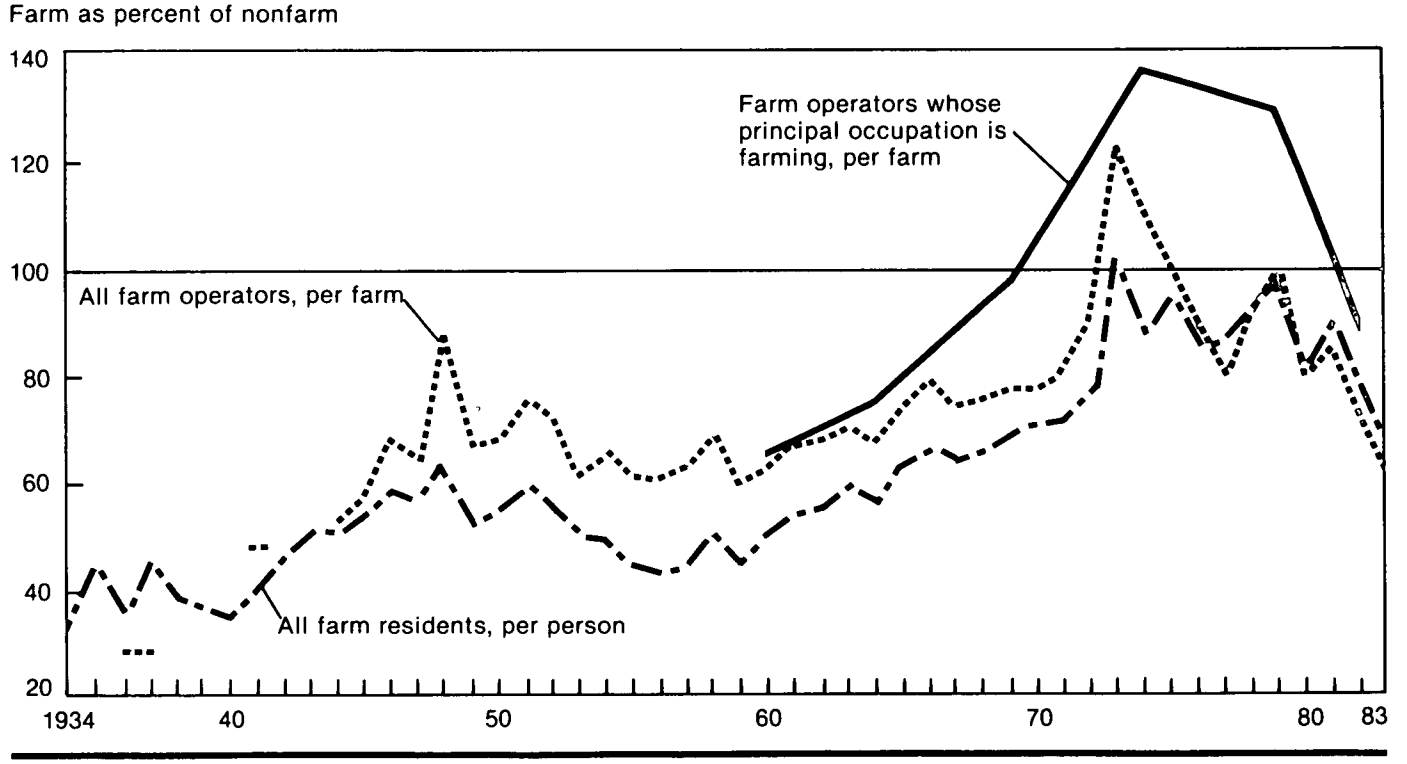
3/ The authors wish to acknowledge the contributions to this section made by Alden C. Manchester, senior economist, National Economics Division, Economic Research Service.

The comparison of income per person after taxes between farm residents and the nonfarm population is available from 1934 to the present. These data include only farm operators living on the farm and farm laborers living on the farm where they work. According to this measure, income per person of the farm population was only a third of that of the nonfarm population in 1934 (fig. 10). It has generally risen since that time, but with much variation. In 1973, the income of farm residents was slightly above that of nonfarm residents and, since then has varied from 75 to 98 percent of the per capita after-tax income of the nonfarm population. This comparison is strongly affected by the decline in the number of farm laborers and in the proportion of them living on the farm where they work. It is also affected by the closing of the gap in family size between farm and nonfarm families. In 1949, 65 percent of all hired farmworkers lived on farms. By 1983, the proportion had declined to 22 percent (1). Farm-resident families averaged only 1.2 percent larger than nonfarm families in 1983 (1), but 17 percent larger in 1950.

Information is available since 1960 to compare the incomes of farm-operator families from all sources with the incomes of nonfarm families. On this basis, the average income of farm operator families was 83 percent of the income of other families in 1960 and generally above 100 percent from 1971 to 1981 (fig. 10). Since 1981, the average income of farm-operator families has been below that of nonfarm families. This calculation assumes that there is one family per farm, a simplifying assumption which is not entirely correct. Partnerships and corporate farms typically provide a living for more than one family, and farms owned by trusts, estates, and institutions are not typically associated with families in any direct fashion. Information available from the 1974 Census of Agriculture indicates that there was an average of 1.04 families

Figure 10

Comparison of farm and nonfarm incomes



per farm in that year, although data on operation of more than one farm by a family would probably lower the number of families per farm if such data were available.

The incomes of all farm operators--including those whose principal occupation is not farming--were above those of other families throughout most of the seventies. If capital gains on real estate are included with current income, average income of all farm operator families was above that of nonfarm families from 1961 through 1980. This does not include any capital gains by nonfarm families, who have experienced significant capital gains on owner-occupied housing over much of the 1961-80 period.

Thus, it would appear that, with the combination of public programs and many other influences over the past 20 years, the general level of current incomes of farm operators has compared favorably with those of nonfarm families. However, not everyone in the farm sector shares in the higher farm incomes. Operators whose principal occupation is farming are much more heavily represented in the larger size farms and tend to have average incomes substantially higher than for all farm oprators. Approximations based on data from Censuses of Agriculture indicate that, in the early to midsixties, the incomes of operators whose principal occupation was farming averaged 4 to 8 percent higher than the average for all farm operators. In 1969, 1974, and 1982 it was about one-fourth greater; but, in 1978 the difference rose to 43 percent (see article on the profile of the farm sector for further discussion of farm income measures).

Poverty is higher among farm residents than among others. In 1982, 22.1 percent of persons living on farms were in poverty, compared to 14.8 percent of the rest of the population (41). But, the poverty that exists in agriculture cannot practically be remedied through price supports or other commodity-oriented farm programs based on production. This is because farm families who fall below the poverty line are typically only marginal producers of program crops. Also, the incidence of poverty among farm laborers, the unemployed, and the retired living on farms tends to be higher among farm operators.

A review of the target price-deficiency payment program during its 10 years of existence suggests that its effects are not limited to income support. Use of deficiency payments to achieve participation in acreage reduction programs converts them into a tool to raise prices rather than just a device to stabilize income when prices are low. When prices increase because of an acreage reduction program, deficiency payment rates are reduced by the amount that the price rises above the loan rate. Income support goes to producers through higher commodity prices and consumer expenditures rather than through deficiency payments out of tax revenues. Thus, income and price supports are no longer separate. Market prices, and consequently, resource allocation decisions, are being influenced by income support payments. The concept of income support was introduced precisely to prevent this from occurring.

If no acreage reduction programs were in effect, or if acreage reduction programs were carried out entirely through paid diversion to reduce output and enhance prices, the deficiency payment would be a direct income transfer rather than a compensation for voluntary diversion. However, in either case the acreage reduction program results in higher prices than would have prevailed without it, and therefore works at cross-purposes with the concepts of setting loan rates at or below competitive price levels, providing income support through direct payments, and allowing market prices to respond to demand and supply forces. Additional implications of acreage reduction programs are addressed in a separate article on that subject.

Price and Income Stability

One of the objectives of commodity programs has been to stabilize farm prices and income. Programs addressing farm income stabilization have generally involved attempts to reduce variability in commodity prices by means of stock management activities.

Throughout recorded history, individual farmers and nations have recognized that a portion of each bountiful harvest should be stored for use when food supplies were relatively scarce. Besides abnormally harsh weather conditions, pests, and disease which frequently can reduce food supplies, modern societies also face many problems related to demand. As traditional trading boundaries have widened, demand for agricultural products has become subject to fluctuations in global economic conditions, food supplies in other countries, and changes in Government policies at home and abroad. Taken individually or in combination, these influences can cause wide swings in farm prices and incomes from year to year.

Wide swings in income are an increasingly important problem facing farmers. Widely fluctuating market signals make it hard for farmers to efficiently plan and allocate resources. Many farmers who made long-term plans based on the expectations prevailing during the early seventies faced bankruptcy in the early eighties. Even farmers who have an adequate income when averaged over a period of years may not be able to weather a few years of reduced income under a heavy burden of debt.

The uncontrollable biological and, to a lesser extent, economic and political problems that affect agriculture underscore the arguments for stock management--the orderly accumulation and dispersal of stocks--whether by private firms, individuals, or the Government. Stock management tends to even out marketings throughout the crop year and over crop years, stabilizing commodity prices and farm income; assuring an even distribution of supplies for domestic consumers, export markets, and disaster relief; and ensuring that excessive stocks do not accumulate.

Some maintain that in a market-oriented economy the management of grain reserves is best left entirely to private individuals and firms. There is no doubt that pipeline stocks will be held by private parties in order to ensure an uninterrupted flow of commercial marketings. Also, the amount of grain that private individuals and firms are willing to hold increases as the Government withdraws from the marketplace. This has been found to be especially true when Government stock management programs do not attempt to keep commodity prices within a relatively narrow range, since highly variable market prices present more opportunities for risk-takers to profit from speculative purchases and arbitrage activities and encourage commodity processors to hedge through crop purchases and stockholding. Futures, options, and private insurance markets have been developed to address the riskiness of private stockholding behavior.

What then is the rationale for Government involvement in the management of grain reserves? A primary objective of the private sector is profit maximization. Stocks are held not only to meet normal commercial needs, but also in anticipation of grain price increases. One of the objectives of Government stock management is to assure social well-being and food security for the general population. Because of possible conflicts arising from these differing objectives, the private sector may not manage stocks in an optimal manner from society's point of view. Private stocks are held not only to meet pipeline needs, but also in anticipation of forseeable events such as expected grain price increases. Governments recognize the long-term need to hold stocks in

periods of rising and declining prices. The value of reserves to society, especially food security reserves, arises from their availability when an unexpected event occurs. Thus, many feel that there is a role for the Government as a participant in managing reserve stocks and distributing the risk among taxpayers.

When there are surpluses, commodity programs offer protection to participating producers, who are guaranteed at least the nonrecourse loan rate for their eligible crop if they choose to default on their loan. In years of crop shortfalls, Government-owned stocks can be released when prices rise to dampen the price rise. Because of the restrictive domestic sale provisions of CCC-owned stocks, CCC inventories generally can be sold only under very tight supply conditions. However, nonrecourse loan rates have sometimes been set above market-clearing levels, rather than stabilizing prices around a market-determined price trend. At such times stocks, and particularly CCC stocks, have accumulated (figs. 6-9).

Price-Stabilizing Implications of the Farmer-Owned Reserve

The FOR was initiated primarily to address the price and income stability issue associated with greater export exposure. If a grain reserve is to act solely for price stabilization purposes, the price corridor defined by the entry and release prices would need to be set so that, once the buffer stock is established, the quantity of grain entering the reserve when prices are below the entry price would, on average, equal the quantity released over time when prices were above the release price. This would imply that the reserve stock price corridor should symmetrically bracket long-term market price trends, and should adjust to changes in those trends. If the entry and release price band is too high relative to the underlying market price trend, excessive stocks would accumulate. If the reserve price band is set too low relative to the market price, stocks would be depleted and the market price could not be kept from increasing above the release level (33).

Another issue related to buffer stock price corridors is the size of the price differential between the entry and release prices; that is, how much price stability is desired. A relatively narrow price differential provides more price stability but requires a larger stock level to keep the market price within bounds. A relatively narrow price corridor would tend to discourage private speculative stockholding because it would reduce the potential to profit from price increases. If the price corridor is too narrow, it would not be enforceable even if stocks were larger. Unless market prices are allowed to rise high enough to cover the principal and interest on a participant's nonrecourse loan, stocks would not come out of the reserve.

Price relationships for CCC and FOR stock activities are presented in table 3. Experience with the FOR to date indicates that, if the FOR is to act primarily for price stabilization purposes, the price band may need to be reconsidered. For example, in 1982-83, the reserve release price of $4.65 per bushel for wheat exceeded the regular loan rate by $1.10 per bushel. Recent USDA analysis indicates that variability within a price band set this wide is not significantly different from that which would prevail in the absence of a FOR (31). It is possible that a relatively wide price band may be necessary to allow the FOR program to function, given regional differences in commodity prices and the legislated minimum target prices. However, without realignment of the release and loan rates, or reduction in both, FOR stocks are likely to accumulate over time and the program is likely to be less effective in reducing price variability. The USDA results tend to agree with the study by Gardner (11) that

found that corn and wheat prices during the 1977-78 period were just as variable under the FOR as before its implementation. Just (20) discovered relatively minor price stabilization under the FOR during the same period. However, Meyers and Ryan (24) estimated that variation in wheat prices during 1978-80 was 16 to 17 percent less with the FOR than without, and variation in corn prices was 22 to 26 percent less with the FOR. These different conclusions can be traced in part to different estimates of the substitutability between private and FOR stocks.

Substitution Between Private and FOR Stocks

Wheat and feed grains began entering the FOR in 1977 and 1978. During the initial accumulation period, one would expect that the FOR represented an additional source of demand for wheat and feed grains, thus tending to raise the price. However, the price impacts of the reserve depend upon the extent to which grains placed into the FOR substitute for stocks that would otherwise have been privately held. Each bushel of grain placed into the reserve may increase total stocks by less than 1 bushel. If there is a sizeable substitution, the price-stabilizing and income-enhancement effects of the reserve are diminished, since there would be a transfer of private for Government stocks with relatively little net price gain.

As shown in figures 1 and 2, free stocks of wheat and corn have dropped since the FOR was opened. A substantial portion of the drop in free stocks came from stocks held as collateral for CCC nonrecourse loans which were allowed to be placed into the reserve. In the absence of the FOR program, these stocks would likely have been either forfeited to the CCC, sold on the market, or held in private storage, depending upon market conditions at the end of the 9-month loan period.

Table 3--Price relationships for CCC and FOR stock activities for wheat and corn, 1977-84

Year	Regular loan	FOR entry	FOR release	FOR call	CCC sales	Target price	Season-average farm price
				Dollars per bushel			
Wheat:							
1977	2.25	2.25	3.15	3.94	4.14	2.90	2.33
1978	2.35	2.35	3.29	4.11	4.23	3.40	2.97
1979	2.50	2.50	3.75	4.63	4.75	3.40	3.78
1980	3.00	3.30	4.20	5.25	5.83	3.63	3.91
1981	3.20	3.50	4.48	5.60	6.22	3.81	3.66
1982	3.55	4.00	4.65	--	5.12	4.05	3.50
1983	3.65	3.65	4.45	--	--	4.30	--
1984	3.30	3.30	--	--	--	4.38	--
Corn:							
1977	2.00	2.00	2.50	2.80	3.00	2.00	2.80
1978	2.00	2.00	2.50	2.80	3.00	2.10	2.25
1979	2.00	2.00	2.63	3.05	3.15	2.20	2.52
1980	2.40	2.40	2.81	3.26	3.42	2.35	3.11
1981	2.40	2.55	3.00	3.15	3.31	2.40	2.45
1982	2.55	2.90	3.25	--	3.58	2.70	2.62
1983	2.65	2.65	2.25	--	--	2.86	--
1984	2.55	2.55	--	--	--	3.03	--

-- = Not announced.

Sharples and Holland (32) estimated that each bushel of wheat added to the FOR tended to increase total wheat stocks (CCC-owned, free, and FOR) only 0.40 to 0.87 bushel. The remaining 0.60 to 0.13 bushel was a reduction by private stockholders. Sharples and Holland estimated that if the substitution effect was 0.87, revenue for wheat producers would have increased about 3 percent in 1977-78 over what their returns would have been with no reserve, with wheat prices estimated to increase 8 cents in 1977 and 54 cents in 1978. The higher revenue received by wheat producers was estimated to be partially offset by a decrease in Government deficiency payments. If the substitution effect was 0.40, wheat prices would have increased an estimated 8 cents in 1977 but only 20 cents in 1978, resulting in a 1.3-percent estimated net increase in producer revenue because of the FOR.

Other estimates of the substitution effect range between 0.2 and 0.9 (11, 20, 24, 31). These estimates differ because of the methods used to determine the substitution effect, the time period covered by the studies, and the assumptions made concerning other important economic variables. However, as a general conclusion, the closer the substitution value is to 1.0, the more stocks added to the FOR increase total stocks, and the higher the positive impact on commodity prices, other things remaining the same.

Price versus Income Stabilization

Traditionally, it has been argued that producers gain and consumers lose from price stabilization if the source of instability lies on the supply side; consumers gain and producers lose if the source of instability lies on the demand side; and that in both cases there are net benefits from price stabilization (23, 27, 43). Newberry and Stiglitz (26) argue, however, that producers are more concerned with variations in income than with variations in price. Income is defined as price times quantity produced minus cost. When the source of variability in farm income is quantity produced (because of variable yields), attempts to stabilize prices within a narrow range may actually contribute to destabilizing income. The empirical estimates of the gains and losses of price stabilization components of commodity programs have been inconclusive.

EFFECTS ON RESOURCE ALLOCATION

A general conclusion from published research is that, in the long run, a combination of price and income support programs, tax policies, credit policies, and changing technology leads to an increased allocation of labor and capital to agriculture together with a relatively fixed land area to produce agricultural commodities (7, 10, 15, 29). The result is that land returns rise relative to the return to labor and other inputs. Higher land returns take the form of higher rents and higher land values as the expectations of higher rents are capitalized into land prices. Labor earnings are increased modestly, if at all, because labor inputs are more elastic in supply and more readily substituted for by capital.

Once a firm becomes a producer of a commodity it will continue to produce the commodity in the short run so long as it can cover variable cost of production. If prices are sufficient to cover total cost at an acceptable rate of return, further investments will be made to expand production of the commodity. The data in figures 11 and 13 show the schedule of prices that would have been sufficient to bring new resources into the production of wheat and corn in 1981. Figures 12 and 14 show the schedule of prices at which resources would eventually be forced to withdraw from production, that is, price is below variable cost.

Figure 11

Wheat produced at less than the specified total cost per bushel, 1981

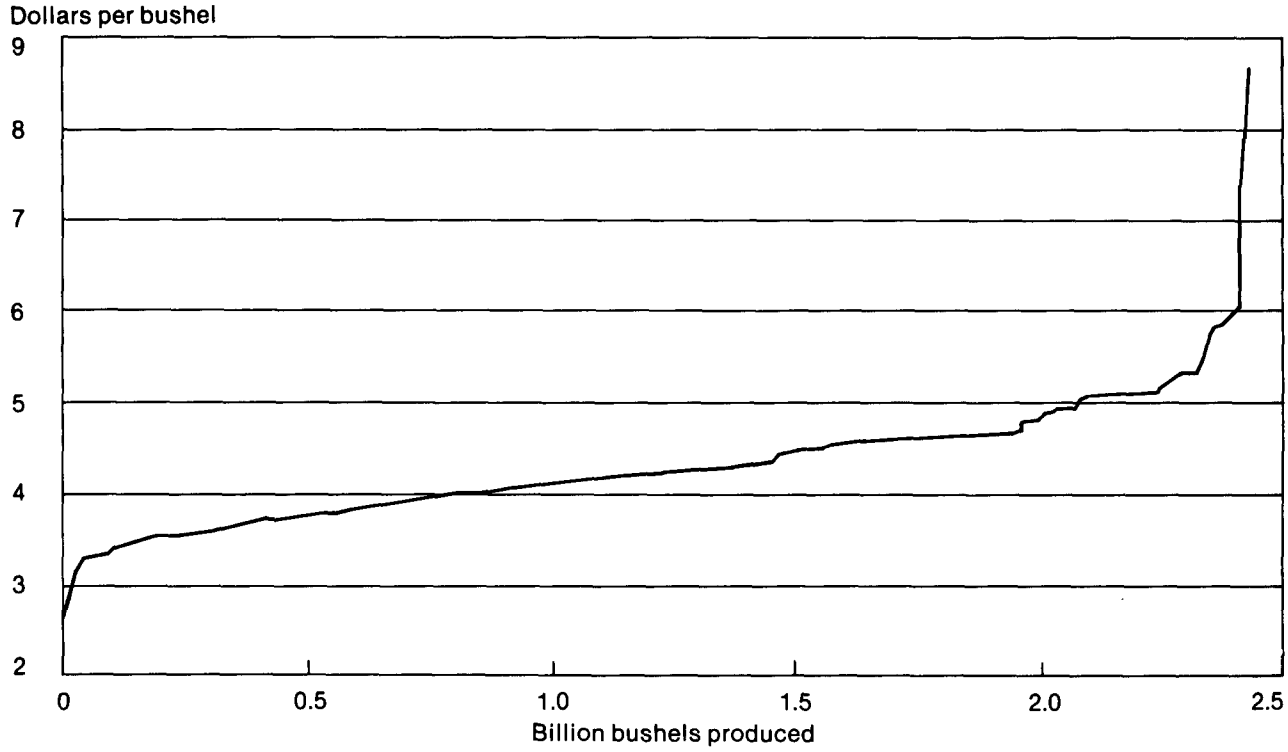


Figure 12

Wheat produced at less than the specified variable cost per bushel, 1981

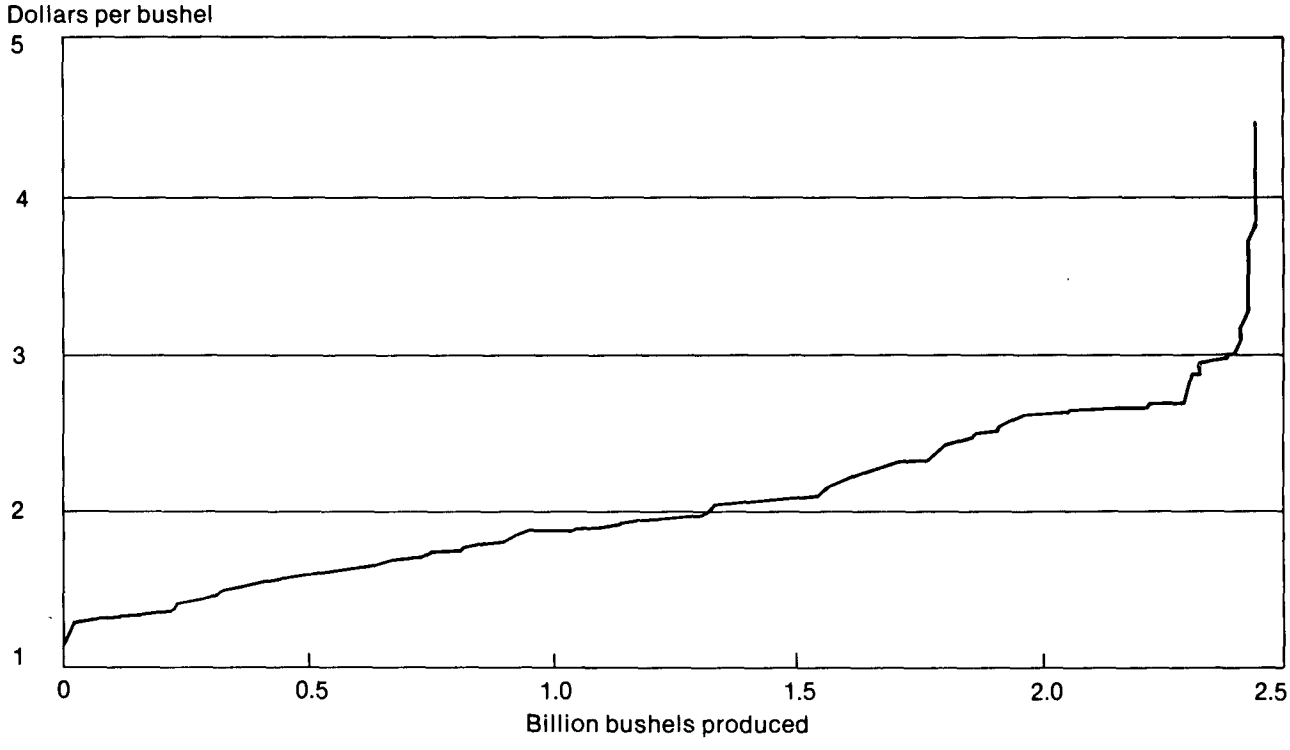


Figure 13

Corn produced at less than the specified total cost per bushel, 1981

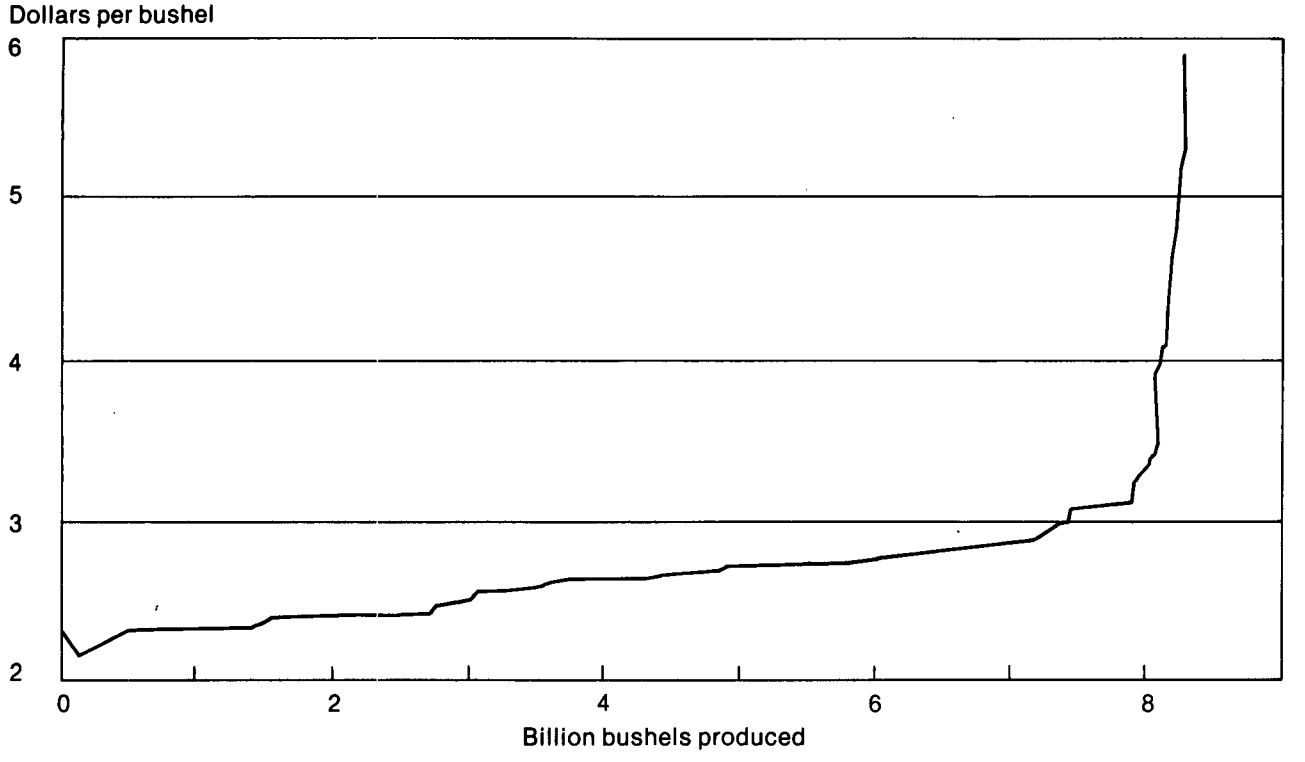
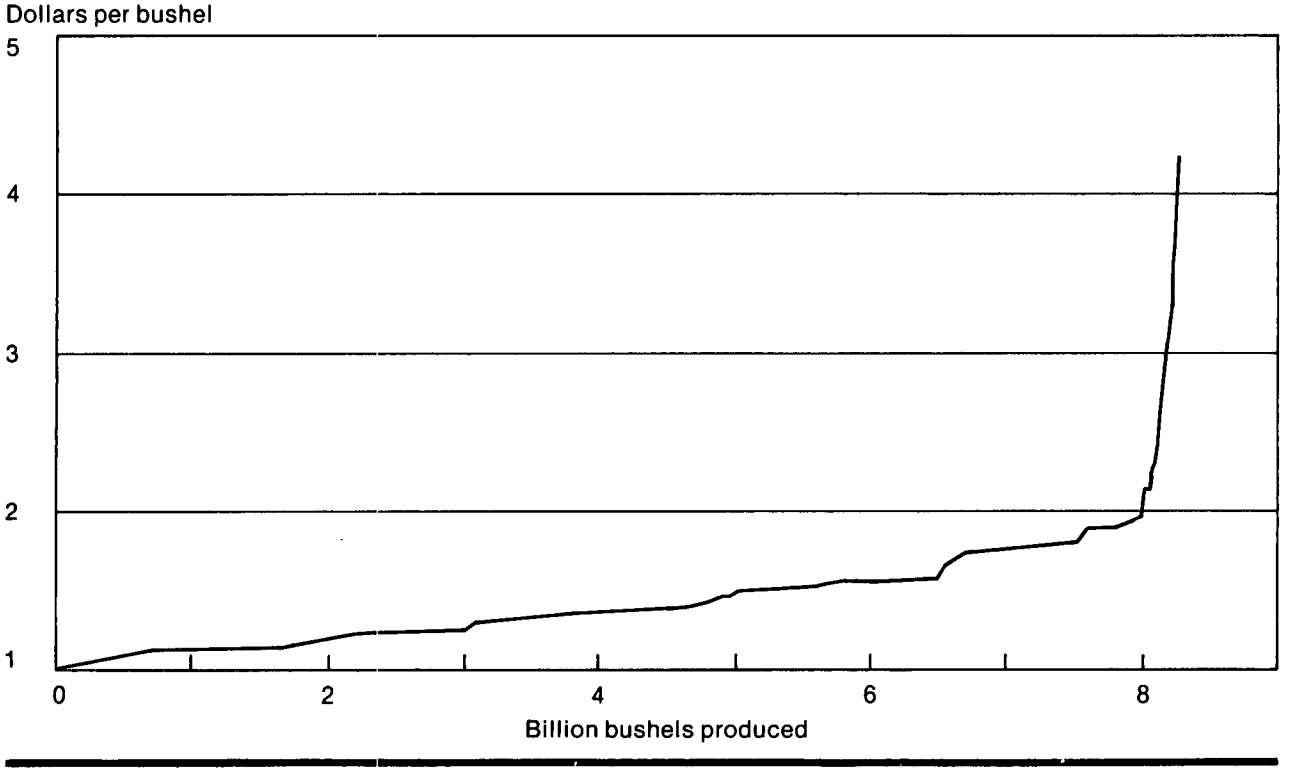


Figure 14

Corn produced at less than the specified variable cost per bushel, 1981



For wheat, prices would have needed to fall below $3.00 per bushel in 1981 and to remain below that level to get a significant reduction in production. At that level, almost no producers would cover total cost. For corn, a market price above $3.00 would have been sufficient to encourage additional production. On the other hand, the price would have needed to fall to less than $1.80 and remain there long enough so that producers incurred losses before producers would have been encouraged to withdraw from corn production.

National cost-of-production estimates provide only a crude basis for evaluating the impact of price support programs. Costs vary greatly because of yield differences among regions, yield variation among production seasons, variations in technology, and variations in management. For any individual producer, however, the bottom line is whether a return over variable cost can be earned at the current price. If it can, a farmer will produce in the short run even though total costs are not being covered.

Because the loan rate acts as a price floor, the minimum average price that farmers expected for the 1981 crop season was $3.20 (table 4). Since there were no acreage reduction programs in 1981, all farmers were eligible for loan rate protection. Producers who had a variable cost of less than $3.20 would have found it to their advantage to plant their maximum acreage, assuming opportunities on other crops were not as profitable. Acreage planted to wheat

Table 4--Cumulative distribution of wheat production by specified variable cost levels

Cost per bushel less than:	1974	1981
	Percent	
$0.75	9.6	0
1.00	28.7	0
1.25	45.3	.5
1.50	59.7	16.3
1.75	71.7	33.5
2.00	79.2	53.3
2.25	85.5	66.4
2.50	89.6	77.4
2.75	91.6	93.6
3.00	93.5	96.9
3.25	94.8	98.8
3.50	96.2	99.0
3.75	97.2	99.1
4.00	97.8	99.8
4.50	98.4	99.9
	Dollars	
Average variable cost	1.15	2.04
Loan rate	1.35	3.20
FOR loan rate	--	3.50
Target price	2.05	3.81

-- = Not applicable.

increased from 71 million acres in 1974 to 88 million acres in 1981. For 1982, the loan rate increased to $3.55 per bushel, and, in spite of an acreage reduction program that idled almost 6 million wheat acres, 86.2 million acres of wheat were planted.

If the 1974 relationship between estimated variable costs and loan rates had been maintained, wheat loan rates would have been about $2.30 per bushel in 1981--nearly 90 cents below the 1981 actual level. Even a loan rate of $2.30 per bushel would have exceeded variable cost on about 66 million acres that produced about 70 percent of the wheat in 1981. Producers with higher costs would not have been encouraged to plant wheat unless market prices were higher. At $3.20 a bushel, the loan rate exceeded estimated variable cost on 97 percent of the wheat produced (fig. 12).

The loan rate and production patterns for corn in 1974 and 1981 were similar to those for wheat (figs. 13 and 14). For corn, estimated variable cost averaged about $1.20 a bushel and total cost averaged about $2.65 in 1974, while the loan rate was $1.10. In 1981, variable cost averaged nearly $1.45 and total cost about $2.67 (table 5). The 1981 loan rate was $2.40 per bushel, 95 cents above average variable cost. If the loan rate had increased in line with variable cost, it would have been about $1.33 per bushel in 1981 and would have exceeded variable cost for nearly 60 percent of all corn produced. At $2.40, the loan rate exceeded variable cost on 98 percent of the corn produced. Acreage planted to corn increased from 78 million acres in 1974 to 84 million acres in 1981.

The increase in planted acreage for wheat and corn during the seventies cannot be attributed solely to loan rates set above variable costs for most producers.

Table 5--Cumulative distribution of corn production at specified variable cost per bushel

Cost per bushel less than:	1974	1981
	Percent	
$1.00	33.1	0.2
1.25	62.1	28.0
1.50	78.5	66.0
1.75	86.7	80.0
2.00	92.5	96.0
2.25	94.7	98.0
2.50	96.1	98.4
2.75	96.8	98.6
3.00	97.7	98.8
3.25	98.3	99.6
	Dollars	
Average variable cost	1.20	1.45
CCC loan rate	1.10	2.40
FOR loan rate	--	2.55
Target price	1.38	2.40

-- = Not applicable.

Market prices for wheat and corn were well above their respective loan rates and per-bushel costs of production during much of the seventies and especially for 1980. However, from the farmer's perspective, a price above variable cost or total cost elicits a predictable management response. The implications for taxpayers and consumers in the near term and farmers in the longer term of a Government price versus a market price can be quite significant.

Target Prices and Resource Allocation

Target prices guarantee farmers an established revenue per unit approximately equal to the target price. 4/ The extent of price and income support separation achieved using a target price depends on other commodity program provisions. For example, a relatively high loan rate reduces the potential importance of the target price. In 1977, the target price and loan rate for corn were equal; thus, no deficiency payments were made. Also, programs that tie eligibility for deficiency payments to compliance with acreage reduction provisions may, in effect, convert a portion of the direct income support into a payment for production adjustment. Miller (25) found that for the 1972 direct payment program, about half of the payment was an income supplement while the remainder was compensation for acreage reduction. No similar studies have been conducted for years when target prices and deficiency payment programs were in effect, but the similarities in the programs would suggest that a portion of the deficiency payment may be appropriately viewed as compensation for idling acreage.

The impact of target prices on a farmer's production decisions depends upon the acreage eligible for target price protection (9). Under the 1973 act, acreage allotments were used to determine the production eligible for deficiency payments. Since the farmer could not receive deficiency payments on production in excess of the allotment acres, there was not as much of an incentive to increase production of an eligible crop whenever the market price was below the target price. The 1977 act changed the payment base for target price coverage from allotments to current plantings. Acreage allotments, based on historical planting patterns, were out of line with actual planting patterns. Applying target prices to normal production from current plantings has caused the target price to become much more important in crop production decisions.

Provisions were included in the 1977 and 1981 acts for an allocation factor to limit the size of the payment base when a set-aside was not in effect. The allocation factor is the ratio of national program acreage--estimated acreage needed for domestic, export, and carryover needs--to actual harvested acreage. The factor for wheat and feed grains must be between 0.8 and 1.0. The minimum national program acreage for cotton is 10 million acres with no minimum allocation factor.

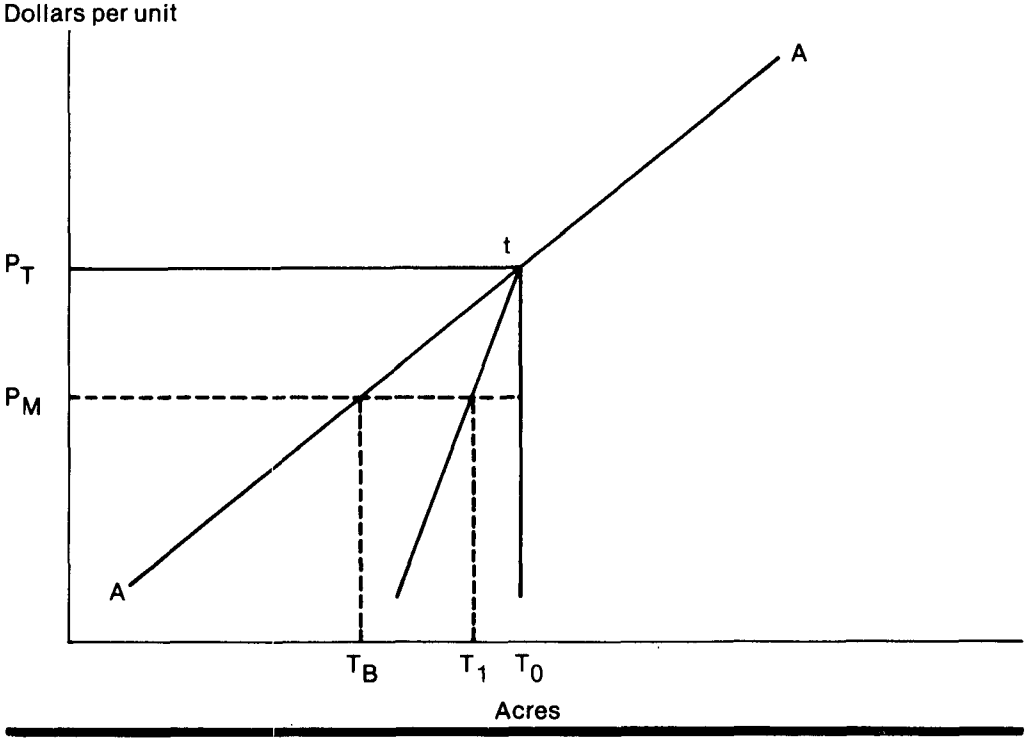
4/ Producers in different parts of the country receive different prices for their crop and it is not uncommon for some producers to actually sell their crop at prices above the established target price. This is particularly true across different wheat classes. However, when national average prices are lower, these producers also receive the full per-unit deficiency payment. Also, producers who receive less than the national average price receive the same deficiency payment rate and thus do not receive a total payment equal to the target price. The wool program is the one that varies the deficiency payment rate for each producer; the payment rate is a fixed percentage of the producer's sale price.

How target prices influence the acreage allocated to a particular crop when coverage is applied to current plantings is illustrated in figure 15. The shortrun relationship between expected price and acreage planted is AA, the target price is PT, and the expected farm price is PM. With an allocation factor of 1.0, the relevant supply curve is T_0tA. The supply curve is vertical (perfectly inelastic) over the range T_0t because at any price below PT (and above the loan rate), the difference between the market price and the target price will be made up by a deficiency payment to the farmer. If the allocation factor was, for example, 0.8, the relevant acreage response curve in figure 15 would be T_1tA. The horizontal difference between lines AA and T_0tA or T_1tA is the increase in acres planted due to the effects of the target price. This would be T_BT_0 acres with an allocation factor of 1.0 and T_BT_1 when the allocation factor is 0.8. The role of the allocation factor as a restraint on the influence of the target price on production response is such that the smaller the allocation factor, the less incentive the target price provides to increase planted acreage. Also, the closer the expected price is to the target price, the lower is the output-enhancing effect of a given target price.

Beginning with the 1982 crops, acreage bases were established for program crops. The acreage base is used to determine how much land is to be idled and how much production is eligible for deficiency payments when acreage reduction programs are in effect (see the article on acreage reduction programs in this report). For example, to qualify for program benefits under a 10-percent acreage reduction program for wheat, farmers could plant no more than 90 percent of their average wheat acreage planted during the previous 2 years.

Figure 15

Acreage response when the market price is below the target price applied to current plantings



Target Prices and the FOR

There is a tendency to set the release price for FOR stocks above the target price, since to do otherwise would increase the likelihood of making deficiency payments even in years when crops are in tight supply. Consider a case where the FOR release price is below the target price. When market prices are above the release level, producers are able to remove grain from the reserve and market it without penalty (assuming they repay their loan plus interest). As more grain is released, the market price tends to fall back towards the release level and, in this example, the market price never reaches the target price. Hence, deficiency payments would tend to be made more often than if the release price was above the target level. By law, the Government cannot sell CCC-owned stocks in the domestic market at less than 115 percent of the CCC loan rate or less than 110 percent of the FOR release price. When the target price is set at more than 115 percent of the loan rate, and the release price is above the target, the range over which prices must rise to trigger the release widens and stocks tend to remain longer in the FOR.

Capacity and Resource Use

Programs which reduce risk and supplement income affect resource use and values. The rationale for stabilizing prices and incomes over time is that resources should enter or exit agriculture based on normal economic signals rather than in reaction to temporary aberrations. Although recently a subject of debate, it has traditionally been argued that the existence of a high level of fixed assets in agriculture dampens the exit of resources from crop production (5, 6, 8, 16, 21). Once high-cost land and machinery resources enter farming, they tend to become fixed in production because of their relatively low worth outside of agriculture in comparison to their cost. Hence, extended periods of depressed demand could result not so much in exit of resources from farming but in lower returns to those resources remaining in agriculture. Farm labor is the exception to fixed adjustment since there are more nonfarm opportunities for labor than there are for land or machinery. Likewise, a temporary period of high prices might attract uneconomic investment into the sector. However, if stabilization and income enhancement measures are simultaneously and continuously pursued, the consequences are that productive capacity is not just maintained, but maintained at a level that results either in large stock acccumulations or the need for diversion programs.

The package of farm programs in use during the eighties, particularly as they relate to target prices and deficiency payments, appears to have encouraged capacity expansion beyond that which the market would have generated. They also appeared to have maintaind capacity and discouraged the downward adjustment which market forces would have caused when farm income declined in the early eighties. Studies have shown that the additional income from higher prices has tended to be invested in capital and land, raising land values and resulting in a windfall to current landowners (28). Likewise, the lower prices and income experienced in recent years would be expected to cause land values to readjust.

The demand for farmland and capital investment has been shown to be positively influenced by farm income. As incomes rise, either because of market forces or farm programs, the quantity of land and other inputs in agricultural use rise, and so do land prices. As more inputs are devoted to agriculture because of higher incomes, productive capacity increases. This becomes a problem only when income of the sector is artificially enhanced or artificially reduced, resulting in a productive capacity that is out of balance with the requirements of the marketplace over an extended period of time. Once productive capacity in

agriculture becomes too large or too small relative to the available markets, the process of adjustment can be difficult and lengthy. Resources are slow to move out of production once committed to agriculture because variable costs of production are typically quite small relative to total costs. Hence, even at very depressed price levels it pays farmers to produce in the short run.

Productive capacity, target prices, deficiency payment rates, and the allocation factor, as well as the market, influence the level of resource utilization in the short run. Farmers produce to the point that expected costs for the next unit of output are equal to its expected price. In the case of price-supported commodities, the expected price used to plan production can be influenced in a number of ways. It can be set by the loan rate or, if an acreage reduction program is in effect, it will be the expected price from a reduced crop--at some level above the loan rate. Alternatively, farmers may use the target price as the expected price. Target prices continuously set above market-trend levels provides incentives for production expansion.

There has been a tendency over the past decade to set target prices by a formula without tying them to market conditions. Consequently, acreage reduction programs have been used to raise prices and reduce budget outlays. But, these results also encourage nonparticipants--both domestic and international--to expand production in response to higher market prices, undermining the shortrun price effects of reduced acreage planted by participants.

INTERACTION WITH EXPORTS

Price and income support programs can often have conflicting impacts upon the demand for U.S. exports. Nonrecourse loan rates which hold U.S. prices above world market-clearing levels act as an implicit export tax and provide downside price stability to foreign producers. That is, they raise the price that foreign buyers must pay to acquire the commodity and reduce the quantity purchased. Foreign producers therefore have an incentive to increase production, causing them to both demand less U.S. grain and sell more of their own production on the world market at a lower price.

An example of the impacts of a high loan rate on the domestic and world commodity markets is illustrated in figure 16 (19). Export supply of the United States (XS) interacts with export demand of the rest of the world (XD) to give a world market-clearing price of 0A and U.S. exports of 0Y. Suppose that the CCC nonrecourse loan rate is set above the world price at 0B. The implications of a loan rate at 0B are as follows: In the United States, excess supply increases from CE to FG. To maintain a domestic price floor at 0B, the United States would have to withhold stocks equivalent to FG from the market. At loan rate 0B, U.S. exports fall from 0Y to 0Z, while quantity supplied in the rest of the world (ROW) increases from 0H to 0J and ROW consumption decreases from 0I to 0K. Hence, setting the loan rate at 0B in this example, other things remaining the same, would lead to a reduction in the quantity of U.S. exports and an increase in the quantity produced in the ROW. The loss of U.S. exports thus comes from both smaller foreign imports and loss of U.S. export market share. The United States has maintained import restrictions on some commodities (for example, dairy and sugar) to control the importation of less expensive foreign products when domestic loan rates were set above the world market-clearing price. If the United States sets a loan rate below the world price level 0A, then there would not tend to be a direct effect upon the world market.

Figure 16

Domestic and international implications of a high loan rate in the United States

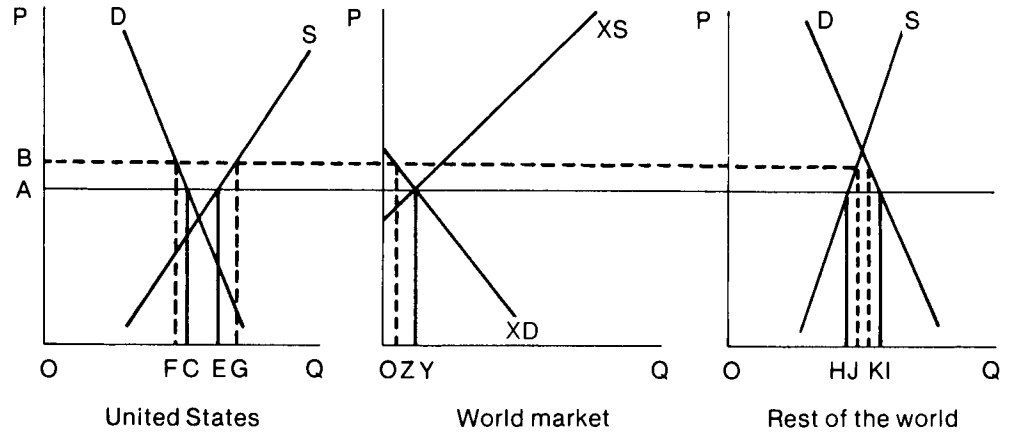


Figure 17

Domestic and international implications of a target price in the United States

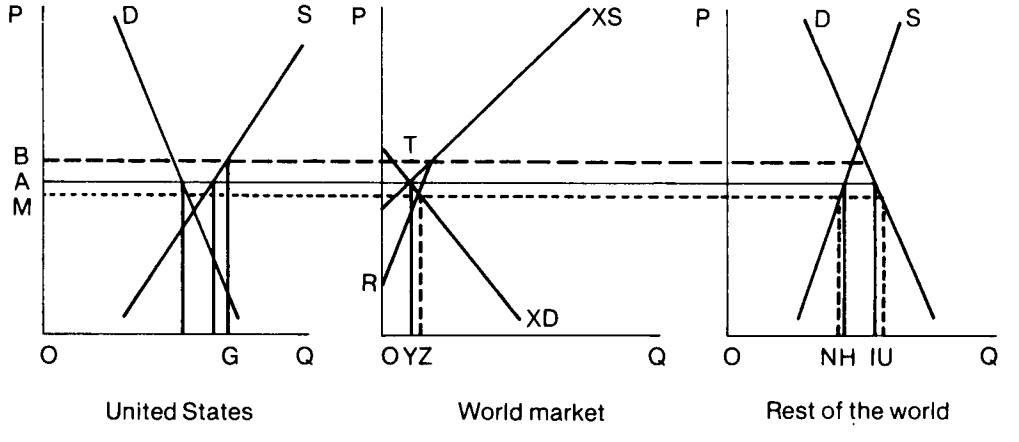
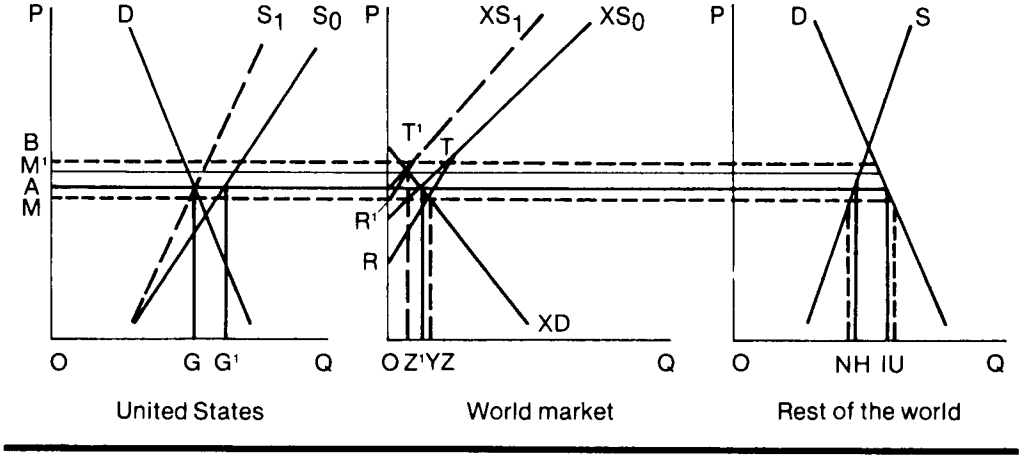


Figure 18

Domestic and international implications of a target price combined with an acreage reduction program in the United States



Programs may be undertaken to offset the domestic stock accumulation in the United States resulting from setting a loan rate at OB in figure 17, such as acreage diversion or export programs to help regain the U.S. share of the export market. However, the obvious long-term response in the absence of other policy programs would be to reduce loan rates. The Agriculture and Food Act of 1981 recognized the domestic and international implications of a high loan rate by allowing the Secretary of Agriculture discretion to reduce loan rates for wheat and feed grains up to 10 percent in any one year whenever the market price in the preceding year did not exceed the loan rate by 5 percent. This authority was used in 1984 to reduce loan rates for wheat from $3.65 to $3.30 per bushel and for corn from $2.65 to $2.55 per bushel.

The export market response to adjustments in loan rates is not entirely clear. Export credit programs and the strong position of the dollar relative to other currencies have had a major influence on exports in recent years. There is at least circumstantial evidence, however, that grain prices in other countries are pegged to U.S. loan rates and target prices. Also, wheat acreage has expanded in other major exporting countries as the United States has taken steps to reduce stock accumulations generated when program prices were supporting the market.

With the loan rate set below world market prices, U.S. producers may still receive price and income support in the form of the target price-deficiency payment program. In this case, the market price may not be directly affected as under the loan program. Establishing a target price above world prices tends to encourage domestic production, however, which adds to world supply and puts downward pressure on world prices. In this instance, absent any domestic supply control measures, a target price-deficiency payment program can act as an export subsidy for U.S. producers.

Assume a U.S. target price is set at OB in figure 17. The loan rate is assumed to be below the world price level OA so that it has no direct impact upon the world market. The relevant U.S. supply curve (assuming no acreage reduction or other supply control program is in effect) is vertical at quantity OG as long as price is below the target price, and it follows the usual supply curve at prices above the target price. The slope of the U.S. excess supply curve (XS) in the world market also changes with the imposition of a target price, with the relevant curve now being RTXS. By defining OB to be a target price rather than a loan rate (price floor), the world price falls from OA to OM, U.S. exports increase from OY to OZ, production in the rest of the world decreases from OH to ON, and price falls from OA to OM. A target price set below the world market level would not tend to have an export expansion effect.

The effectiveness of a target price-deficiency program in expanding exports depends in part upon other program provisions. Supply control programs have often been used to reduce domestic supply and boost domestic prices. Since participation in supply control efforts is an eligibility requirement for commodity program benefits, the expansion in domestic production in response to the target price may be offset depending upon the effectiveness of an acreage reduction program.

Assume, for example, that the initial excess supply (XS_0) and excess demand (XD) curves are as shown in figure 18, resulting in a world price for the commodity of OA with U.S. exports equal to OY. Setting a U.S. target price at OB leads to a new world price of OM and an expansion of U.S. exports from OY to OZ. Suppose in addition to a target price program, the United States also implements an acreage reduction program. Assuming 100 percent participation in the program, the U.S. supply curve would shift back from S_0 to S_1 (a decrease in supply),

causing a corresponding shift in the excess supply curve in the world market from RTXS to R'T'XS. World price increases to OM' with U.S. exports falling to OZ' and production in the rest of the world increasing from ON to OH. Hence, even with a target price, an acreage reduction program could reduce domestic production by a sufficient amount to increase world prices and reduce U.S. exports. However, this may not be the case if there is either low participation in the voluntary program or a relatively high rate of slippage in the program (slippage is discussed in the article on acreage reduction). If participation is less than 100 percent, then the vertical segment of the U.S. supply curve below the target price would pivot towards the left, depending on the rate of participation and the allocation factor.

International Grain Stock Issues

The examples above allude to the importance of domestic stock management activities as an integral component of U.S. price and income support programs. For example, in figure 16, stocks equivalent to FG would need to be be withheld from the market to support domestic prices at OB in the absence of supply control measures. The level of U.S. stocks has significant consequences for stockholding behavior of other nations. In recent years, the United States held about one-third of the world's wheat stocks and well over half of the coarse grain stocks. The United States shares certain policy goals with other leading exporting nations--Canada and Australia--such as maintaining adequate supplies to meet domestic consumption and export requirements and meeting food aid commitments. But, the question arises: Why does the United States absorb excess world supplies to a greater extent than other nations?

Responses to Supply Variability

Most countries other than the United States and Canada tend to hold only working stocks. Developed countries tend to offset production variability and stabilize consumption either by trade or by stock management. Recent research indicates that during 1960-82, the United States and Canada absorbed over 60 percent of their variability in wheat supply by adjusting stocks and acreage (9). Australia divided its adjustment fairly evenly between stocks and trade. None of these countries significantly adjusted domestic use of wheat. Domestic consumption adjusted more for coarse grains than for wheat stocks, primarily reflecting adjustments in livestock feeding. The United States still absorbed almost half of its coarse grain supply variability through adjustments in stocks and acreage, while Australia adjusted to changes in supply chiefly through trade. Hence, domestic stock policies of the United States have, to a major extent, also helped to stabilize world grain markets by absorbing supply shocks through stock management rather than through changes in trade.

Stocks as a Source of Food Aid

U.S. stock policies have benefited foreign countries by stabilizing prices and by assuring a reliable source of international food aid. The Food Security Wheat Reserve Act of 1980 authorized establishment of a reserve of up to 4 million metric tons of wheat (about 147 million bushels) solely for emergency humanitarian food needs in developing countries. Stocks of wheat acquired for this reserve may be released by the President to provide, by donation or sale, emergency food assistance to developing countries any time that the domestic wheat supply is so limited that wheat cannot be made available for distribution under P.L.-480. Any quantity removed from the reserve is to be promptly replaced either through purchases from producers on the market, if such purchases would not disrupt normal market conditions, or by designation by the Secretary of

Agriculture of stocks of wheat otherwise acquired by the CCC. Any funds used to acquire wheat through purchases from producers must be authorized in appropriation acts. Although specifically designed for purposes of food aid, the Food Security Wheat Reserve has served to isolate a small proportion of our current stocks from the market, thus enhancing domestic prices to a minor degree.

DISTRIBUTION OF PROGRAM BENEFITS

Price and income support programs are often criticized for contributing to the growth in farm size and to the decline in farm numbers. A nonrecourse loan program distributes benefits to farms in proportion to their level of production because payment limitations have not applied to nonrecourse loans. Current output-based programs provide relatively larger income enhancement for low-cost producers. Economies-of-size studies indicate that larger farms are typically lower cost producers (4). For some producers, loan rates are high enough to provide a return above the current cost of capital. These farmers have a substantial incentive to expand their operations. However, the nonrecourse loan program also allows those producers who operate at the margin where they just cover variable costs to continue in production. Hence, there is no clear evidence that nonrecourse loans in themselves are responsible for increased farm sizes. The safety net provided by nonrecourse loans and stock management activities tends to benefit all producers, but in proportion to their level of production.

Distribution of Target Price Benefits

The deficiency payment program has enhanced incomes of producers, directly or indirectly, although the total amount of the increase in cash income is uncertain. Total payments averaged $675 million per year during 1974-83, but some of this was, in effect, a payment for cooperating with "unpaid" acreage reduction programs and foregoing net returns on the idled acreage. To the extent that production was reduced and prices increased when acreage reduction programs were in effect, direct payments were reduced, but indirect benefits from higher market prices were received. How these benefits are distributed among farms is of interest. Because income was transferred to agriculture does not necessarily mean that specific income needs were met or that program objectives were accomplished.

Direct payments, while important to many farms with low incomes, have neither been equal among farmers nor have they been targeted to raise the income of small and medium sized farms up to the national level. Data from 1978 and 1982 also show that the distribution of both direct and indirect 5/ benefits from the program tends to increase as farm size increases (22). In 1982, direct income support to cash grain farms with over $100,000 in sales averaged $17,649 per farm, and their net farm income averaged over $70,000 (table 6). Farms with $40,000 to $99,999 in sales received about $5,510 in direct payments. Cattle, hog, and sheep farms with more than $100,000 in sales received an average of $3,450 in direct payments from commodity programs (mostly feed grains), or roughly 20 percent as much as received by cash grain farms. Direct payments to both livestock and grain farms with less than $40,000 in sales were not sufficient to offset farm losses, and net returns from farming were negative.

5/ Indirect benefits are those which producers realize not from direct payments, but from increased commodity prices.

A recent study for the Senate Budget Committee found that the distibution of direct payments from the wheat, feed-grain, cotton, and rice programs closely reflected production distribution (42). That is, large producers received a disproportionate share of total program payments relative to small producers; and, midsized producers received payments roughly proportional to their numbers.

Table 6--Distribution of income and farm program payments, 1982, by selected farm types

Item	$100,000 and over	$40,000-$99,000	$20,000-$39,000	$10,000-$19,000	$5,000-$9,000	$2,500-$4,999	Less than $2,500
				Thousand			
Cash grain farms	57	120	105	94	77	56	66
				Dollars			
Net farm income	70,667	9,475	(1,419)	(2,926)	(3,273)	(3,500)	(1,803)
Off-farm income	6,418	7,686	11,208	15,194	19,233	21,559	20,122
Total income	77,085	17,161	9,789	12,268	15,960	18,059	18,319
Government payments	17,649	5,542	2,524	1,277	649	339	121
				Percent			
Government payments as a percent of total income	22.9	32.3	25.8	10.4	4.1	1.9	0.7
				Thousand			
Cattle, hog, and sheep farms	60	89	90	116	154	174	322
				Dollars			
Net farm income	63,617	3,978	(2,355)	(3,465)	(3,239)	(2,976)	(1,813)
Off-farm income	10,479	11,146	15,239	18,856	20,950	26,348	15,661
Total income	74,096	15,124	12,884	15,391	17,711	23,372	13,848
Government payments	3,450	1,034	378	129	39	17	3
				Percent			
Government payments as a percent of total income	4.7	6.8	2.9	0.8	0.2	0.1	--

-- = Less than 0.1 percent.

Source: Based on ERS projections of data from 1978 Census of Agriculture, 1979 Farm Finance Survey, and Economic Indicators of the Farm Sector, 1982, U.S. Dept. Agr., Econ. Res. Serv.

Cotton producers tended to have the most concentrated distribution of payments, while barley producers had the least. Indirect benefits were estimated to exceed direct benefits by more than 400 percent in 1982. Since larger producers also tended to benefit more from price increases on the commodities they sold, they also tended to receive a larger share of these indirect benefits than small- or medium-sized producers.

Farmers indirectly benefit when acreage control programs or grain storage programs are in effect, reducing market supplies and increasing market prices. These indirect benefits accrue to both participating and nonparticipating farms, but the indirect benefits accruing to participants are reduced when acreage reduction is required as a condition of eligibility for direct program benefits. Data from 1978 show that for a farm of less than 1,000 acres, the income reduction for production foregone was greater than the indirect price enhancement effect (16).

Payment Limitations

The uneven distribution of benefits from deficiency payments has led to a number of proposals to target benefits. Among these are proposals to limit payments; to set target prices, or payment rates, at different levels for different size farms; or to graduate payments, with large payments on the first bushels of production and successively smaller payments on higher levels.

Only the payment limitation has been implemented. Concern that unrestrained payments to farmers would be both inequitable and a drain on taxpayers led Congress to impose payment limits. The first payment limitation was established in 1970 with separate $55,000 annual limits established for wheat, feed grains, and upland cotton. A combined limit was set at $20,000 for 1974-77 for wheat, feed-grain, and upland cotton payments and a separate rice limit was set at $55,000. The combined limitation for total payments for wheat, feed grains, and upland cotton was set at $40,000 for 1978, $45,000 for 1979, and $50,000 for 1981 (with rice included beginning in 1980). A separate rice limitation was continued in 1978 at $52,250 and in 1979 at $50,000 per person.

For 1982-85 crops, the total annual amount of deficiency plus diversion payments that may be received by one person cannot exceed $50,000. This applies to total payments from programs for wheat, feed grains, upland cotton, and rice. Extra-long staple cotton payments were included beginning with the 1984 crops. Total disaster payments are separately limited to $100,000, but nonrecourse loans and storage payments under the FOR are excluded from the limitation. Payments received under the 1983 PIK program were not limited. However, PIK payments for the 1984 wheat crop were subject to the limit.

The payment limit applies to a person rather than a total operation. On farms which are divided among family members, total payments to a family may be higher than the payment limit. A corporation which is composed of several families, on the other hand, is considered one person. The limit does constrain to some extent amounts going to the largest operations. Research indicates that total payments were reduced 1 percent in 1970 and 7 percent in 1982 because of payment limitations. Thus, payment limitations appear to have had only a small effect on the distribution of benefits among producers. However, there are significant regional differences. For example, in Arizona and California, cotton growers received only 60 percent of what they would have gotten with no limit in 1982.

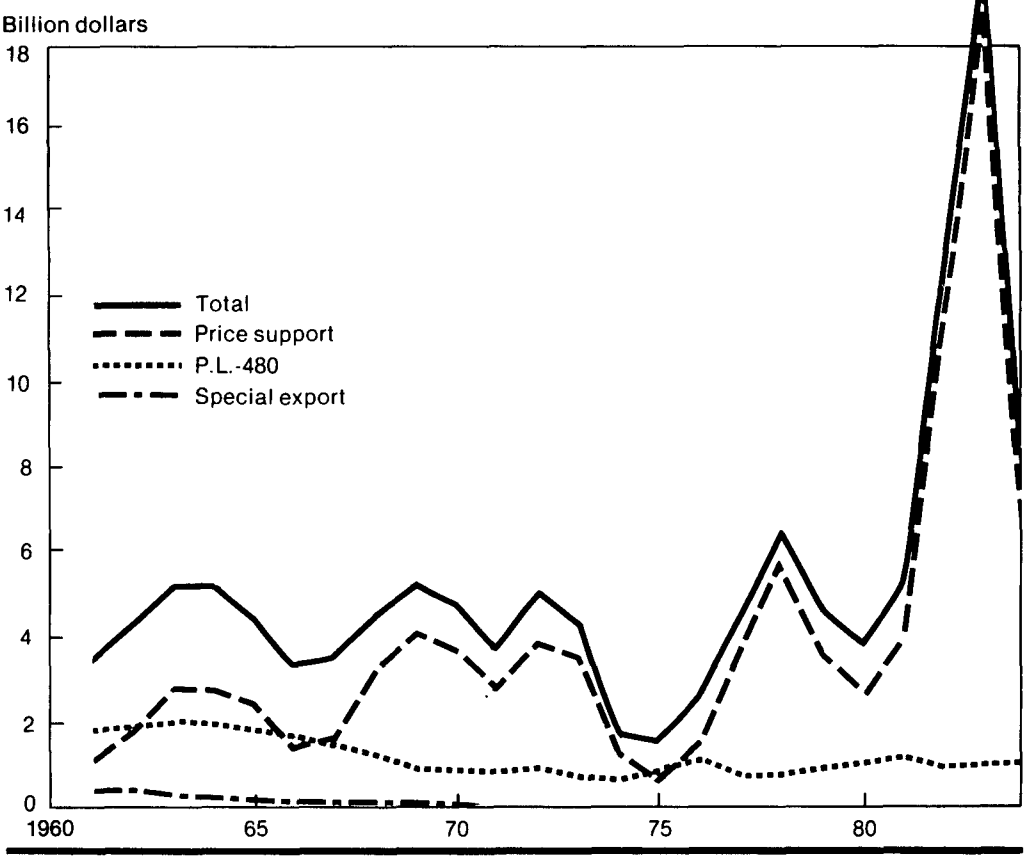
The CCC has an authorized capital stock of $100 million and authority to borrow up to $25 billion from the U.S. Treasury or private lending agencies. Net realized losses of the corporation are reimbursed annually by approriations. These appropriations are used to maintain the CCC's borrowing authority.

Net realized losses are proceeds received from sales of commodities plus repayment of loans, minus recoveries of CCC expenses. Major expenses include the acquisition cost of commodities disposed of from CCC inventories (such as P.L.-480 shipments and payments in kind); costs of storing grain on farms under extended price support loans; direct payments to producers for support, disaster payments, and cropland diversion, if these programs are in effect; interest and storage fees; and general overhead expenses. As shown in figure 19, total CCC budgetary expenditures for price support, P.L.-480 shipments, and related stock management programs have varied considerably over time, and more than doubled in 1982.

An additional cost of the loan program is the cost to consumers, to the extent that commodity prices are kept above market-clearing levels. While no doubt this cost is often positive, it represents a relatively small proportion of the total amount spent on food. It is difficult to place a monetary value on the benefit of a consistently adequate supply of farm commodities at relatively stable prices, which price and income support programs have attempted to provide. Import quotas protect the prices of some commodities (for example, dairy products

Figure 19

Total net CCC budgetary expenditures for price support, P.L.-480, and special export programs



and sugar), but do so "off-budget." Hence, taxpayer cost may be small relative to income transferred to producers. When Government price support programs are effective, consumers and livestock producers pay higher prices for the supported commodities than they would otherwise. Also, taxpayers subsidize the farm sector through reserve storage payments, interest waivers, deficiency payments, and favorable tax treatment (usually larger than transfers through price and income support programs).

When market prices exceed the reserve release price, the flow of benefits is reversed. In concept, consumers and livestock producers are protected against sharp increases in market prices by release of grain stocks onto the market when supplies are relatively tight or when demand is relatively strong. Producers, of course, may not receive as high a price in such situations as they would if stocks were not available to be released onto the market. Also, when prices are above the release level, taxpayers benefit from elimination of storage subsidies, resumption of interest charges, and the increased likelihood that nonrecourse loans will be repaid and commodities will be removed from Government-owned or subsidized storage facilities.

Deficiency Payments

Deficiency payments on program crops have been made in 7 of the 10 crop years since 1974 (table 7). Of the $6.8 billion in total deficiency payments, nearly half was paid to wheat producers. Total deficiency payments depend on the market-sensitive payment rate and the quantity of production eligible for payments.

When target price levels are generally low relative to market prices, as in the case of corn for most of the 1974-83 period, or when loan rates are set at or near target price levels, the program does not lead to large deficiency payments. In contrast to corn, market prices for sorghum and wheat over the 1974-83 period

Table 7--Total deficiency payments by commodity and total, crop years 1974-83

Commodity	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	Total
					Million dollars						
Cotton	0	0	0	0	0	0	0	468	522	431	1,421
Wheat	0	0	0	996	617	0	0	415	476	775	3,279
Corn	0	0	0	0	88	0	0	0	291	0	379
Barley	0	0	0	91	79	17	0	48	60	44	339
Oats	0	0	0	0	0	0	0	0	0	5	5
Sorghum	0	0	0	138	181	63	0	233	64	0	679
Rice	0	0	128	0	58	0	0	22	267	235	710
Total	0	0	128	1,225	1,023	80	0	1,186	1,680	1,490	6,812

Source: Agricultural Stabilization and Conservation Service.

tended to be below the target price more often, despite acreage control programs in effect to buoy market prices. A sluggish world economy, a serious decline in exports, and successive bumper crops made acreage reduction programs necessary in 1982 and 1983 to support prices above minimum loan rates, reduce the level of deficiency payments, and reduce grain stocks. Yet, even with these programs in place, wheat deficiency payments reached $476 million in 1982 and $775 million in 1983. Total deficiency payments on all crops amounted to $1.5 billion in 1983.

CONCLUSIONS

There seems to be increasing concern over U.S. Government price and income support programs. The stated objectives of these programs may be summarized as being an attempt to maintain farm prices and incomes at a reasonable and relatively stable level compared to the nonfarm economy, to assure consumers of an adequate supply of inexpensive farm commodities, and to ease the adjustment process of resources in and out of agriculture.

Based on evidence reviewed in this article, Government programs appear to have increased the average income of commercial farmers above the level that would likely have prevailed in their absence. While income is a difficult concept to measure, it also appears that, with the combination of public policy programs and many other influences over the past 20 years, the general level of current incomes of farm operators has compared favorably with that of nonfarm families, especially since the seventies. However, the income-enhancement effects of nonrecourse loans, stock programs, and deficiency payments tend to benefit producers in proportion to their level of production. That is, both direct and indirect benefits from farm programs tend to increase as farm size increases.

Recent experience indicates that using grain reserves to support farm income in the face of excess productive capacity results in large stock accumulation, especially when market forces and other program provisions tend to encourage increased production and progressively lower real commodity prices. As a direct result of large Government stock accumulation caused by relatively high and rigid nonrecourse loan rates, additional policy tools have had to be used to limit production, such as paid diversion and voluntary acreage set-aside and reduction programs.

The use of acreage reduction programs results in higher prices than would have prevailed without them, and therefore helps to reduce Government stock accumulation and the potential for deficiency payments. However, maintaining prices above market-clearing levels and above average variable cost tends to lead to surplus production, higher Government expenditures for CCC stocks, higher feed grain prices that increase costs for livestock producers, and higher food costs for consumers.

Relatively high loan rates have demonstrated a strong potential to reduce U.S. exports. When world commodity prices fall to the U.S. loan, U.S. commodity programs act to withdraw sufficient stocks from the market to maintain prices at the loan-rate level. This is an incentive for other countries to expand production.

Fluctuating market signals make it more difficult for farmers to efficiently plan and allocate resources for production. A primary objective of target prices and the farmer-owned reserve was to help stabilize farm prices and income, but this has not always been the case. Use of deficiency payments to achieve

participation in acreage reduction programs converts them into a tool to raise prices rather than a device to stabilize income when prices are low. Experience with the FOR indicates that potential price variability within the loan rate-release price band set under current programs is not significantly different from that which would prevail in the absence of the FOR.

Both crop and livestock producers and consumers benefit from adequate supplies of food and fiber, and economic efficiency is enhanced by relatively stable commodity prices. However, efficient resource allocation would seem to be challenged if there is a continuous accumulation of grain far in excess of that needed for international food aid, emergency disaster relief, and domestic food security. Recent U.S. experience with stock accumulation plus the present provisions of related Government programs which seem to encourage production at levels that lead to further stock increases, and reduced exports, bring into question what role price and income supports are to play in U.S. farm policy.

APPENDIX

HISTORICAL CRITERIA FOR SETTING PRICE AND INCOME SUPPORTS

Several criteria have been used as mechanisms for setting nonrecourse loan rates, including parity, cost of production, and legislated minimums. Each of these raises conceptual as well as practical problems regarding implementation.

Parity, 1938-73

Parity prices were used as a basis for adjusting loan rates for grain, soybeans, and cotton from 1938 to 1973, although the percentage of parity at which loan rates were set varied greatly. Parity prices were originally defined as the price which gave a unit of a farm commodity the same purchasing power or exchange value in terms of goods and services that the commodity had in the 1910-14 base period. Because parity prices are not adjusted to account for long-term changes in productivity, they do not reflect returns to investment, increased productivity, or the changing structure of agriculture.

In 1948, the parity price formula was revised to make parity prices dependent on the relationship of farm and nonfarm prices during the most recent 10-year period for nonbasic commodities. Basic commodities, including wheat, corn, rice, peanuts, and cotton, as defined by the 1948 act, were to use the higher of the historical formula or the new formula.

Cost of Production, 1973-80

In the Agriculture and Consumer Protection Act of 1973, loan rates and income support prices for wheat, feed grains, and cotton were established at minimum levels by the Congress in relation to costs of production. Setting loan rates above these levels was left largely to the Secretary's discretion.

Legislated Loan Rates and Target Prices, 1981-85

The Agriculture and Food Act of 1981 set specific dollar levels for target prices and loan rates for wheat, feed grains, and rice. And, while flexibility was provided to lower the loan rate by as much as 10 percent per year under specific circumstances, the target price could not be reduced.

The 1981 act included provisions for setting loan rates for soybeans and upland cotton using past movements in market prices. Beginning with the 1982 marketing year, the loan level for soybeans was established at 75 percent of the simple average price of soybeans received by farmers over the preceding 5 years, excluding the high and low years. A minimum soybean loan rate of $5.02 per bushel was imposed, except in situations when the market price did not exceed the loan rate by more than 5 percent, in which case the Secretary could reduce the loan level as much as 10 percent, but to no lower than $4.50 per bushel.

Nonrecourse loan rates for upland cotton were set at the lower of either 85 percent of the 5-year moving average of spot market prices for upland cotton, excluding the high and low years, or 90 percent of the average C.I.F. Northern Europe price of cotton quoted prior to announcement of the loan level. A minimum of $0.55 per pound was imposed. This formula corresponds closely with that introduced for cotton in 1966.

The legislated-minimum loan rates have been above the formula-determined loan rates for both soybeans and cotton over the past several years. Cotton loan rates were formula-determined in 1974-77, 1979, 1981, 1982, and 1985. Hence, the effectiveness of moving-average loan rates has not received a fair test.

Adjustments in Target Price Levels

The 1973 act established explicit target prices for 1974 and 1975 crops of wheat, corn, and cotton, but was less specific regarding other crops. Sorghum and barley target prices, left to the Secretary of Agriculture's discretion, were to be set at a level deemed "fair and reasonable" in relation to corn. The act also specified an adjustment procedure for use in deriving 1976 and 1977 target prices from the 1974 target prices. Under the specified formula, the annual percenta e change in the target price would equal the percentage change in the aggregate index of prices paid by farmers, minus the percentage change in a 3-year moving average of yields for the specified commodity. This was an approximation of changes in cost of production, but was subject to the limitation that the yield adjustment not be the cause of an actual target price decrease. The prices paid index was USDA's published index of prices paid by farmers for production items, interest, taxes, and wage rates.

Under the 1977 act, explicit estimates of national average costs of production for individual commodities were considered in evaluating alternative target price levels and in specifying the adjustment formula. The target price levels initially proposed by the administration were based on a total per-unit cost concept that included a 1.5-percent return on current value of land as well as estimated costs for all nonland costs of production. The levels eventually worked out through compromise were somewhat higher than the initial proposal. Concern with the estimated costs of the program and other undesirable implications of full-cost support levels were important factors in arguments against even higher levels.

The basic target price adjustment formula adopted for all crops in the 1977 act relied on estimated costs of production per unit (reflecting costs per acre and yields), but with adjustments limited to variable costs, machinery ownership costs, and general farm overhead costs. Costs of land ownership were explicitly excluded from adjustment formulas because of concern that including a charge for land would result in a spiral of target prices, land values, and costs of production. Based on the formula adopted, the change from the previous year's target price would reflect changes in the 2-year moving average adjusted cost of

production. No specific limitation was imposed on reducing target prices with the formula, as was the case in the 1973 act.

The next major comprehensive farm bill was not scheduled until 1981, but two laws affecting target prices were passed before 1981. Under the Emergency Agricultural Act of 1978, target prices could be raised to compensate producers for limiting the use of land. The Agricultural Adjustment Act of 1980 discarded the cost-of-production formula and set 1980 target prices at $3.63 per bushel for wheat and $2.35 per bushel for corn. Target prices for 1981 could be increased (but not decreased) by the Secretary to reflect costs.

The cost-of-production formula for adjusting target prices was abandoned by the Agriculture and Food Act of 1981. Instead, minimum target prices were established for the 1982 through 1985 crops. These minimum levels increased approximately 6 percent per year, reflecting anticipated inflation rates. The Secretary had discretion to set target prices above the legislated minimums to reflect actual changes in per-acre (not per-bushel) production costs; however, there was no explicit formula like that specified in the 1977 act. Since the passage of the 1981 act, however, a decrease in annual inflation rates and increases in Government deficiency payments brought about legislative 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 (appendix table 1).

Appendix table 1--Minimum target prices in 1981 and 1984 acts

Crop year	Wheat	Corn	Upland cotton	Rice
	Dollars per bushel		Cents per pound	Dollars per hundredweight
1981 act:				
1982	4.05	2.70	71	10.85
1983	4.30	2.86	76	11.40
1984	4.45	3.03	81	11.90
1985	4.65	3.18	86	12.40
1984 act:				
1984	4.38	3.03	81	11.90
1985	4.38	3.03	81	11.90

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Effectiveness of Acreage Reduction Programs

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ABSTRACT

Acreage reduction programs are used to reduce supplies and boost prices. In 1983, they were used to idle a third of the land used for program crops. Acreage reduction programs have been costly and inefficient. Their effectiveness is offset by increased plantings on unrestricted acres. Idling of lower yielding land reduces their impact on production. Most farmers are paid more than the minimum they would accept to idle the land. Erosive lands generally are not idled. Downward adjustment in land prices as a consequence of technical change is blunted. Acreage reduction programs need to be evaluated in relation to these inefficiencies, foreign acreage response, and the production signals given producers by other program provisions.

KEYWORDS: Acreage reduction, allotment, base acreage, quota, conservation, slippage, windfall benefits.

INTRODUCTION

Acreage reduction programs require that farmers idle a portion of their land in order to receive price and income supports. Over the past 50 years, acreage reduction programs have been a major policy tool to control crop production. But there is a growing frustration with these traditional programs because they have proved to be costly, less than fully effective, and they ultimately result in inefficient use of available resources. Further, the acreage reduction programs have become symbolic of how the United States has been virtually alone among agricultural exporters in assuming the burden of supply adjustment.

ORIGINS OF ACREAGE REDUCTION

Acreage reduction programs are rooted in a longstanding concern about farm income and farm prices. Supporting prices without adjusting production may have an initial appeal, but that approach may ultimately be self-defeating. Higher prices prompt more production and, at the same time, discourage consumption. If prices are supported at too high a level, the problem of excess production is made worse. Stocks accumulate; Government costs rise.

Allotments and Quotas

Rising stocks and costs were evident as early as the thirties. The Agricultural Marketing Act of 1929 provided price supports without production control. The

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futility of trying to raise prices without controlling production quickly became apparent; policymakers therefore established a set of measures to regulate output. The Agricultural Adjustment Acts of 1933 and 1938 used acreage allotments, and a combination of marketing quotas and acreage allotments which have been used since (table 1).

Allotments were used to allocate a desired U.S. acreage back to individual farms, using each farm's historical acreage. Quotas amounted to a type of mandatory acreage reduction. Under the 1938 act, the Secretary of Agriculture was required to proclaim quotas for wheat, rice, corn, cotton, and tobacco when supplies were excessive (for example, when wheat supplies exceeded 135 percent of total use). Once quotas were proclaimed, producers voted in referendums to determine if they would take effect. If two-thirds approved, a mandatory marketing quota was applied to all producers of the commodity in question.

Quotas required operators to restrict their production to a specified acreage or, in some cases, limited the amount of the commodity that they could sell. Production controls were usually implemented in terms of acreage controls through allotments but were still referred to as marketing quotas. The term "marketing quota" was used to emphasize the regulation of marketing, rather than production, in deference to an earlier Supreme Court ruling which invalidated production controls. Stiff penalties were assessed on producers who planted or marketed beyond their quotas. But to compensate for the restriction on production, price supports were raised when mandatory marketing quotas were in effect. If quotas were not in effect, farmers could exceed their acreage allotments without penalty, although they forfeited their rights to price and income supports if they did so. Enabling legislation often specified minimum allotment levels below which officials could not reduce program acreage.

The results were predictable. First, the action had a spillover effect because farmers continued to use their land by expanding production of uncontrolled commodities. The supplies of those commodities rose, reducing the demand for the controlled commodities. This was a primary reason why the allotment program for corn was abandoned in 1959. Noncontrolled feed grains, soybeans, and some additional minor crops gained acreage during periods when allotments were applied to other crops. Sorghum acreage rose in the Great Plains and Southeast, replacing wheat and cotton. Barley area rose in the Midwest and West, replacing land that otherwise would have gone to wheat. Soybean acreage rose in the Midwest and Southeast while corn and cotton acreage were controlled. Second, allotments locked in historical production patterns. Production shifts to lower cost areas were limited. Third, allotments and quotas controlled production in the short run, but in the longer run, farmers were able to increase yields per acre until production again exceeded use at the price support-level. Growing supplies mounted into highly visible surpluses. Fourth, despite this land-saving technical change, land prices were maintained by the scarcity valve created by allotments and quotas.

During the period of rising surpluses in the fifties and early sixties, efforts were made to expand demand, such as the enactment of P.L. 480 in 1954. But, at the same time, pressure grew to reduce supports and allotment and quota minimums. The Soil Bank was established in 1956 to help reduce surpluses. It had an acreage reserve program designed for shortrun acreage reduction. The program paid farmers to put part of their wheat, corn, cotton, tobacco, peanut, and rice allotments into conserving use. The program also provided for a conservation reserve, which paid to retire land under 3- to 10-year contracts. The program had little effect on surpluses, because farmers idled low-yielding cropland and land not normally cropped.

Table 1--The use of allotments (A), marketing quotas (M), acreage bases (B), and normal crop acreages (NCA) as a basis for acreage reduction, 1950-85

Crop	1950	1951-53	1954-58	1959-63	1964-70	1971-73	1974-77	1978-81 1/	1982-85 2/
Wheat	A	3/	M	M	A	A	A	NCA	B
Corn	A		A	B	B	B	A	NCA	B
Cotton (upland)	M		M	M	M	A	A	NCA	B
Rice	A	3/	M 4/	M	M	M	A	A	B
Peanuts	M	M	M	M	M	M	M	M	M 5/
Tobacco	M	M	M	M	M	M	M	M	M

1/ Except for peanuts and tobacco, reduction is specified as a percentage of current plantings such that diverted plus planted acreage is less than NCA.

2/ Except for peanuts and tobacco, reduction is specified as a percentage of crop base. If a set-aside program is specified, NCA could be used at the discretion of the Secretary of Agriculture.

3/ In 1951, allotments were in effect for a time, but were terminated early in the year.

4/ No quotas in 1954.

5/ Allotments were suspended for 1982-85; poundage quotas were in effect for peanuts for domestic edible use.

Voluntary Commodity Programs

When efforts at controlling production through allotments, quotas, the Soil Bank, and demand-expansion programs failed, policymakers turned to idling land through voluntary acreage reduction programs of the sort used today. Wheat provides a good example. Despite marketing quotas and the Soil Bank, wheat stocks grew to 1.5 billion bushels at the end of 1960/61--nearly 1-1/4 year's use. In 1962, quotas were still in effect, but in addition, growers were required to divert to conserving use 10 percent of their allotments. In 1963, an alternative was tried: growers were offered the option of diverting a percentage of their wheat allotment in return for a payment. This was a voluntary paid diversion used in conjunction with quotas. By 1964, wheat growers had voted against quotas and an entirely voluntary program was in place. For the next several years, program benefits were contingent on planting within allotments, and in some years, diverting a percentage of the allotment.

Still more versions of voluntary acreage reduction programs were introduced in the seventies and eighties (table 2). The set-aside concept, introduced in 1970, made program benefits contingent on idling a percentage of the farm's allotment or base acreage (the term base was used for feed grains and analogous to the allotment in that it was assigned to a farm according to historical plantings). Remaining land could be planted to any nonquota crop, including the specific program crop. The intent was to permit greater regional adjustments in cropping patterns, previously limited by allotments. In 1977, allotments were dropped, and the set-aside concept was altered to require that a percentage of current plantings of a crop be diverted to conserving uses. In the eighties, acreage reduction programs have required idling a percentage of the base acreage of a crop in return for program benefits. Additional diversion programs have offered cash payments or Payment-in-Kind (PIK) in return for idling a percentage of the base acreage of a crop.

Acreage reduction programs have had many names including soil bank, acreage reserve, conservation reserve, cropland adjustment, diversion, cash diversion, set-aside, acreage reduction, and PIK. Some have restricted production for a single year, others for many years. Most land idled today is under annual programs (table 3).

Prior to the soil bank, the old system of allotments and marketing quotas generally restricted production of commodities but did not require diversion of the land to a nonproductive use. Modern acreage reduction programs require farmers to take land entirely out of production of commercial crops. The benefits to farmers of today's reduction programs range from direct compensation payments to eligibility for loans and target price protection. Because participating farmers must put their idled land to conserving use, acreage reduction programs offer an opportunity to enhance resource conservation in addition to controlling production.

ACREAGE REDUCTION ISSUES

Basically, acreage reduction programs have been used as a way to reduce supplies and boost commodity and land prices. In recent years, it has become increasingly clear that several drawbacks to voluntary acreage reduction programs limit their effectiveness.

Table 2--Participation in set-aside, acreage reduction, and diversion programs, 1978-85 1/

Crop	1978	1979	1980	1981	1982	1983	1984 2/	1985 3/
					Percent			
Wheat:								
Program	20/0/0	20/0/0	NP	NP	15/0/0	15/5/10-30	20/10/10-20	20/10/0
Participation	72	57			48	78/78/66	60/60/35	74/74
Corn:								
Program	10/10/0	10/10/0	NP	NP	10/0/0	10/10/10-30	10/0/0	10/0/0
Participation	40/90	21/65			29	71/71/84	53	71
Upland cotton:								
Program	0/10/0	NP	NP	NP	15/0/0	20/5/10-30	25/0/0	20/10/0
Participation	NA/37				78	94/2/82	69	83/83
Rice:								
Program	NP	NP	NP	NP	15/0/0	15/5/10-30	25/0/0	20/15/0
Participation					78	98/98/88	83	92/92

NP = No program. NA = Not applicable.

1/ Programs are indicated as required set-aside (1978 and 1979) or acreage reduction (1982-84) percentage/optional cash diversion percentage/optional payment-in-kind (PIK) percentage. For 1978 and 1979 programs, participation in set-aside is defined as set-aside acreage as a percentage of acreage that would be set aside if participation were 100 percent. Participation in diversion is diverted acreage as a percentage of acreage that would be diverted if all participants (for cotton, all growers) complied with the optional diversion. For 1982-85 programs, participation in the acreage reduction programs is the base participating in all programs as a percentage of total base. The same definition is used for participation in the cash diversion when diversion was required, as it was for the 1983 wheat, corn, and rice programs and the 1984 and 1985 wheat programs. For the optional cash diversion for cotton in 1983, participation is base in the diversion as a percentage of total participating base. Participation for optional PIK programs is the base in PIK as a percentage of total participating base. PIK includes whole-base option.

2/ Participation rates are preliminary.

3/ Participation rates are based on enrollment rather than compliance.

Table 3--Principal crops planted and total idle acreage reduction, United States

Crop year	Principal crops planted	Annual acreage reduction	Long-term acreage reduction	Total idle acreage	Planted plus idle acreage
			Thousand acres		
1955	349,407	0	0	0	349,407
1956	340,926	12,000	1,400	13,400	354,326
1957	329,489	21,400	6,400	27,800	357,289
1958	326,843	17,200	9,900	27,100	353,943
1959	327,793	0	22,500	22,500	350,293
1960	324,337	0	28,700	28,700	353,037
1961	308,119	25,200	28,500	53,700	361,819
1962	297,598	38,900	25,800	64,700	362,298
1963	299,196	31,700	24,400	56,100	355,296
1964	298,454	37,600	17,500	55,100	353,554
1965	297,215	41,900	14,400	56,300	353,515
1966	293,062	47,500	15,700	63,200	356,262
1967	305,781	25,200	15,600	40,800	346,581
1968	299,384	35,700	13,700	49,400	348,784
1969	291,153	50,200	7,800	58,000	349,153
1970	293,211	53,100	3,900	57,000	350,211
1971	305,830	33,800	3,400	37,200	343,030
1972	294,609	58,700	2,800	61,500	356,009
1973	318,682	16,300	2,800	19,100	337,782
1974	326,076	0	2,700	2,000	328,076
1975	332,236	0	2,400	0	332,236
1976	336,091	0	2,100	0	336,091
1977	344,873	0	1,000	0	344,873
1978	336,438	18,200	0	18,200	354,638
1979	346,803	13,000	0	13,000	359,803
1980	355,677	0	0	0	355,677
1981	363,167	0	0	0	363,167
1982	358,708	11,100	0	11,100	369,808
1983	309,536	78,000	0	78,000	387,536
1984 1/	344,927	26,600	0	26,600	371,527
1985 1/	NA	34,000	0	34,000	NA

NA = Not available.
1/ Preliminary. Idle acres for 1985 are based on enrollment.

Slippage

The impact of acreage reduction programs on production is less than the number of idled acres would suggest. This discrepancy has been called "slippage." Acreage slippage, which is related to production slippage, occurs when harvested acres change by less than the change in idled acres. Slippage can refer to total crop acreage or to acreage of specific crops. It can refer to the acreage and production of program participants, or nonparticipants, or both. Slippage varies by crop, region, and year. The type of acreage control program in effect and the program rules also affect slippage.

One acre of land idled under an acreage reduction program does not reduce the acreage of the given crop by a full acre. Experience with acreage reduction in 1982 through 1984 provides graphic examples (table 4). Programs in these years required a participant to devote to conservation uses a portion of the farm's established base acreage of the crop. The size of a farm's base acreage was determined by the level of plantings during the previous 2 years. Record crop acreage was harvested in 198', so the available cropland acreage was utilized to a greater degree than ever before. In 1982, 2.1 million acres of the U.S. corn base were idled, but harvested acreage declined only 1.8 million acres. Thus, the idled acreage was 86 percent effective in reducing harvested area (1.8 million acres divided by 2.1 million times 100 percent). The following table presents additional data on acreage slippage in the 1982 to 1984 acreage reduction programs (computed from data in table 4).

	Change in harvested area (col. 1)	Change in idled area (col. 2)	Col. 1 divided by col. 2
	Million acres		Percent
Corn			
1982	-1.8	+2.1	86
1983	-21.2	+30.1	70
1984	+20.3	-28.4	71
Average			76
Wheat			
1982	-2.7	+5.8	47
1983	-16.5	+24.2	68
1984	+5.5	-7.9	70
Average			62

In 1976, Ericksen (1) concluded that diversion was only 50 to 60 percent effective in reducing acreage. "olding 10 acres idle reduces crop acreage by only 5 to 6 acres. The above table indicates that the 1982 to 1984 experience seems to coincide with the experience from earlier acreage reduction programs. Effectiveness was slightly higher with corn, averaging 76 percent, and wheat, 62 percent.

Nonparticipants--a Key Source of Slippage

An important source of acreage and production slippage has been the plantings of farmers not participating in crop programs. Because acreage reduction programs have been voluntary, there have been nonparticipants. Other things equal, an

Table 4--Harvested acres for major field crops and conserving-use acres, selected years

Item	1955	1972	1977	1978	1979	1980	1981	1982	1983	1984 1/
					Million acres					
Harvested:										
Corn for grain	68.5	57.5	70.9	71.9	72.4	73.0	74.5	72.7	51.5	71.8
Sorghum grain	12.9	13.2	14.1	13.4	12.9	12.2	13.7	14.1	10.0	15.3
Oats	39.0	13.4	13.5	11.1	9.7	8.7	9.4	10.3	9.1	8.1
Barley	14.5	9.6	9.6	9.2	7.5	7.3	9.0	9.0	9.7	11.2
Feed grains	134.9	93.8	108.1	105.6	102.5	101.5	106.6	106.1	80.3	106.4
Wheat	47.3	47.3	66.5	56.5	62.5	71.1	80.6	77.9	61.4	66.9
Rice	1.8	1.8	2.2	3.0	2.9	3.3	3.8	3.3	2.2	2.8
Cotton, upland	16.9	12.9	13.2	12.3	12.7	13.1	13.8	9.7	7.3	10.5
Soybeans	18.6	45.7	57.6	63.7	70.3	67.8	66.2	69.4	62.5	66.1
Total harvested	219.5	201.5	247.6	241.5	250.9	256.8	271.0	266.4	213.7	252.7
Conserving-use acres:										
Corn	0	--	0	6.1	2.9	0	0	2.1	32.2	3.8
Sorghum	0	--	0	1.4	1.2	0	0	.7	5.7	.6
Barley	0	--	0	.8	.7	0	0	.4	1.1	.5
Oats	0	--	0	0	0	0	0	.1	.3	.1
Feed grains	0	36.6	0	8.3	4.8	0	0	3.3	39.3	5.0
Wheat	0	20.1	0	9.6	8.2	0	0	5.8	30.0	22.1
Cotton	0	2.0	0	.3	0	0	0	1.6	6.8	2.4
Rice	0	0	0	0	0	0	0	.4	1.8	.8
Cropland adjustment	0	2.8	0	0	0	0	0	0	0	0
Total conserving	0	61.5	0	18.2	13.0	0	0	11.1	78.0	26.6
Total harvested and conserving	219.5	263.0	247.6	259.7	263.9	256.8	271.0	277.5	291.7	279.3

-- = Not available.

1/ Preliminary.

acreage reduction program reduces total production and has a positive effect on market prices. Nonparticipants therefore have an incentive to expand their acreage of crops in the reduction program to take advantage of the higher expected prices. They become "free riders," receiving indirect program benefits in the form of higher farm prices. The 1982 feed-grain and wheat programs demonstrate the contribution of nonparticipants to slippage.

In 1982, farmers initially enrolled 78 percent of the U.S. corn base in the corn program. However, only 29 percent of base acreage ultimately complied with the program. Farmers not complying--no damages were assessed for noncompliance--undoubtedly expected the high enrollment to strengthen prices. Nonparticipants planted 63 million acres, compared with established base acreage of nonparticipants of 57.6 million acres. This expansion, amounting to 109 percent of the base, was relatively greater than even 1981's record-high U.S. corn acreage, which was 104 percent of the 1982 U.S. corn base.

Nonparticipants also reduced the effectiveness of the 1982 wheat program. They planted 53.2 million acres, 13 percent above the nonparticipants' established base. Winter wheat growers were largely responsible for the extra plantings. The final 1982 program was not announced until January 1982, subsequent to the passage of the Agriculture and Food Act of 1981 during December 1981. Plans for the wheat program had been announced at the end of August 1981, contingent on passage of the bill. Uncertainty by winter wheat growers over the final provisions of the program and prospects for 1981/82 wheat prices 15 to 25 percent above the loan rate (as indicated by USDA forecasts published in August 1981) encouraged winter wheat producers to plant at or above their base acreages.

The smaller the required acreage reduction, the greater the prospect for slippage caused by nonparticipants. A program requiring only a small percentage reduction might be announced when only a small market imbalance is expected in the absence of the program. For farmers, the probability of receiving high prices for the new crop--caused by program participation, stronger than expected demand, or yield shortfalls--is greater than if a large percentage acreage reduction program were needed for market balance. Thus nonparticipation might be greater, and the nonparticipants are more likely to plant in excess of their bases. If a program requiring a small percentage reduction were accompanied by low expected prices, nonparticipation might be small, such as in the 1985 programs. Program effectiveness could still be low, as above-average yields or nonparticipants' acreage could easily offset the small amount of idled acreage.

Type of Program and Acreage Control of Participants

Sources of slippage also differ by type of acreage reduction program. Participants themselves can be a major factor. For the acreage reduction programs of 1982 to 1984, participants' planted plus idled acreage for a given crop was required to be, and generally was, equal to or less than their base acreages for the crop. In this type of program, if bases accurately reflect recent planting history, participants' plantings will be restrained, unless they violate the program rules. However, for set-aside programs, a participant's planted plus idled acres of a specific crop are not required by program regulations to be equal to or less than acreage planted to the crop in previous years.

The set-aside program requires that a percentage of current planted acreage of the crop, rather than the crop base, be diverted. Also, the sum of planted acreage of all crops plus diverted acreage must not exceed normal plantings of all crops, as measured by the farm's established normal crop acreage (NCA).

Cross-compliance can be imposed to limit slippage. Cross-compliance requires farmers to comply with set-aside provisions (or plant within established acreage bases) for all crops to be eligible for program benefits for any crop.

If a farmer were optimistic about the market prospects for a crop with a set-aside program, the farmer could increase plantings of the crop, yet remain within the NCA by diverting acreage of some other crop. An attractive target price can cause such an acreage expansion (2). Ironically, the Emergency Agricultural Act of 1978, signed into law in May, gave the Secretary of Agriculture the authority to raise target prices for major program crops whenever a set-aside program was in effect for at least one of the crops. The ostensible purpose was to attract participation and lower acreage. However, the higher target price could raise both acreage and Government costs. Of wheat producers participating in the 1978 program, 65 percent grew program crops, in addition to wheat (4). Around 40 percent of corn program participants grew other program crops. When nonprogram crops such as soybeans are considered, it is clear that most farmers have the potential to expand acreage of the crop with the set-aside program and still comply with program regulations.

Slippage in the 1978 and 1979 set-aside programs was significant and may be an important reason why set-aside programs have not been used since then. In 1978, with a 10-percent set-aside program for corn, 6.1 million acres were idled, but harvested acreage rose 0.3 million acres. In addition to the set-aside, there was a voluntary 10-percent cash diversion program, and this may have contributed to the slippage. The payment rate was 20 cents per bushel on planted acres or roughly $100 an acre on diverted acres. The cash diversion payment rate was the main attraction for overall corn program participation: 90 percent of set-aside participants were also in the additional paid diversion program (table 2). The attractive payment rate actually may have prompted plantings, because the more corn a producer planted, the greater the cash diversion payments. Again in 1979, there was little relationship between harvested and idled acreage in the corn program. Idled acreage fell 3.2 million because participation was halved, but harvested area rose only 0.5 million acres. Low participation in both 1978 and 1979 contributed to program ineffectiveness.

The 1978 wheat program was very effective--slippage was nil. High participation--70 percent of acreage--limited slippage by nonparticipants. Because corn acreage was expanding, cross-compliance also likely limited slippage by wheat growers; some probably did not have enough acreage of other crops to expand both corn and wheat acreage and meet set-aside requirements. Almost 10 million acres were set aside, and harvested acreage dropped 10 million. In 1979, participation among wheat and corn growers fell and wheat price prospects were much improved. Idled acreage dropped 1.4 million acres from 1978, but harvested wheat acreage rose 6 million acres.

Program Rules

Under any type of acreage reduction program, slippage caused by participants will also depend on program rules and enforcement of rules. Violation of rules reduces program effectiveness, but violators can be assessed damages and their benefits can be reduced. A USDA audit of the 1983 programs showed that 11 percent of farms in 20 States that were studied did not fully comply with requirements (9). Violators either designated ineligible or insufficient land as reserve acreage or misreported program crop acreages. However, there is no evidence indicating that the propensity to violate rules is greater under one type of acreage reduction program than another.

Recent acreage reduction programs provide several examples of how program rules can contribute to slippage, even when participants follow all requirements. Consider the rules for computing a farm's base acreage. For 1982 programs, base for a given crop was the higher of the acreage planted (or considered planted) in 1981 or the average plantings in 1980 and 1981. The example that follows shows how a farm with 200 acres of wheat and corn could have been assigned base acreages totaling 225 acres in 1982. This "phantom base" was an issue in the 1982 and later programs.

	1980	1981	Average	Base
		Acres		
Corn	50	100	75	100
Wheat	150	100	125	125
Total	200	200	200	225

Conserving-use acres were required to have been cropped in 2 out of the previous 3 years. Depending on availability of other land, such as soybeans or pasture, this farm could have had corn, wheat, and conserving-use acres in excess of 200 acres and still have been in compliance with the 1982 wheat and feed grain programs.

Turn-row, skip-row, and summer fallow acreage are normally excluded from the base acreage. Some 30 million acres of wheat are planted in a rotation with summer fallow land. Provisions for the 1982 through 1985 acreage reduction programs permitted wheat growers to use summer fallow as their conserving-use acres (although in 1983, land idled for PIK had to be land that would have been cropped in that year). This enabled participants to crop their entire base and still comply with program requirements.

In some cases, land incapable of being cropped can also qualify as conserving acres. In 1983, large amounts of land in California were severely flooded and could not have been planted. Some of this land qualified as conserving acres. Although not slippage *per se*, this provision allowed some farmers to plant all or most of their available cropland and still be program participants. However, an acreage reduction did occur even though it was due to weather, not the program.

Productivity of Idled Land

A factor that can substantially raise production slippage is yield. When acreage reduction programs are in effect, participants and nonparticipants alike tend to devote more inputs to land in production, thereby increasing yields. What occurs, then, is that idling an acre of land does not produce an equivalent reduction in production.

Another source of slippage associated with yields is the tendency for land withdrawn from production to be of lower productivity than the land remaining in production. Most of the land idled in the 1978 corn program was found to be in two soil groups that were 65 and 95 percent as productive as the national average yield (6). An earlier study concluded that the productivity of diverted acreage as a percentage of acreage in production was 90 percent for wheat, 85 percent for grain sorghum, 83 percent for barley, 82 percent for corn, and 80 percent for cotton (10). Econometric estimates can be used to relate average yield per harvested acre to the number of planted or idled acres (3, 5). Recent experience suggests that for every 10 percent of an acreage base that is idled, average yield on the remaining acres will increase 3.5 percent for cotton, 3 percent for corn, 2 percent for wheat, and 1 percent for grain sorghum.

Windfall Benefits to Some Producers

Another problem with acreage reduction is that the direct compensation payments made to producers are typically a constant per-bushel or per-pound offer rate to forego production. Under this method of compensation, a higher rate is required to bring in more producers to increase participation. However, those farmers who would otherwise be willing to participate at a lower rate also get the higher payment rate, which gives them a windfall. In effect, many farmers receive compensation for foregone income on idled acres plus an additional amount that is really a direct income supplement.

The diversion payment rate is stated explicity in cash diversion programs. For example, the 1983 wheat program paid participants $2.70 a bushel to idle 5 percent of their wheat base, and it offered an in-kind payment of 95 percent of a farm's yield to divert an additional 10 to 30 percent of base acreage. However, the payment rate is not explicit for acreage reduction programs that require idling a percentage of base in return for program benefits, such as nonrecourse loans and target price protection. Yet, the payment rate is still constant and can be computed by a farmer in order to make the decision whether to participate.

For example, the 1983 upland cotton program required a producer to idle 20 percent of cotton base acreage for eligiblity for program benefits; there was no explicit diversion payment rate applicable to this 20 percent. At the time of program signup, farmers generally expected that a deficiency payment rate of around 13 cents a pound on planted acreage would be a primary benefit of compliance. However, the deficiency payment could be viewed as a payment of 52 cents a pound on production foregone from diverted acreage (13 cents a pound times the ratio of the percent of base planted to the percent of base diverted, or 13 x (.8/.2) = 52). So, even when there is no explicit cash diversion payment rate, a dificiency--or income support--payment rate functions as one.

In principle, a constant payment rate that will induce a farmer to idle land has to be at least large enough to meet that farmer's net return expectations on the acre that is left idle. For a given level of payment, the farmer earning the lowest net return by farming the land is the farmer most likely to participate. Therefore, the program not only attracts the least efficient producers, but also gives them the largest windfall supplement to income. It can be argued from an efficiency standpoint that land reduction programs tend to perpetuate inefficient producers. It can be argued from a welfare standpoint that the program provides the most help to those who are receiving relatively lower returns per acre and perhaps are in most need of a subsidy. It is not known if these are the producers with the lowest family incomes, but some are surely in the group of inefficient producers.

A few numbers can illustrate the windfall. Consider wheat producers A and B who expect yields of 45 and 35 bushels per acre, respectively, and a price of $3.65 a bushel. Producer A expects to spend $35 an acre on variable costs, while producer B expects to spend $65. If the Government announces a cash diversion payment rate of $2.70 a bushel, producer A could earn more growing rather than diverting wheat. In fact, the diversion payment rate would have to rise to $2.87 a bushel to interest producer A. Producer B--the farmer with the higher production costs--could earn more by participating in the program. Producer B would have been willing to idle an acre for $1.80 per bushel and thus gains a windfall of 90 cents a bushel or $31.50 an acre.

Figure 1 graphically depicts the windfall payment involved in a typical acreage reduction program. If the Government could pay each producer the minimum amount

the producer would accept for participation, Government costs would be represented by the lined area. Producers would receive different payment rates, rather than a constant rate. Each producer would receive a rate equal to the producer's expected net return.

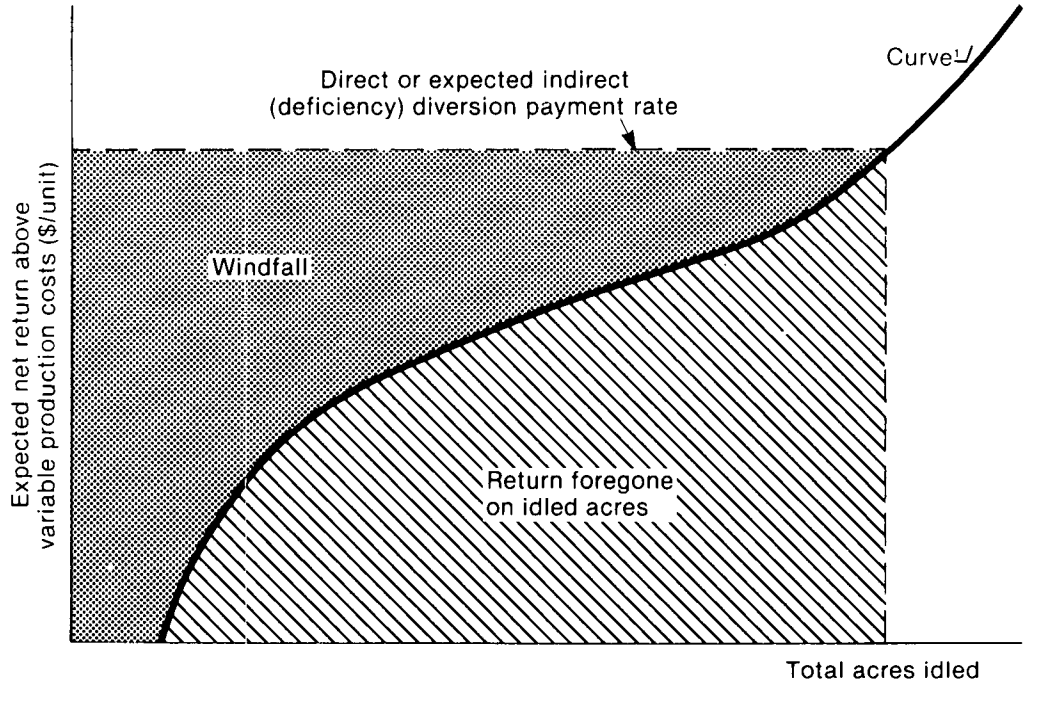
A constant payment rate will be equal to or greater than the expected net return per acre of all participants. The Government cost is then the lined area plus the shaded area, with the shaded area representing the windfall.

The lined area represents the minimum Government cost to idle land similar in productivity to that which has entered acreage reduction programs in recent years. This pattern of idle land implies limits on the amount of land each producer may idle. However, a recent study suggests that the cost can be reduced even below the lined area with a least cost conservation reserve program that targets the most marginal lands for retirement (6). The authors use such a program to compute a measure of the windfall. They conclude that to achieve the drop in production caused by the 1978 acreage reduction programs, a least cost program focused on idling the most marginal land would have been 25 percent less expensive than paying all farmers a fixed rate equal to the net return on the most marginal acre idled under the least cost program. The least cost program was assumed to operate through competitive bids by farmers, and it allowed all of a farm's less profitable land to be idled.

The PIK program provided an opportunity to compare fixed diversion offer rates with farmer-submitted bids. The Government offered wheat farmers 95 percent of their program yields to idle 10 to 30 percent of their base. Growers of other PIK crops were offered 80 percent of their program yields. Farmers could also

Figure 1

Constant diversion payment rate assures windfall



1/ Curve shows the number of acres idled with an expected net return at or below the specified level under a given acreage reduction program.

submit bids to idle their entire base acreage. Accepted bids averaged 85.9 percent of program yields for wheat, 73.3 percent for corn, 72.9 percent for sorghum, and 72.7 percent for cotton. There were many rejected bids below these averages, but limits on the amount of land that could be idled in any one county prevented their acceptance.

Adverse Effects on Local Economies

Idle land tends to have an adverse effect on local communities. The effect on farm input suppliers is particularly noticeable, as their sales are reduced. The effect hits some communities harder than others because the idle acres tend to concentrate in certain regions rather than being proportional to the base acreage.

The 1984 programs provide an example. Based on program enrollment, diverted wheat acres accounted for an estimated 20 percent of the Kansas wheat base. In Arkansas, where participation by growers who doublecrop soft red wheat is normally lower, required conserving acres accounted for only 6 percent of the wheat base.

The 1983 PIK program had a dramatic effect on input suppliers. An estimated 47 million acres were idled in return for an in-kind payment. In an initial assessment of the program, USDA estimated that farm expenditures would fall about 12 to 15 percent on seed, fertilizer, pesticides, and repairs; 8 to 10 percent on fuel; and 2 to 3 percent on machinery (8). The total decline was estimated at $5 billion. In order to limit the consequences of these reduced expenditures in any one area, USDA restricted the acreage for each program crop that could be diverted in any one county to 45 percent of the county's base acreage.

Increasing Crop Bases

Some producers have not participated in programs in some years in order to expand their bases of program crops either by adjusting crop rotations or by plowing up less productive, erosive land. Once land has a cropping history, it has been possible to enter it into the program acreage base, making it eligible for program benefits.

After the surpluses of the sixties, allotments were reduced in the seventies. Since then, the bases have been allowed to increase sharply (fig. 2):

- The corn base, at a low of 60.7 million acres in 1975, reached 81.2 million acres in 1984.
- The wheat base was 45.5 million acres in 1970 (domestic allotments were as low as 18.7 million acres in 1973); in 1984, it reached 91.0 million acres.
- The upland cotton base for 1978 was 10.0 million acres. In 1984, it reached 15.0 million acres.
- The rice base was 1.8 million in 1981--near the level of the early seventies. In 1984, it was 4.0 million acres.

The base changes reflect growth in demand, changes in methods for computing bases, and whether the bases were used for acreage reduction or payment purposes, or both.

Some of the added land is marginal and is likely brought in so that it can be entered into Government programs. Under current methods of paying for acreage reduction, the greatest relative benefits go to the less efficient producers. Therefore, if marginal land can be brought into the base and then be idled to earn acreage reduction payments, it can turn out that the Government payment provides a greater return than what could be earned from production in many years. In addition, it becomes more expensive to taxpayers to achieve the necessary production control.

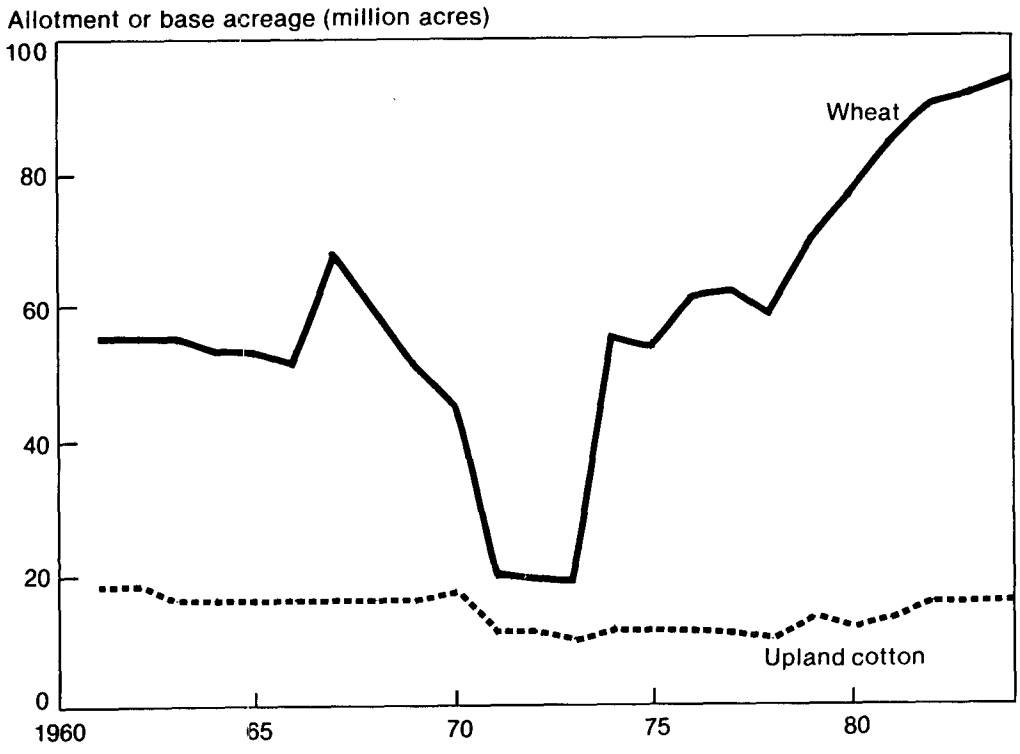
During the early eighties, bases have expanded while demand for crops has stagnated. Bases for crops such as wheat, rice, and cotton have moved well above the peak acreages of 1980 and 1981. For example, the estimated U.S. wheat base for 1985 is 93.9 million acres, compared with the record for plantings of 88.3 million set in 1981. Should demand remain stagnant, expanding bases will reduce the effectiveness of acreage reduction programs. The percentage of base that needs to be taken out of production will increase as the base increases. This will raise the cost of participating to those farmers who have not expanded their bases--primarily the participants in previous programs--unless they receive a cash payment for the larger reduction. The outcome of expanding bases, then, is lower participation and a higher probability that a large cash diversion program will be required to idle the necessary acreage.

Inefficient Land Conservation

Marginal land is idled under acreage reduction programs, but marginal land is not necessarily erosive land. Also, the size of the cash and in-kind diversion

Figure 2

Growth in crop bases



payment rates and expected deficiency payment rates in recent programs have encouraged the idling of land in productive, nonerodible areas. Consequently, erodible land generally will not enter an annual acreage reduction program, unless the program is designed to encourage its entry (6). This is consistent with USDA findings for the 1983 programs; the distribution of diverted acres by land capability class was about the same as that for U.S. cultivated cropland (7).

Land idled under acreage reduction programs allows the opportunity to implement conserving practices--leveling, terracing, tiling, weed control, or conversion to pasture and forest. However, the opportunities are not always taken or else are undone to the detriment of the environment, wildlife, and effectiveness of future programs. For example, USDA found that acreage idled under the 1983 programs generally suffered less erosion than if it had been cropped. It was also found, though, that in areas where a cover crop is hard to establish--which can be the case for erosive land--or where land was left fallow, erosion was worse on idled acres because of exposure to wind and water. Moreover, some conservation practices, such as on erodible land, may take more than a year to develop and are thus not encouraged by annual acreage reduction programs. Multiyear conservation programs have a much larger soil-saving effect than annual programs.

Acreage Reduction Effects on Land Values

The value of farm program benefits has been capitalized into land values, with the degree of capitalized value relating to the relative size and kind of commodity allotment or base. Programs with high price supports and relative permanence, such as tobacco, experience the greatest degree of capitalized value. Landowners benefit from acreage reduction programs because these programs limit the supply of land that can be used for profitable program commodities, thus giving that land a scarcity value. Tobacco provides an extreme example. The land and quota charge (net-share rent basis) for producing burley tobacco was $1,087 per acre in 1983, compared with an average gross cash rent of $58 an acre for cropland rented in Kentucky in that year. Those who wish to produce program crops must compete for a smaller eligible supply of land and, in so doing, they bid up the price or rent above what it would be otherwise. The increase is likely greater during periods when farmers expect reduction programs to be frequently in effect. Crop prices strengthened by acreage reduction programs will also be reflected in higher land prices or rental rates. Renters or subsequent landowners do not benefit to the same degree as landowners, because the higher priced land simply raises their production costs. Programs that depend on acreage bases for their administration tend to be perpetuated because current owners as well as communities fear an equity loss if bases were to be eliminated or changed.

Reduced Participation by Large Producers

About 12 percent of today's farms market about two-thirds of all farm products, while 60 percent of all farms account for only 10 percent of total farm sales. The effectiveness of acreage reduction programs is increasingly restricted because some of the larger farms are precluded from participation by the $50,000-per-person limitation on program payments. The effectiveness of PIK in reducing production would have been limited to a considerable degree if the PIK compensation were subject to the $50,000 payment limit.

If payment limits apply to all types of compensation, future acreage reduction requirements will be increasingly directed to the smaller farmers. This pattern has been evident for cotton, a high-value crop. In 1984, the average California cotton farm had 291 acres of cotton base on which yields were double the national

average; only 28 percent of the State's base acreage was in the 1984 acreage reduction program. The remainder of U.S. farms averaged 103 acres of cotton base, and 74 percent of their total base participated in the 1984 program.

The payment limit is often debated as an equity issue. The political process has judged that large efficient farms--those accounting for most of today's production--should have limited Government income supplements. But if program payments are made to induce farmers to idle acreage--rather than to supplement income--then equity and program effectiveness are stalemated. The larger the acreage reduction percentage and the larger and more efficient the farm, the larger the payment will have to be in order to attract adequate participation.

POTENTIAL FOR MAKING ACREAGE REDUCTION MORE EFFECTIVE

Some have suggested tightening up acreage reduction programs to make them more effective. As has been demonstrated, the very nature of limited acreage reduction programs makes this difficult at best. Others have suggested cross-compliance or offsetting compliance as a means of shoring up acreage reduction programs. Both views ignore the political reality that attempts of any kind to tighten up acreage reduction programs (such as cross-compliance, restrictions on summer fallow, or mandatory controls on haying and grazing) usually meet with strong opposition in Congress--at least they have in the past.

While cross-compliance may have value for certain commodities or in some regions of the country, there are also costs. Cross-compliance could be detrimental to participation in commodity-specific programs. For example, a producer with a large wheat base and a small corn base may only want to participate in the feed grain program. However, under cross-compliance the grower may very well not participate at all rather than being forced to participate in both commodity programs, or plant within the base of the nonparticipating crop. Moreover, if cross-compliance were administered as it has been in the past, it would be structured to control the total acreage in production, not individual crop acreages. Thus, there is no assurance that less wheat, corn, or another commodity will be produced on farms that are participating in the programs.

Offsetting compliance requires that farmers with multiple farming units be in compliance or plant within their bases on all units they operate or else forfeit eligibility for program benefits on any units. Offsetting compliance can reduce slippage because it prevents operators from increasing plantings on the most productive units and complying with acreage reduction only on their least productive units. But as farms become larger and comprise more units--some of which may be owned and others rented--the offsetting compliance requirement pits operators against landlords. It becomes difficult for an operator to get a consensus among different owners about participating in reduction programs.

The prospect that we will again be forced to rely on acreage reduction programs to correct a supply-demand imbalance makes improvements to increase effectiveness desirable. One possible improvement would be to use farmer-submitted bids which would offer to idle a quantity and quality of land for a payment acceptable to the farmer. The bid system was used for the whole-base PIK provision, and it proved workable. Program administrators could apply reasonable criteria to select efficient acreage reduction offers. It might also give administrators better control over the cost and the amount of reduction and even a way to retire more erosive lands and focus reduction programs geographically. If the program could be designed so that farmers believed that competitive bids would be necessary in order to be selected as participants, bids would likely be close to

the net returns farmers would expect from cropping the land. Thus, the windfall to less efficient producers that is associated with constant offer-rate reduction programs could be lowered.

CONCLUSIONS

High price supports, acreage allotments, and quotas evolved in an era when domestic use was a larger portion of total commodity use than it is currently. When the domestic market is dominant, price supports can be raised with minimal effects on the amount demanded by the domestic market, especially when there are no close market substitutes. But when the export market grows in importance, U.S. prices supported above world prices lead to a loss of markets.

A drop in production achieved by acreage reduction programs is likely to be at least partly offset by competitors overseas. For example, U.S. harvested wheat acreage was about the same in 1984/85 as in 1977/78. But during that period, Argentina, Australia, Canada, and the European Community increased their harvested acreage by about 24 million acres. Because of stagnant world trade and record production by other exporters, the U.S. share of world wheat trade fell from 48 percent in 1981/82 to an estimated 37 percent during 1984/85. The effectiveness of acreage reduction programs needs to be measured with regard to export markets, the single major growth area for U.S. farm products.

Acreage reduction programs typically follow from the judgement of policymakers that prices are too low, stocks are too high, or Government payments--such as for storage or income support--are excessive. Voluntary programs, as managed in the past, have often been an inefficient and costly means to restore market balance. At times, poor weather and export growth have masked the inefficiencies. Acreage reduction provisions have also had to contend with other program provisions, such as loan rates and target prices, which have insulated individual producers from market feedback that would indicate production was exceeding use. Hence, the future of acreage reduction programs will depend on whether policymakers will choose to idle U.S. resources in a competitive world market, whether cost-effectiveness can be improved, and whether the reductions can be made complementary with other price and income support provisions.

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Agricultural Export Programs and U.S. Agricultural Policy

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ABSTRACT

Various Government programs to increase farm exports have been used since the fifties. They have been used in combination with domestic commodity programs as part of an overall farm policy rather than as an explicit trade policy. With recent declines in U.S. agricultural exports, several export programs that were a part of the commodity management strategy prior to 1973 have recently been used. At the same time, these declines have generated increased interest in a redirection of U.S. policy to improve export performance. Even under a more market-oriented policy, export policy instruments which expand long-term demand play a role in formulation of a trade strategy.

KEYWORDS: Agricultural policy, agricultural trade, exports, U.S. agricultural export promotion programs.

INTRODUCTION

Government programs to increase farm exports date largely from the fifties. These programs have been used to expand the total volume of exports and to offset the impact of domestic commodity programs on exports. The emphasis and type of program used have varied with changing international market conditions. When U.S. support prices have been above market-clearing export prices, generating large Government-owned stocks, export market programs have been designed to dispose of surplus commodities abroad. When U.S. support prices have been below world market prices, and Government payments to farmers have depended on the relationship between market and target prices, export market programs have been directed to increasing world market prices by expanding the demand for commercial sales abroad.

The seventies were marked by a growing interdependence of nations in a world economy and increased exposure of U.S. agriculture to external forces (5). The change from a quasi-fixed exchange rate, the internationalization of financial markets, the growth of Western European and Japanese trade, and the increasing participation of centrally planned and developing countries in international trade all contributed to these developments (4). The world economy has become much more interdependent and U.S. agriculture is less insulated from external forces (5).

The impact of the international economy on U.S. agriculture has been particularly evident over the last 3 years. Since 1981, market prices for grains have been at or near the loan rate, which has prevented export prices from dropping in response to increased stocks, a strong U.S. dollar, and decreased purchasing power in importing countries. Government farm program

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spending reached record levels and, by 1983, stocks had risen to the highest levels since the sixties. To cope with these problems, the Government has made increased use of export market programs, some of which had not been in use since the early seventies. Given the situation since 1981, policymakers are reassessing the direction of agricultural policy and the role of export market programs. It is argued that the United States does not have an explicit agricultural trade policy or a well-defined strategy for improving export performance (6). Yet Government programs to increase exports, which have been a part of overall U.S. commodity management objectives, constitute an implicit trade policy.

The importance of agricultural trade in the seventies and the increasing importance of international commodity and financial markets in the eighties has been well documented, and are described in other chapters of this publication. The importance of trade and export markets prior to 1973, however, has not been emphasized. This article provides background information for future discussion on export market programs and their role in U.S. agricultural policy. Specifically, it discusses the types of programs that have been used, their effects on farm exports, and their relationship to domestic farm programs and international commodity markets.

EXPORT MARKET PROGRAMS AND POLICIES

U.S. export programs primarily have served agricultural policy objectives by promoting increased agricultural exports from the private sector. U.S. agricultural trade is carried out by private individuals and firms, and the U.S. Government assists exporters through programs designed to increase the quantity of U.S. commodities sold in international markets. At the same time, when Commodity Credit Corporation (CCC) inventories have become large, the Government has reduced CCC stocks by releasing them directly to U.S. exporters for commercial sale or for carrying out Government-negotiated contracts under various Government-financed programs.

Export market programs have included commercial and concessional credit programs, market development, barter, export payments, and foreign donation programs. In addition, the United States has sought to improve market access of U.S. exporters in international markets through multilateral negotiations to reduce trade barriers under the General Agreement of Tariffs and Trade (GATT), and by negotiation of multiyear bilateral trade agreements with countries such as the USSR and the Peoples Republic of China.

Export policy instruments, listed by program title in table 1, increase the demand for U.S. agricultural exports in three ways (3). First, some types of export market programs lower the prices at which U.S. exporters can offer commodities on the world market. These programs have the effect of increasing demand for U.S. exports at a lower export price. Programs to lower export prices have included cash or in-kind export payments, direct sales of CCC stocks for export at reduced prices, and outright donations. Direct payments and CCC sales at reduced prices enabled U.S. exporters to sell at market-clearing export prices when U.S. domestic prices were supported by relatively high nonrecourse loan rates. In addition to lowering export prices, these programs also helped the CCC to reduce its inventories. Foreign donations, made for humanitarian purposes, are a more direct method for reducing CCC stocks.

Loan rates have also been reduced periodically to lower the export price and increase the quantity demanded. In this case, deficiency payments were made

Table 1--U.S. export market policy instruments

EXPORT PRICE POLICY INSTRUMENTS

- Export payment programs:
  - P.L. 320, Section 32
  - International Wheat Agreement
  - CCC export payments in cash or in kind
  - CCC sales at reduced prices 1/
- Foreign donation programs:
  - P.L. 480, Title II
  - Agricultural Act of 1949, Section 416
- Reduced loan rates

EXPORT DEMAND EXPANSION POLICY INSTRUMENTS

- Concessional long-term credit:
  - P.L. 480 nonconvertible currency sales 2/
  - P.L. 480 dollar credit sales
- Barter programs:
  - P.L. 480 barter program
  - CCC barter program
- Commercial, short-term credit:
  - Export-Import Bank loans and guarantees
  - GSM-5 export sales credit program
  - GSM-101, 102 credit guarantee programs
  - Blended credit
- Intermediate investment credit programs: 3/
  - P.L. 480 nonconvertible currency loans
  - GSM-201 intermediate credit
  - GSM-301 intermediate credit
- Foreign market development programs:
  - Cooperator program
  - Export incentive program
  - Regional-State export groups
  - Agricultural Information Marketing Service
  - Government-sponsored exhibits
  - Product testing activities
  - Export trading company legislation

POLICY INSTRUMENTS TO INCREASE MARKET ACCESS

- General Agreement on Tariffs and Trade (GATT)
- Bilateral agreements
- Attache contacts

1/ CCC direct sales to U.S. exporters, foreign governments, or voluntary agencies abroad. 2/ Foreign exchange credit. 3/ Intermediate-term credit programs were authorized by the 1978 Agricultural Trade Act to finance development of markets for breeding animals (GSM-201) and market infrastructure (GSM-301). A small GSM-201 program with Spain was funded in fiscal year 1980, and a small GSM-301 program with Israel was funded in fiscal years 1981 and 1982.

to farmers to offset the loss in income from the lower support price, and payments to exporters were discontinued.

Second, a variety of programs expand export demand. Their effect is to expand demand and thereby raise export prices to levels that are higher than price levels would be without the programs. Credit programs achieve this by providing dollar purchasing power at the time of the sale to countries that would otherwise not be able to buy because of foreign exchange or income constraints (2). Short-term credit is provided to countries that have cash flow problems, whereas long-term credit is targeted more to low-income countries with chronic foreign exchange problems. With the exception of the blended credit program, short-term credit is provided to eligible importing countries at commercial rates of interest. Long-term credit is provided at very low rates of interest with a grace period of from 3 to 10 years.

Barter exchanges also expand export demand through foreign exchange savings, and have been used by the United States on occasions when mutually agreeable two-way exchanges of goods could be arranged. Market development expenditures expand demand for agricultural exports over the longer term through a variety of techniques in importing countries that include advertising and other product promotion activities; technical assistance to improve productivity in industries such as baking, milling, or livestock feed compounding; and provision of information on product quality and pricing to importers.

Third, policies to promote market access increase foreign demand by lowering barriers to imports and increasing trade contacts. The United States has taken part in multilateral negotiations, concluded bilateral trade agreements, and has agricultural attaches in many countries. Removal of trade restrictions increases exports by allowing exports to compete on a more equal basis with competing products in importing countries, and by reducing incentives for countries to produce products which are more cheaply produced in other countries. To the extent that barter programs facilitated market access in countries that otherwise would not have traded with the United States, the effects from barter on U.S. trade are similar to other types of bilateral trade agreements.

Tables 2 and 3 indicate the importance of export market programs in facilitating trade in various periods. During the late fifties and early sixties, exports under Government-financed programs (P.L. 480, Section 416, and AID 1/) and commercial exports with export payments assistance averaged about one-half the value of total U.S. agricultural exports (table 2). 2/ This proportion declined to 8 percent in the seventies as changes in U.S. domestic policy favored commercial sales. It is not possible to determine the proportion of commercial credit and barter export sales that also received export payments assistance. However, table 3 shows that commercial exports under credit and CCC barter programs increased from 5 percent during the late sixties and early seventies to 13 percent of commercial sales in 1983. In 1983, a period of world economic recession and large U.S. supplies, sales under Government-financed and commercial credit export programs increased to 16 percent of the value of total agricultural exports. The operation of

1/ Exports under AID programs, not included in table 1, comprise agricultural exports under foreign assistance or mutual security programs administered by the U.S. Agency for International Development.

2/ Exports under P.L. 480 and AID programs were also eligible for export payments.

specific U.S. agricultural export market programs and their use in U.S. agricultural trade since 1950 are discussed below.

Programs to Lower the Export Price

Sales of CCC stocks for export at prices below those in the domestic market as well as cash or in-kind payments to exporters provided a means for the CCC to reduce its inventories when producer support levels were above market-clearing export prices. From 1956 to 1960, 54 percent of the value of commercial agricultural exports were marketed under these programs (table 2). This proportion declined to 25 percent during the sixties and to 5 percent during the early seventies, when loan rates were brought more in line with market-clearing levels. In addition, 50 to 80 percent of exports under Government-financed programs, excluding donations, received export payments assistance during the sixties.

Export payments were discontinued in 1974, but were revived in 1983 with a wheat flour sale to Egypt, and in 1984 with CCC grain sales to African countries. Prior to 1974, export payments were made uniformly to exporters of eligible commodities, while recent export payments have been targeted to exporters for sales to specific countries or regions under particular circumstances.

Table 2--U.S. agricultural exports: total, specified Government-financed programs, and commercial, selected years

Fiscal year	Exports under Government-financed programs		Commercial exports			Total agricultural exports
	Title I 1/	Other 2/	With export payments 3/	Without export payments	Total commercial exports	
	Million dollars					
Average:						
1956-60	710.4	685.0	980.0	1,717.2	2,697.2	4,092.6
1961-65	1,109.9	405.8	1,144.0	2,806.5	3,950.5	5,466.2
1966-70	927.8	294.4	1,087.4	4,143.8	5,231.2	6,453.3
1971-75	686.1	395.9	669.8	12,563.7	13,233.5	14,315.5
1976-80	761.3	680.3	--	27,732.1	27,732.1	29,173.7
1981	789.7	702.4	--	42,296.1	42,296.1	43,788.1
1982	722.3	467.4	--	37,904.6	37,904.6	39,094.5
1983	809.7	525.6	103.5	33,330.7	33,434.2	34,769.5
1984	762.7	719.4	4/	36,544.5	36,544.5	38,026.6

-- = Program not in use.

1/ P.L. 480 Title I dollar credit and sales for foreign currencies (long-term credit).

2/ P.L. 480 Title II and Section 416 donations, P.L. 480 barter, and AID (Mutual Security Act) programs.

3/ CCC sales at reduced prices. Export payments under CCC and Section 32 programs.

4/ Does not include competitive-bid sales to African countries because these exports had not been shipped by the end of the 1984 fiscal year.

CCC Sales at Reduced Prices

Until the inauguration of payment-in-kind export programs, the CCC sold the bulk of its commodities for export at competitive bid or announced export prices, which were often below domestic market prices. Sales were made from CCC stocks to private exporters for commercial export or for export under Government-financed programs. The major problem with these programs was that the CCC became a major supplier of export commodities, and it incurred additional expenses for storing and transporting commodities before reselling to the private sector below acquisition cost. CCC sales to exporters for unrestricted commercial export were sharply reduced in the mid- to late fifties in order to promote sales from private stocks through in-kind export payments. 3/

A targeted, CCC competitive-bid program was authorized by House Joint Resolution 493 in March 1984. This resolution authorized the CCC to make available up to $90 million worth of wheat, wheat flour, corn, and rice to private exporters for resale to African countries hard-hit by severe drought. Exporters negotiated sales with buyers in the eligible African countries and then bid for the grain, which was acquired by the CCC through its price support programs.

Export Payments

Export payment programs were primarily designed to encourage the movement of privately owned stocks of agricultural commodities into export channels. This

3/ CCC export sales of dairy products at negotiated prices have continued to the present. CCC sales programs for other commodities were used during the sixties and the early seventies depending upon the availability of private stocks for export and the level of CCC stocks.

Table 3--Total U.S. commercial agricultural exports including credit sales and CCC barter, selected years

Fiscal year	Credit sales		CCC barter	Other commercial	Total commercial
	CCC 1/	Export-Import Bank 2/			
	Million dollars				
Average:					
1956-60	11.5	81.7	0	2,604.0	2,697.2
1961-65	68.1	70.0	35.9	3,776.5	3,950.5
1966-70	203.4	58.8	300.3	4,668.7	5,231.2
1971-75	1,067.3	81.8	626.5	11,458.4	13,233.5
1976-80	1,328.4	77.6	0	26,326.1	27,732.1
1981	1,873.0	48.0	0	40,385.9	42,296.1
1982	1,393.1	60.4	0	36,457.7	37,904.6
1983	4,069.1	91.7	0	29,273.4	33,434.2
1984	3,646.3	86.9	0	32,811.3	36,544.5

1/ Sales under GSM-5, GSM-101, GSM-102, GSM-201, and GSM-301 programs, and blended credit.
2/ Data from 1976 to 1984 are based on authorizations.

would reduce quantities taken over by the CCC under price support programs, lower storage costs, and raise domestic prices. Export payment programs were authorized by Section 32 of the Agricultural Adjustment Act of 1935 from 1938 to 1974, by the CCC for wheat under the authority of the International Wheat Agreement Act of 1949 from 1950 to 1966, and by the CCC under its permanent charter authority from 1956 to 1974. Section 32 provides the USDA with funds equal to 30 percent of the revenue duties collected on all imported commodities for use in programs to expand markets for surplus agricultural commodities (8). This authority facilitated sales of commodities such as cotton, tobacco, grain, fruit, chickens, and eggs, among others. Before 1955, export payments under Section 32 averaged $20-35 million per year. The authority permitted private exporters to buy at domestic prices, sell at world prices which were often below U.S. price support levels, and receive the difference in cash from Section 32 funds.

Export payments were made for wheat obtained by U.S. exporters at the domestic market price and sold at a lower fixed international price under the International Wheat Agreement (IWA) from 1950 through 1967. 4/ Cash payments were made until 1956, when the CCC implemented a payment-in-kind (PIK) export program for both IWA and non-IWA export wheat. The CCC PIK export payment program was later extended to cotton, rice, flaxseed, and linseed oil, and to feed grains and dairy products for a few years. Under this program, payments were made in the form of commodity certificates which were redeemable for CCC-owned stocks. The certificates were interchangeable between commodities and transferrable among certificate holders; the certificates had stated dollar values and were freely traded. The PIK export program was discontinued in 1966 when the exhaustion of CCC-held inventories reduced the supplies available for the program. Cash payments were continued for wheat, tobacco, rice, and other commodities until 1974.

In 1983, an export payment was made to U.S. wheat millers under an agreement between the United States and the Egyptian Government that provided for the commercial sale and delivery of flour equal to 1 million metric tons of wheat to Egypt. The agreement stipulated that wheat flour would be purchased from U.S. millers on a tender basis at a suggested price of $155 per metric ton (compared with U.S. wheat flour prices of $250-$260 per ton), with 77.5 percent of the purchase price eligible for CCC financing under the GSM-102 credit guarantee program. Wheat was released to flour millers from CCC stocks to enable millers to contract for sale and delivery to the Egyptian market at or below the suggested price without financial losses. Actual export flour prices averaged about $138 per ton of flour.

Foreign Donations

P.L. 480, Title II, authorizes the use of CCC-held or private stocks for donation directly to foreign governments or through international agencies or U.S. voluntary agencies abroad. Since 1982, supplemental foreign donations of dairy products have been authorized by Section 416 of the Agricultural Act of

4/ The IWA, a multilateral commodity agreement in effect from 1950 to 1967, set a fixed trade price for hard red spring wheat, with adjustments for quality and grade. Exporters selling wheat under this agreement paid a tax or received a subsidy on export sales depending on whether market prices were above or below the fixed trade price. Wheat was sold to importing countries under the agreement on the basis of negotiated quotas.

1949. 5/ This authority was amended in 1984 to include wheat, but this provision was never activated. Foreign donations, which averaged about 20 percent of total P.L. 480 exports during the sixties, increased to over 30 percent in the seventies. Foreign donations fell from an average of 8.0 percent of total U.S. exports during 1956-60 to 1.4 percent in 1976-80, but rose to 2.0 percent in 1984 with use of the Section 416 dairy provision.

Programs to Expand Export Demand

Demand expansion programs are primarily designed to raise the level of U.S. agricultural exports by easing financial constraints in importing countries and by helping U.S. producer groups or interested parties in importing countries to develop overseas markets. As shown in table 4, which presents data on official export credit authorizations and expenditures on selected agricultural export market programs, credit has been the mainstay of the U.S. export demand expansion strategy. In the late fifties and early sixties, long-term credit sales to developing countries under Title I of P.L. 480 averaged about 19 percent of the value of total U.S. agricultural exports. In the seventies, short-term commercial credit programs became more important, financing about 5 to 8 percent of the value of total U.S. agricultural exports, as the proportion of exports marketed through commercial channels increased. To reduce Federal outlays, the provision of direct short-term

5/ Authority for foreign donations under Section 416, which was used before 1966, was subsumed under P.L. 480, Title II, in that year. It was reactivated in 1982 for dairy products under the Omnibus Budget Reconciliation Act of 1982.

Table 4--Official export credit authorizations and expenditures on market development and export payments programs, 1956-83

Fiscal year	Demand expansion programs			Export payments 4/	Total outlays
	Short-term credit 1/	Long-term credit 2/	Market development 3/		
	Million dollars				
Average:					
1956-60	93.2	710.4	3.0	367.1	1,173.7
1961-65	138.1	1,109.9	8.2	645.1	1,901.3
1966-70	262.2	927.8	12.7	232.7	1,435.4
1971-75	1,149.1	686.1	12.3	199.4	2,146.9
1976-80	1,406.0	761.3	15.6	0	2,182.9
1981	1,921.0	789.7	22.9	0	2,733.6
1982	1,453.5	722.3	23.8	0	2,199.6
1983	4,160.8	809.7	27.1	20.0	5,017.6
1984	3,733.2	762.7	31.6	0	4,527.5

1/ CCC and Export-Import Bank credit programs. For credit guarantees, actual Government outlays occur only in the case of nonpayment.

2/ Long-term credit under P.L. 480 from table 2.

3/ Does not include cooperator contributions. Does not include regional-State export program data until 1978.

4/ CCC export 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).

credit to importing countries was abandoned in favor of credit guarantees in the late seventies. In 1983, exports with short-term credit increased to $4.1 billion, or 11 percent of the total value of agricultural exports, of which $1.0 billion was under the newly created blended credit program.

Export credit authorizations shown in table 4 are a measure of the magnitude of Government export promotion efforts. Since the Government is a low-cost borrower of funds, official credits, whether loaned at or below market cost, provide a credit subsidy to the importer in most cases. This subsidy in turn makes the terms offered by U.S. exporters more competitive. 6/ The amount of the credit subsidy depends upon the difference between the cost of funds otherwise available to the importer and the interest rate charged for official credit, and upon the term and grace period of export credit loans. The costs to the Government from direct credit programs (P.L. 480 and GSM-5), however, depend upon the difference between the market cost of money to the Government and the interest rate charged for export credit. In the case of credit guarantees (GSM-101 and 102), actual Government outlays occur only in the case of importer default. 7/

Throughout the 1950-84 period, more emphasis was placed on programs which facilitated the immediate movement of commodities through export channels. This is in contrast to expenditures on market development, which promote exports over the longer term through investment in economic development in importing countries, and whose benefits have not been greatly understood. 8/

Concessional Sales under P.L. 480

The Mutual Security Act of 1951 authorized the sale of surplus agricultural commodities to friendly countries for local currencies. The Agricultural Trade Development and Assistance Act of 1954 (P.L. 480) incorporated this concept to help develop and expand export markets for U.S. agricultural commodities. Under Title I of this law, sales were made from CCC inventories for nonconvertible local currencies. 9/ The local currencies were deposited in a U.S.-owned account and used for a variety of purposes, including market development; procurement of services, strategic commodities, and military equipment; repayment of U.S. obligations abroad; the financing of educational exchanges; and for loans promoting multilateral trade and economic development in recipient countries. The terms of these loans from nonconvertible currency deposits were from 3 to 10 years at market interest rates. However, the loans were repaid at a constant rather than market-determined exchange rate. With a depreciating currency, this provided a foreign exchange subsidy to the borrower.

6/ It should be noted that export credit subsidies are often used by high-cost exporters.

7/ The social costs of official export credit programs differ from the actual outlays incurred by Government. For instance, through official credit programs the Government is channeling funds into specific uses, and thus the social cost of these funds is their opportunity cost to other sectors of the economy. To the extent they increase the Government's overall liabilities, Government guarantees may raise the cost of Government borrowing over the longer term.

8/ For a summary of studies which have examined the impacts of market development activities, see (3). Most of these studies have shown the returns to market development activities for commoditities such as eggs, milk, orange juice, soybeans, and feed grains to be relatively high.

9/ Sales could be made from private stocks if it were determined that CCC inventories were insufficient to meet U.S. obligations under this law.

Long-term dollar credit sales as acceptable payment for commodity exports were added to P.L. 480 in 1959. 10/ Countries purchased agricultural commodities with loans at low interest rates, repaying in dollars or convertible local currencies, usually over a period of 20 to 40 years. Dollar credit sales were in addition to nonconvertible currency sales. In the sixties, the objectives of P.L. 480 shifted from domestic commodity management to the use of privately owned or CCC-owned commodities to promote economic development in recipient countries, meet emergency food aid needs, and combat malnutrition abroad. In 1966, P.L. 480 was amended to provide for the transition solely to a program of concessional dollar sales on credit terms under Title I by the end of 1971.

Barter Programs

Provisions for barter programs were included in the permanent authority of the CCC and in Title III of P.L. 480, which authorized the exchange of CCC-owned commodities for strategic materials (7). The objective of barter programs was to reduce CCC inventories by exchanging agricultural commodities for goods and services required by the United States from abroad. Agricultural exports under barter programs averaged 5 to 6 percent of the total value of U.S. agricultural exports from 1954 to 1973.

From 1954 to 1962, the barter program operated under P. L. 480 authority and involved exchanges of CCC-held commodities for strategic materials required for the U.S. strategic stockpile (see 7 for details). By 1962, changes in planning for wartime needs had reduced stockpile goals, strategic materials inventories exceeded minimum requirements in many cases, and the CCC's agricultural inventories had been greatly reduced. From 1963 to 1973, emphasis was placed on barter sales to offset part of the dollar drain from U.S. spending abroad. Barter agreements during this period relied upon authority of the CCC which allowed barter contractors to export private-stock commodities in exchange for foreign-produced supplies and services destined for overseas military installations and AID projects.

The United States signed barter agreements with Jamaica in February 1982, November 1983, and January 1984. The first two agreements provided for the exchange of Jamaican bauxite for U.S. nonfat dry milk and anhydrous milk fat from CCC stocks, tin and tungsten from the U.S. strategic stockpile, and cash. The third agreement exchanged Jamaican bauxite for nonfat dry milk and butter oil.

Export-Import Bank Loans and Guarantees

The Export-Import Bank extended credit to foreign buyers when commercial credit could not be obtained as early as 1948. In 1963, the Bank initiated a system of guarantees against political and financial risk. Export-Import Bank loans and guarantees for agricultural exports have been a small proportion of Export-Import Bank lending, which has generally been extended for investment in development.

CCC Export Credit Sales Program (GSM-5)

The CCC, under its permanent charter authority, made direct, short-term, export credit loans to stimulate commercial exports of agricultural

10/ Dollar credit sales were made through Title IV initially but later were moved to Title I.

commodities, mainly grains, soybeans, tobacco, and cotton, from 1956 to 1980, and in 1984. The purpose of this program was to increase commercial sales above the level which would exist without the credit program by alleviating cash flow problems of importers and permitting exporters to meet credit terms offered by competitors. Under this program, U.S. exporters sold agricultural commodities to importers on a deferred-payment basis for periods up to 36 months. In turn, the CCC reimbursed the exporter and held the note of the buyer. The CCC determined the interest rate paid by the importer. In the early years of the program, the interest rate charged borrowers was usually greater than the CCC's cost of borrowing from the Treasury; later, the interest rate was set from 0.5 to 1.5 percentage points above the U.S. prime rate. In 1984, the interest rate was set 1.5 percent above the rates paid by the Treasury on 52-week Treasury bills.

CCC Credit Guarantee Program (GSM-101, GSM-102)

CCC credit guarantees have been available since 1979. Their purpose is to encourage U.S. agricultural exports at levels above those which would exist without the guarantees by shifting some of the risks usually associated with export transactions from the U.S. exporter to the CCC. The GSM-101 Program, in operation from 1979 to 1981, provided a guarantee against noncommercial risks such as embargoes on imports, freezing of foreign exchange, revolutions, and wars. In 1981, commercial risk (that is, inability to pay for economic reasons) was added to the guarantee through GSM-102. The CCC now relies heavily on the GSM-102 guarantee program.

Under both programs, credit is provided through commercial institutions on a short-term basis, 6 to 36 months, at a cost of financing set by U.S. banks. The CCC reimburses the exporter for a portion of the exporter's account receivable in the event of nonpayment. Typically, the CCC guarantee covers 98 percent of the principal and interest up to 8 percent per year on the guaranteed amount of credit. The exporter pays a guarantee fee to the CCC prior to shipment which is usually added to the price of the commodity.

The CCC guarantee affects the terms of agricultural export sales in two ways. First, a U.S. Government guarantee enables banks to provide financing in excess of country lending limits and to offer longer credit terms than they normally would provide for agricultural commodities. Second, banks usually charge a lower rate of interest because of the guarantee.

Blended Credit

The blended credit program, begun in October 1982, uses GSM-5 direct credit and GSM-102 commercial export credit guarantees. The credit is blended on a ratio of a minimum of four parts Government-guaranteed credit (GSM-102) to one part interest-free, direct Government credit (GSM-5). The program was initiated in response to the buildup of U.S. stocks in 1982. Blended credit promotes commercial agricultural exports by providing credit for up to 3 years at interest rates below normal commercial levels to buyers of U.S. agricultural products. The blended credits were targeted principally to developing countries for purchase of U.S. wheat, rice, corn, vegetable oil, soybean meal, and cotton in fiscal year 1983. In fiscal year 1984, blended credits were offered to countries such as Morocco, Tunisia, Algeria, and Egypt for purchase of wheat.

Export Market Development Programs

The cooperator program has been the major export market development program since 1956. The objective of this program has been to develop, maintain, and expand long-term commercial markets for U.S. commodity exports. The program was started in 1955 after the passage of P.L. 480, which provided the legislative foundation and an initial source of funds for the program. Through the cooperator program, the USDA's Foreign Agricultural Service (FAS) cooperates with U.S. nonprofit producer organizations and governments, firms, or trade associations of other countries. Currently cooperators represent cotton, dairy products, poultry, fruit, vegetables, livestock and livestock products, tobacco, forest products, and seeds, in addition to grain and oilseeds. The type of activities used in the program varies among commodity groups. Rice promotion techniques are aimed at the final consumer to increase product demand, whereas wheat and feed-grain market development techniques are aimed at earlier users in the marketing channel such as millers, bakers, and feedlot operators. Soybean export market development has been aimed variously at crushers, feeders, and household or industrial consumers.

Other market development programs include the export incentive program, initiated in 1971, which assists firms with promotion of branded, consumer-ready, U.S. agricultural products for the period during which the product is being established in the market. FAS also cooperates with regional-State export groups to encourage suppliers with potential export capabilities to seek overseas markets. Support services are provided through seminars, market surveys, and other educational efforts. Agricultural trade offices were set up in 1978 in selected regions to facilitate export market development. In addition, FAS launched the Agricultural Information Marketing Service (AIMS), in 1984. The program provides, on a fee basis, the Trade Leads Service, a computer-based referral system that links the foreign market with domestic suppliers; a list of foreign importers; statistical trade information; and other services. Trade exhibits, catalog exhibits, and in-store promotions have also been used outside of the cooperater program. Finally, export trading company legislation was passed in 1982 to enable the private sector to develop trading companies for the export markets including the farm commodity market.

Agricultural Trade Negotiations

Agricultural trade negotiations are an effort to improve market access by removing sovereign restrictions on trade that are constraints to increased U.S. commodity exports. Restrictions include tariff and nontariff barriers such as quotas, licensing requirements, state trading practices, variable levies, and domestically administered prices. Removal of agricultural trade restrictions in many cases requires a change in domestic agricultural policies. For this reason, earlier multilateral negotiations under the General Agreements on Tariffs and Trade (GATT), the Dillon Round ending in 1962, and the Kennedy Round from 1963 to 1967, made little progress in negotiating agricultural trade policies. The Common Agricultural Policy (CAP) of the European Community (EC) was being formulated in that period and was viewed as essentially non-negotiable. The most recent GATT negotiations, the Tokyo Round, from 1973 to 1979, made limited progress in lowering restrictions for particular commodities and countries.

The United States has also attempted to increase market access and stability for U.S. exporters by entering into bilateral trade agreements with the Soviet

Union and the Peoples Republic of China. 11/ The current Soviet trade agreement, the second consecutive agricultural trade agreement signed by the two countries, stipulates minimum purchase levels of wheat, feed grains, and soybeans from the United States over a period of 5 years starting in October 1983; the Chinese agreement stipulated minimum purchase levels of wheat and corn over a 4-year period starting in 1981. Trade agreements are also used extensively by competitor countries such as Canada, Argentina, and Australia to promote their agricultural exports.

U.S. EXPORT MARKET PROGRAMS, DOMESTIC PROGRAMS, AND INTERNATIONAL MARKETS

Export market programs are designed to raise export demand or to reduce export prices in order to increase exports and decrease excess supplies. The export market programs have been used as policy instruments along with domestic market programs to regulate commodity supply and demand in order to achieve agricultural policy objectives. The objectives have been to maintain U.S. agricultural capacity, support producer income, and assure consumers an adequate food supply while minimizing surpluses and Government expenditures. Producer income has been maintained by domestic price and income policies, but the result has often been oversupply and surpluses, except in periods of strong export demand such as the midseventies. The export market programs have been used to decrease excess supply during periods of surplus, and to further support the market price in periods of strong demand. Thus, a combination of domestic and export market programs has been used at least since the fifties to regulate supply, demand, and farm prices.

Until 1962, domestic farm price supports tended to be unresponsive to world market conditions. The combination of high, supported domestic prices and increasing yields resulted in large stocks of commodities. Domestic efforts to reduce surpluses relied on acreage control programs and marketing restrictions for some commodities. Export market programs were initiated mainly for the purpose of dispersing large surpluses (1). The export market strategy was based on nonconvertible currency concessional sales, export payments, CCC direct sales, and barter programs. Direct, short-term credit loans to alleviate cash flow problems of the more-developed purchasing countries and market development programs were also instituted during this period.

In the early sixties, support prices for most commodities were reduced, production adjustment controls were used, and farm income was supported with income payments for producers. Domestic prices were generally low enough for coarse grain and cotton exports to compete in world markets. As CCC-held stocks declined, export programs became more oriented toward generating dollar sales. Dollar credit sales under P.L. 480 increased as nonconvertible currency sales declined. More emphasis was also placed on expenditures for market development in the late sixties. With lower support prices and increased commercial exports, target income payments were used to maintain farm income.

Cochrane argues (2), based on a series of studies, that if domestic programs had been dismantled in the fifties and sixties, prices of supported

11/ To the extent that commitments under bilateral agreements are fulfilled regardless of the world market situation, bilateral agreements increase instability in that part of the market not covered by such agreements.

commodities would have decreased, thereby increasing demand and decreasing excess supply. But, producer income probably would not have recovered to the supported level. However, Cochrane states that since export market programs were used in combination with domestic programs, exports of grain, oilseeds, and possibly meat and cotton would probably not have increased beyond the actual levels of the sixties. In other words, the export market programs were used to counter the impact of domestic programs on the export market by removing the implicit tax on the export market from domestic price supports.

During the seventies, rapid growth in world population and income, the devaluation of the dollar in 1971 and again in 1973, crop shortfalls, and the decision on the part of the Soviet leadership to begin importing large amounts of grain from the United States all combined to eliminate domestic surpluses of most agricultural commodities. The value of agricultural exports increased from $7.0 billion in fiscal year 1970 to about $43.8 billion in fiscal year 1981, and the volume more than doubled. A target-price and deficiency-payment program supported producer income during this period. This program permitted loan rates to be set at or less than world market levels and, thus, it represented an alternative to the export payments and high support prices that had been used up to this time. Market prices were supported by strong commercial demand and by U.S. programs to make the private sector more competitive in international trade. Barter, nonconvertible currency P. L. 480 sales, and export payments were phased out as the strong foreign demand substituted for these programs in meeting agricultural policy goals. Dollar credit was retained to facilitate increased export sales.

As demand strengthened, banks became more accustomed to country borrowings with Government guarantees and there was an increased supply of money from oil revenues (petrodollars) after 1973. As a consequence, the short-term direct credit program was changed to a credit guarantee program in the late seventies in order to reduce direct Federal outlays on credit. The Agricultural Trade Act of 1978 legislated expansion of the agricultural attache program and establishment of 6 to 25 trade offices around the world. Representation was elevated to the level of counselor in several cases. Authority for a revolving fund to finance agricultural exports was also legislated in the Agriculture and Food Act of 1981, but this provision was never funded.

Due to a number of factors, including world recession and a strong U.S. dollar combined with high U.S. nonrecourse loan rates, the value of U.S. agricultural exports declined from $43.8 billion in fiscal year 1981 to $39.1 billion in fiscal year 1982, with a further drop to $34.8 billion in 1983. By October 1983, CCC stocks of wheat and feed grains had increased to a record level of 140 million metric tons. Increased authorization for short-term credit guarantees, a new blended credit program, export payments, and sales of CCC stocks were implemented to increase exports.

EXPORT MARKET PROGRAMS AND FUTURE U.S. POLICY

The recent declines in U.S. agricultural exports have generated increased interest in policies to improve export performance (6). The ability of U.S. exporters to compete in world markets during the last 2 years has largely been constrained because legislated loan rate levels have prevented export prices from adjusting in response to the international demand situation and the strong dollar. The purposes of the recent export market initiatives are to offset the effect of the high value of the loan rate on the export market and

to permit U.S. exporters to make export sales to cash-short countries in a period of global world recession.

To improve export performance, agricultural policy can move either towards more reliance on market forces or towards increased use of export programs, which are an integral part of U.S. commodity management programs. However, there is a possible conflict between relying on a strict market-oriented policy and stabilizing farmers' incomes. Emphasis on a particular direction will affect the types of export market programs used as well as the strategy for their use.

Three alternative agricultural policy strategies are shown in table 5. Under a purely market-oriented strategy, exports are the primary determinant of farm income. Export demand expansion and market access policy instruments play a role in increasing long-term demand for U.S. agricultural exports. In this case, export market programs are the major policy instruments used to increase price and producer income. In the second strategy, producer income is supported through domestic commodity management programs. Export market programs are used as they were in the past to regulate demand and price in combination with domestic commodity programs.

The third strategy is an intermediate scenario in which the loan rate is responsive to market demand, but some domestic commodity programs are retained. In particular, the level of the target price will determine the extent to which income objectives are met. If the target price is reduced along with the loan rate, producer income will decrease if export demand is price-inelastic. On the other hand, if the target price is not reduced when the loan rate is reduced, Government expenditures will increase with the larger deficiency payments. To the extent that export demand expansion programs shift demand and raise the price level, increased expenditures on deficiency payments or the reduction in producer income will be lessened. Export policy instruments do not include export payments in this case since the reduction in the loan rate has the same effect on the export market as export payments. 12/ Export market programs are again the major policy instrument to increase price and producer income.

SUMMARY AND CONCLUSIONS

The appropriate use of export policy instruments depends upon policy objectives and the overall direction of agricultural policy in achieving these objectives. Policy objectives in the past have been to increase and stabilize producer income and to decrease Government expenditures. In the past, export market programs have been used to improve export performance in order to achieve these domestic policy objectives. Export market programs to expand export demand, such as credit and market development, and programs to lower the export price, such as export payments, have been used to reduce excess supply during periods of commodity surpluses. Demand expansion programs have also been used in periods of strong demand to further support the market price.

12/ However, the costs to the Government and to domestic consumers are different. When the loan rate is dropped, increased deficiency payments are paid on all of allowable supply and domestic consumers benefit from lower prices. The export payment lowers the price to the foreign consumer only, and is made on the proportion exported.

Table 5--Alternative agricultural policy strategies and the role of export policy instruments

Strategy	Policy instruments	Policy objectives: Producer income sources	Policy objectives: Government expenditures	Role of export market programs
Market-oriented	Export credit, market development, trade negotiations	From domestic or export market	Export programs	Expand long-term demand
Domestically oriented	Export market instruments noted above, export payments, deficiency payments (fixed loan rate and target price), supply and stock control	From commodity management programs; from export market in periods of strong demand	Domestic and export programs	Regulate demand and price in combination with domestic programs
Intermediate:				
Fixed target price	Flexible loan rate with flexible target price, export demand expansion	From domestic and export markets, reduced income from domestic programs	Reduced deficiency payments and expenditure on export expansion	Expand long-term market demand
Flexible target price	Flexible loan rate with fixed target price, export demand expansion	From domestic programs except in periods of strong export demand	Increased deficiency payments, export expansion	Expand long-term market demand

Given the changes in the international market in the past decade and the recent declines in U.S. exports, it is reasonable to assume that agricultural policy objectives may not remain the same. Any reassessment of the direction of agricultural policy and changes in policy objectives will involve an examination of the role of export market programs in meeting new policy objectives. It is clear that whether the strategy is market-oriented or domestically oriented, export market programs have a potential role to play.

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Resource Conservation Programs in the Farm Policy Arena

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ABSTRACT

Maintaining our agricultural productive capacity over time is the primary stated focus of soil and water conservation programs. To assess the role of these resource conservation programs in developing future legislation, an understanding is needed of the soil and water resource problems, the rationale for conservation spending, the historical evolution of the programs, and the effectiveness of current programs. This information can then be used to achieve greater efficiency in future conservation programs and to realize improved consistency between conservation and commodity programs.

KEYWORDS: Agricultural Conservation Program, commodity programs, conservation programs, consistency, cost-sharing, erosion, soil, soil and water resources.

INTRODUCTION

American farmers have combined the Nation's abundant soil and water resources with modern farm technology, purchased inputs, and skilled labor and management to form an extremely productive agricultural system. U.S. agriculture has been able to satisfy domestic and foreign demands for food and fiber, but the sector is burdened with surplus production and the public is concerned over the cost of Federal farm programs.

Under these circumstances, a number of questions are being raised. First, are Federal soil and water conservation programs really needed? Second, are current soil and water conservation 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? This article attempts to provide some insights and answers to these questions.

It is important to recognize that soil and water resource use will change gradually over time. Occasionally, there are temporary, dramatic changes in resource use such as occurred in 1983 under the Payment-in-Kind (PIK) Program, but such changes are the exception more than the rule. With anticipated conservation programs, commodity demands, and capital investments, no significant short-term changes in resource use are expected even if Federal soil and water conservation programs are modified. The productivity and environmental impacts of soil erosion and water use are gradual but cumulative over time. Schultz (15)

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has noted that society is preoccupied with shortrun supply shocks, but that longrun supply shifts may be far more significant. Similarly, long-term soil and water resource problems and solutions are far more important than the short-term issues, which can benefit from a long-term framework.

During 1985, Congress will develop legislation to succeed the Agriculture and Food Act of 1981. The 1981 farm bill included a "conservation title" that was not integrated into the legislative package. Ultimately, little of the title was implemented. Various interest groups have expressed a strong preference for an integrated conservation title in the 1985 farm bill. Given the importance of consistency between Federal programs for agriculture and the size of Federal expenditures to aid agriculture, an integrated soil and water conservation title has substantial public support.

This article begins by reviewing the nature of the resource problem and the rationale for Federal spending on soil conservation. It then considers the degree to which current programs maintain the longrun productivity of soil and water and the consistency between Federal conservation and farm commodity programs. The final section discusses some proposed modifications to better integrate conservation policies with other program objectives and to make them more cost-effective.

NATURE OF THE CONSERVATION PROBLEM

The public is clearly aware that soil and water resources are not unlimited and that the natural environment has limited capacity to absorb runoff without serious adverse effects. At the same time, recent shifts in the supply-demand balance for agricultural products have led to substantial excess capacity in farming.

Under these circumstances, should the public be concerned with the conservation of soil and water resources or with the adequacy of farmers' capacity to produce? Although we do not need to be concerned with current shortages, the Nation does need to sustain productive capacity to satisfy future domestic and export demands for food, feed, and fiber.

Our future productive capacity will depend on the judicious use of soil and water resources over time, the feasibility of substituting purchased inputs, such as fertilizers, for natural resources, and the rate of future technological change. Because purchased input prices may exhibit relative increases over time and continued technological progress is uncertain, heavy reliance on substitute inputs and technological progress is risky. Also, profligate water and soil resource use in the present and heavy reliance on purchased inputs and technology in the future may increase the adverse environmental impacts of nonpoint source pollution (that is, pollution which cannot be traced to a specific source).

Few would deny that we have soil and water use problems. But how these problems are described can make a big difference in how they are perceived and in what approaches are taken to solve them. For example, quoting average erosion rates and potential yield losses, either for the Nation or for individual States, is inadequate. Not all cropland is subject to productivity-threatening erosion. Erosion is a concentrated problem, threatening a relatively small portion of cropland, but in some regions more than in others.

Based on 1982 National Resources Inventory (NRI) data, which quantifies the seriousness of the soil erosion problem, only 7 percent of U.S. cropland was

eroding at rates that would pose a serious threat to longrun productivity. Table 1 provides an indication of the variation in average annual cropland erosion rates between States. To illustrate the variation in erosion rates within and between States, table 2 indicates the cropland acres eroding below tolerance or T (the rate that poses no threat to longrun productivity), between T and 2T, and greater than 2T. As Cook (3) discusses, the use of tolerance levels may overstate the problem. On soils having deep favorable root zones, the allowable soil loss of 5 tons per acre is arbitarily low. There is little if any scientific basis for a maximum 5-ton-per-acre tolerance level and only a very limited scientific basis for lower tolerance values. Additionally, economic considerations were not taken into account in establishing T values.

Similarly, declining groundwater levels are a serious problem in some irrigation regions, but not a universal problem. The data in table 3 indicate the irrigated area with declining groundwater supplies in the 11 major groundwater irrigation States in 1977. In addition, the rate of decline is highly variable within and between States. Some recharge is occurring in many areas, but generally at rates that are exceeded by withdrawals.

Although the jury is still out on the productivity impacts of soil erosion, recent research by USDA and others (5, 9) indicates that the productivity impacts of soil erosion may be less serious on most soils than initially hypothesized. Also, eroding soil and declining groundwater tables do not in and of themselves indicate the existence of a natural resource problem or the misallocation of natural resources over time in an economic sense. Given the relatively slow rates of soil genesis on many soils and water recharge in many aquifers, any erosion or pumping will reduce natural resource stocks. Society's goal is to allocate these resource stocks over time so as to maximize the well-being of current and future generations.

Although uncertainty about the future always surrounds such allocation decisions, market forces may be capable of achieving the desired allocation of soil and water productivity over time. For example, if farmland purchasers recognize the soil productivity consequences of soil erosion and adequately reflect these foregone earnings in their bids to purchase farmland, then the market will send signals to landowners with respect to the economic consequences of allowing soil to erode. On the contrary, if farmland purchasers ignore soil erosion impacts, society may infer that the market system is failing and that a more significant form of Government intervention is necessary to protect future soil productivity. Two studies (10, 11) that shed some light on this issue indicate that soil quality differences are reflected in farmland prices in Iowa and that the market valuation of soil quality characteristics (for example, topsoil depth or potential erosivity) reflects potential productivity losses. Although further research is needed to verify and extend these results, the initial results do indicate an important role for the marketplace in conserving soil resources.

The marketplace does not account for off-site impacts of soil erosion and groundwater mining. Such impacts may destroy fish and wildlife habitats, reduce recreational opportunities and flood protection, increase water treatment costs, reduce water availability for competing use, and contaminate water. There is public concern that these external effects are receiving inadequate attention. Because such externalities are ignored in market transactions, food, feed, and fiber prices do not reflect the true cost that the public is incurring for agricultural products. Future demands for control of soil erosion and groundwater use may come from groups who are adversely affected. This implies different program strategies to achieve specific policy objectives.

Table 1--Average annual cropland erosion from wind and water (sheet and rill)

State	Wind	Sheet and rill	Total
		Tons per acre	
Alabama	0	7.1	7.1
Arizona	3.3	.5	3.8
Arkansas	0	4.9	4.9
California	1.1	1.2	2.2
Colorado	9.3	2.2	11.5
Connecticut	0	2.8	2.8
Delaware	1.8	2.0	3.8
Florida	.9	2.0	3.0
Georgia	0	6.4	6.4
Hawaii	0	6.4	6.4
Idaho	2.9	5.0	7.9
Illinois	0	7.0	7.0
Indiana	.6	5.5	6.1
Iowa	2.7	9.4	12.0
Kansas	2.8	2.7	5.5
Kentucky	0	9.5	9.5
Louisiana	0	4.6	4.6
Maine	0	2.1	2.1
Maryland	.2	5.0	5.2
Massachusetts	0	2.1	2.1
Michigan	1.6	2.2	3.8
Minnesota	3.9	2.5	6.4
Mississippi	0	7.5	7.5
Missouri	0	9.8	9.8
Montana	8.3	1.6	9.9
Nebraska	1.3	5.2	6.5
Nevada	9.2	.1	9.3
New Hampshire	0	1.2	1.2
New Jersey	.1	5.7	5.8
New Mexico	5.2	1.3	6.5
New York	0	3.0	3.0
North Carolina	0	6.8	6.8
North Dakota	3.1	1.9	5.0
Ohio	.2	3.7	4.0
Oklahoma	3.3	2.2	5.5
Oregon	1.7	4.0	5.7
Pennsylvania	0	5.3	5.3
Rhode Island	0	2.5	2.5
South Carolina	0	3.6	3.6
South Dakota	2.7	2.6	5.3
Tennessee	0	10.0	10.0
Texas	13.1	2.6	15.8
Utah	2.5	.8	3.3
Vermont	0	1.3	1.3
Virginia	.2	6.2	6.4
Washington	2.1	4.8	6.9
West Virginia	0	2.6	2.6
Wisconsin	1.4	4.5	5.9
Wyoming	.7	1.0	1.7

Source: 1982 NRI.

Table 2--State distribution of average annual cropland erosion (sheet, rill, and wind) by T value, 1982

State	Less than T	Between T and 2T	More Than 2T	Share of cropland acres above 2T
		1,000 acres		Percent
Alabama	1,951	1,297	1,261	1.3
Arizona	1,007	56	142	.1
Arkansas	4,796	2,386	918	.9
California	9,584	309	623	.6
Colorado	4,120	2,122	4,359	4.5
Connecticut	189	27	27	1/
Delaware	644	114	56	1/
Florida	2,751	550	255	.3
Georgia	3,495	1,838	1,234	1.3
Hawaii	326	60	41	1/
Idaho	3,963	1,118	2,206	2.3
Illinois	14,500	5,506	4,720	4.9
Indiana	8,093	3,210	2,476	2.6
Iowa	7,390	7,822	11,228	11.6
Kansas	17,851	6,928	4,338	4.5
Kentucky	3,521	788	1,624	1.7
Louisiana	4,237	1,713	457	.5
Maine	485	156	111	.1
Maryland	1,125	342	327	.3
Massachusetts	261	15	20	1/
Michigan	6,677	1,798	967	1.0
Minnesota	10,192	7,831	4,999	5.2
Mississippi	4,405	1,545	1,464	1.5
Missouri	7,774	2,099	5,124	5.3
Montana	7,369	3,580	6,247	6.4
Nebraska	13,471	3,193	3,611	3.7
Nevada	114	23	55	1/
New Hampshire	81	4	4	1/
New Jersey	561	213	182	.2
New Mexico	1,562	300	550	.6
New York	4,295	818	798	.8
North Carolina	4,218	1,027	1,449	1.5
North Dakota	15,569	7,908	3,560	3.7
Ohio	8,477	2,429	1,540	1.6
Oklahoma	7,528	1,977	2,062	2.1
Oregon	2,364	656	1,335	1.4
Pennsylvania	3,682	839	1,375	1.4
Rhode Island	18	5	3	1/
South Carolina	2,879	394	304	.3
South Dakota	9,886	4,517	2,543	2.6
Tennessee	2,785	902	1,904	2.0
Texas	13,628	5,124	14,566	15.0
Utah	1,629	170	239	.2
Vermont	582	40	25	1/
Virginia	2,153	512	731	.8
Washington	4,097	1,576	2,119	2.2
West Virginia	969	45	78	1/
Wisconsin	6,728	2,498	2,229	2.3
Wyoming	2,275	197	114	.1

1/ Less than 0.1 percent.
Source: 1982 NRI.

HISTORICAL PERSPECTIVE

Natural resource conservation is not a new farm policy issue, but over the years the intensity of concern has heightened and its focus has shifted considerably. The need to conserve soil to maintain agricultural productivity of land was recognized in colonial times and was advocated by such leaders as Thomas Jefferson (13). However, it was labor rather than land that limited agricultural production possibilities in the 18th and 19th centuries. Land and water resources, a large share of which had never been tapped for agriculture, were viewed as greatly abundant. If soil was depleted on a given unit of land, there always was the opportunity to move westward and develop new land for cultivation. This was encouraged by the Homestead Act of 1862, which heavily subsidized private ownership and cultivation of new land. This historical period might be considered an "Age of Apparent Abundance" with respect to natural resource perceptions and policies.

Enter the Great Depression of the early thirties, accompanied by severe drought, and public awareness of soil erosion and water availability suddenly increased. Farmers, particularly those in the Great Plains, suffered relatively more from the depression than did many other members of the society. Public sympathy for the farmers' plight was great. Public opinion with regard to agriculture focused on farm income, unemployment, and soil loss, and was fueled by graphic depictions of destitute farm families fighting the duststorms on their drought-stricken land. Similar concerns with income and unemployment in all sectors of the economy led to the election in 1932 of Franklin D. Roosevelt and the initiation in 1933 of Roosevelt's New Deal programs.

The first publicly financed conservation project was authorized by the National Industrial Recovery Act of 1933. This act, which established the Civilian Conservation Corps, initiated an effort to jointly ease unemployment and reduce soil erosion by employing large numbers of people to carry out conservation projects on Federal land. During that same year, $5 million was allocated to the Department of the Interior to conduct research on soil erosion and use

Table 3--Areas irrigated by water source in 11 major groundwater irrigation States, 1977

State	Total irrigation	Total groundwater irrigation	Groundwater decline area irrigated
		1,000 acres	
Arkansas	1,698	1,400	407
Arizona	1,150	940	734
California	8,190	4,388	1,814
Colorado	2,470	1,650	570
Florida	2,918	1,076	250
Idaho	3,934	1,149	150
Kansas	3,158	3,083	1,995
Nebraska	7,165	5,855	1,842
New Mexico	1,240	760	560
Oklahoma	951	730	507
Texas	8,900	7,846	6,425

Source: (17).

relief labor to demonstrate soil conservation practices to managers of private as well as public land. In 1935, this program was made permanent through passage of the Soil Conservation Act, responsibility for the program was shifted to the USDA, and the Soil Conservation Service (SCS) was established.

Concurrent with the initiation of a strong Federal role in soil conservation were efforts to adjust agricultural production and thus to stabilize prices. The first attempt at this objective, the Agricultural Adjustment Act of 1933, was judged by the U.S. Supreme Court to be unconstitutional in 1936. This act's replacement, the Soil Conservation and Domestic Allotment Act of 1936, closely correlated soil conservation objectives with production adjustment goals. It gave USDA's Agricultural Adjustment Administration responsibility for implementing a "temporary" program. The program established a soil-depleting base (defined as total acreage of intensively cultivated row crops) and a soil-conserving base (defined as acreage devoted to grasses, legumes, green manure, and certain other crops as of 1935) for each participating farm (13).

Program participation was voluntary. Farmers were offered direct payments for shifting acreage from soil-depleting to soil-conserving crops, and cost-share assistance for soil conservation practices was provided. The focus of this program was on production adjustment. Its linkage with soil conservation was the fact that the crops that, in their then-current locations, presented the greatest threat of erosion also were the crops for which production adjustments were required. Whether contrived or purposeful, this program maintained a close integration of soil conservation and commodity production objectives. Its implementation ushered in the first of several brief historical periods of close commodity and conservation program consistency. The luxury of acreage set-asides for conservation purposes is easily afforded during such times of surplus. However, due to changes in farming practices, economic conditions, program provisions, and public opinion, the consistency between commodity and resource conservation programs has deteriorated considerably since World War II.

Throughout the late thirties and early forties, SCS programs provided soil conservation technical assistance, as they continue to do today. Since 1937, SCS has provided technical and financial assistance to farmers for flood control and the development of water resources as well. The Agricultural Conservation Program (ACP) administrated by the Agricultural Adjustment Administration and its successors (now the Agricultural Stabilization and Conservation Service) also continues to function. But, where prior to World War II ACP mainly was used to divert land from soil-depleting crops, its postwar primary role has been in cost-sharing farm-level implementation of conservation practices. Increased demand during the war years required that additional land be brought back into production, thus negating the production-adjustment advantages of reserves.

By the late forties, problems with surplus production and low farm prices recurred. The Agricultural Act of 1949, which remains the permanent legislative basis for today's farm programs, addressed this problem by devising a system of price supports for major food and feed grain crops, cotton, and dairy production. Surplus problems persisted into the fifties. In 1953, the USDA tried to eliminate production-oriented practices from those that could be cost-shared through ACP. But Congress denied this change, maintaining some linkage between production and conservation programs. In 1956, a new coordination of commodity and conservation goals was attempted through the Soil Bank Program. Farmers entered long-term (3- to 10-year) contracts under which they were paid to divert crop acreage into conservation uses. The Great Plains Conservation Program, also authorized in 1956, entitled farmers in the drought-susceptible Great Plains to contract with USDA for a period of 3 to 10 years to cost-share the application

of long-term conservation practices, including reversion of cropland to permanent grassland. The Soil Bank Program terminated in 1958, and by 1972 all acreage conserved in the "bank" was eligible for recultivation. The Great Plains Program continues today and is authorized through 1991.

The last 25 years have been characterized by increased divergence between Federal commodity and resource conservation programs. Program provisions require only that land placed in set-aside or diversion programs be protected from erosion by the planting of an appropriate cover crop. The Food and Agriculture Act of 1965 further refined the role that acreage reduction of any kind could play in production adjustment. By the early seventies, when export demand for U.S. agricultural products surged, there seemed no need for production restrictions. In fact, farmers were encouraged, both as stated policy and through strong price supports, to "plant fence row to fence row." This they did. Now we find ourselves again in a situation of overproduction.

While farm program administration has become more specialized to achieve different goals, so too have conservation programs become more focused on single objectives. The 1977 Food and Agriculture Act restricted provision of ACP assistance to land on which an identified resource problem was demonstrated to exist. The 1980 act went further in stating that "(ACP) cost-sharing will not be used for carrying out measures that are primarily production-oriented or that have little or no conservation or pollution benefits" (20).

The refined specification of Federal conservation programs arose in part from criticism that the now almost 50-year-old SCS and ACP programs were not cost-effective in reducing soil erosion (20). Congressional scrutiny of the programs led in 1977 to the initiation of the Soil and Water Resources Conservation Act (RCA). Under RCA, resource problems were to be documented, past programs evaluated, and current programs improved. The RCA process has broadened the base of popular support for soil and water policy decisionmaking. But the focus of current public opinion, unlike that of the thirties, is more on the off-site damage and long-term consequences of soil erosion.

Thus, at the present time, U.S. agricultural price and production programs are divorced from resource conservation objectives, and agricultural resource conservation programs have become isolated from price and production goals. We are in an "Age of Divergence".

The basis for heightened concern in this Age of Divergence may be illustrated by recapping the history of commodity and conservation policy for a hypothetical unit of land in the Great Plains. It is entirely possible that a plot of land in this area was first cultivated under subsidization through the Homestead Act in the late 1800's. In the early thirties, the land was likely decimated by drought and wind erosion, becoming unproductive. In 1936, the landowner might have been paid with public funds to replant the land to grasses. In the early seventies, the owner, encouraged and supported through a variety of agricultural programs to cultivate the land for production of export crops, likely adopted irrigation to increase productivity, and began drawing down groundwater levels. Currently, both price support and disaster payments may be going to the owner to encourage continued production on this vulnerable land, but ACP or Great Plains program payments may also be going to the same owner to prevent soil erosion and water depletion during this period of overproduction. It is no wonder that the public is raising questions regarding consistency between programs.

CURRENT CONSERVATION PROGRAM EFFECTIVENESS

Current conservation programs, as we have seen, grew out of the era of depression and the dust bowl. Given the need for economic relief and recovery, soil and water conservation programs were organized to spread benefits among as many farmers as possible, reduce soil- and water-depleting (surplus) crop production, and improve farm incomes. Over the last 50 years, however, the economic structure of agriculture has changed considerably while only limited changes have been made in conservation programs. Consequently, the programs have come under increasing criticism for a number of shortcomings.

First, conservation practices are not being applied to the most severe problem areas. For example, the 1980 Agricultural Conservation Program Evaluation (19) found that 52 percent of erosion control practices were installed on lands eroding at less than 5 tons per acre per year. On many soils, up to 5 tons is considered tolerable and not threatening to longrun cropland productivity. Moderate erosion threats (5-14 tons per acre per year) were occurring on 9 percent of the sample farmland, which was receiving 27 percent of the soil conservation practices. Lands suffering serious erosion threats accounted for 84 percent of the excess erosion, involved only 4 percent of the sample farmland, and received only 27 percent of the practices. The American Farm Bureau estimated in 1981 that "less than 5 percent of the total SCS budget is . . . being utilized to finance erosion control measures on cropland with an excessive erosion problem" (20).

Second, much concern has been expressed over the cost-effectiveness of current soil and water conservation programs. Previous studies raise some serious questions about the efficiency of current program initiatives. Table 4 indicates the distribution of Federal soil conservation expenditures that can be allocated to the State and regional level, the percentage of U.S. cropland eroding in excess of two times tolerance level, and the share of U.S. cropland gross erosion in the 10 major agricultural regions. Although there is some disagreement over the comparability of the estimates, the sheet and rill (water-based) erosion estimates are combined with the wind erosion estimates

Table 4--Distribution of 1983 soil conservation expenditures and 1982 NRI soil erosion estimates

Region	Share of Federal soil conservation expenditures	Share of total cropland with erosion exceeding 2 T	Share of of total gross erosion
		Percent	
Northeast	8.7	2.8	2.3
Lake States	8.0	8.5	8.3
Corn Belt	18.4	26.0	25.4
Northern Plains	10.8	14.5	17.0
Appalachian	13.1	6.0	6.0
Southeast	10.6	3.2	1.7
Delta States	7.0	2.9	4.1
Sothern Plains	12.3	17.1	19.4
Mountain States	5.6	14.2	12.6
Pacific	4.3	4.2	3.3

to compare the distributions of conservation funding and soil erosion. The distribution of cost-sharing and technical assistance expenditures among States does not reflect the distribution of soil erosion among States. Additionally, the distribution of conservation funds by States has witnessed few significant changes over the last 50 years, in spite of major shifts in the location of crop production and erosion problems (16).

The ACP Evaluation (19) also found significant variation in the average cost of erosion practices cost-shared by the ASCS in the sample counties. The average cost of saving a ton of soil over the life of a practice ranged from $14.87 per ton on cropland eroding less than 5 tons per acre to $0.22 per ton on cropland eroding at rates over 50 tons per acre. The study concluded that over three times as much erosion control could be achieved with effective targeting of the same conservation expenditures.

A current payment limit of $3,500 per farm spreads the benefits of conservation financial assistance over a larger number of farms but may reduce program efficiency. Again relying on the ACP evaluation sample of farms and the $2,500 payment limit that existed when the evaluation was completed, farms under 300 acres comprised 71 percent of farms and 17 percent of the farmland, and they received 65 percent of the cost-sharing practices. Farms over 500 acres comprised 16 percent of farms and 72 percent of land but received only 20 percent of the practices. Soil conservation needs are more likely to be correlated with land area than with farm numbers.

Finally, the environmental impacts of soil and water use in agriculture are receiving inadequate attention in current soil and water conservation programs. The highest priority of these programs has been to maintain a productive agricultural resource base. But efforts to conserve soil and water do have significant impacts on stream and lake water quality, stream flows, and groundwater drawdown. These impacts may enhance fish and wildlife habitat, increase recreational opportunities, and produce other amenity benefits. However, efforts have not emphasized targeting financial and technical assistance toward improvement of environmental quality.

The SCS and the Agricultural Stabilization and Conservation Service (ASCS) do have major efforts underway to respond to efficiency and allocative concerns. They have modified current programs to target technical and financial resources to problem areas, to reallocate the conservation funds among States based on conservation needs, and to focus program initiatives on priority problems identified through ongoing program evaluation activities (18). These program adjustments have increased the cost-effectiveness of soil and water conservation activities, but additional gains remain to be realized. Also, efforts are underway to identify the magnitude of the environmental impacts associated with water and soil use in agricultural production.

RELATIONSHIPS AMONG CURRENT COMMODITY PRICE, FARM INCOME, AND RESOURCE CONSERVATION PROGRAMS

There is no inherent inconsistency between the objective of stabilizing commodity prices to assure adequate farm income, and the objective of reducing excessive erosion on agricultural land to levels that maintain the long-term productivity of soil resources and improve water quality.

The current programs designed to achieve them, however, are not coordinated and have a tendency to work at cross-purposes. The principal mechanism inducing

inconsistencies is the positive effect of Federal commodity, loan, and crop insurance programs on the relative economic attractiveness of crops covered by these programs. This, in turn, may induce production patterns that are inconsistent with soil conservation and water quality goals.

Three sets of characteristics determine soil loss from or water depletion on a given site: (1) the physical and climatic characteristics; (2) planting and crop management decisions determing what and how crops are cultivated, and (3) investments in durable capital goods that affect soil conservation (such as terraces) or water use (such as irrigation facilities).

Farm policies and programs have no effect on inherent physical and climatic factors. Policies and programs that affect the relative price or relative production risk of alternative crops strongly influence crop management decisions, including the area and location of production for program crops. Policies and programs that increase farm income and credit availability may affect the extent to which long-term conservation and irrigation investments are made.

Price supports, target prices, nonrecourse loans, acreage reduction programs, subsidized crop insurance, disaster payments, Farmers Home Administration (FmHA) emergency loans, and current export policies all have one thing in common: each increases the economic attractiveness of covered commodities relative to commodities not covered by the program or considered by the policy.

Land set-aside and deficiency payments provide direct income benefits to farmers participating in commodity-specific acreage reduction or other price support programs. Because these programs maintain or increase the market prices of the commodities to which they apply, nonparticipating farmers also benefit, albeit indirectly, through the programs' price-enhancement effects, because they can plant full acreage without restriction and still reap the benefits of high and stable prices. The expectation of high, stable prices may encourage widespread production of price-supported commodities by program participants and nonparticipants alike.

Subsidized crop insurance, disaster payments, and FmHA loan availability help participating farmers by reducing the probability of financial disaster during bad crop years or under poor cropping conditions. These programs, too, make production of program crops more attractive relative to commodities without similar risk-reducing advantages. Such programs also allow crops to be produced in locations that might otherwise be considered too risky. If an individual farmer has choices in deciding what, where, and how much of various commodities to produce, direct and indirect program benefits will naturally be taken into consideration when making planting and crop management decisions. The sum of individual farmers' planting and crop management decisions, as influenced by farm program incentives, subsequently affects soil-erosion and water-use rates. Two implications of this relationship for resource conservation are:

- o program crops generally are more erosive than commodities receiving less support (table 5), and
- o the availability of farm program benefits encourages cultivation of marginal lands subject to soil erosion and water shortages.

Farmers engaging in production of cotton, corn, grain sorghum, wheat, small grains, and rice are eligible to receive deficiency, diversion, or disaster payments when enrolled in available commodity programs. All of these activities,

plus soybean production, also are eligible for subsidies through nonrecourse loans and Federal all-risk crop insurance. With the exception of dairy farmers, producers engaged in activities involving grassland, hayland, range and pasture, and forest and tree-crop land uses are not eligible for commodity program benefits. Because program crops are relatively more erosive than nonsupported production activities (table 5), increased soil erosion may unintentionally result from farmers' response to farm program incentives.

Land that has thin layers of topsoil or is otherwise marginally suited for cultivation generally has lower value and requires higher input costs to be effectively utilized for crop production. Land of this type also is associated with higher rates of soil erosion. Likewise, land that is located in areas subject to drought (such as the Great Plains) carries relatively high production risk. It also is subject to periodic wind erosion and water shortage hazards. Subsidized production and emergency loans to farmers, subsidized crop insurance, and disaster payments, by providing the economic means for recovery from poor cropping conditions, may encourage production on land relatively more subject to high rates of soil erosion or groundwater use.

The basic, conceptual incompatibility of the production of program crops with soil and water conservation is aggravated by current commodity and conservation program provisions and administration. Specifically:

Table 5--Agricultural land uses, erosion potential, and eligibility for major direct farm program benefits

Relative erosiveness 1/	Land use or production activity 2/	Eligibility to receive-- Deficiency, diversion, and disaster payments	Nonrecourse loans	Federal all-risk crop insurance 3/
1	Cotton	X	X	X
1	Soybeans		X	X
2	Corn	X	X	X
2	Grain sorghum	X	X	X
3	Wheat	X	X	X
3	Barley	X	X	X
3	Oats	X	X	X
3	Rice	X	X	X
4	Grassland			
4	Hayland			
4	Range and pasture			
4	Forest and tree crops			4/

1/ 1 = most erosive, 2 = moderately erosive, 3 = less erosive, 4 = least erosive.
2/ Specialty and miscellaneous crop production is not included since the relative erosiveness of crops in those categories can range from high (for example, tobacco) to low (for example, vineyards).
3/ FCIC all-risk crop insurance is available in locations where disaster payments are not made in conjunction with commodity programs.
4/ FCIC all-risk crop insurance is available for some forage and seed enterprises and tree fruit producers in a few U.S. counties only.

- The direct and indirect income benefits of producing commodity program crops are available to farmers regardless of the soil erosion on their land.

- Current commodity program provisions discourage long-term conservation uses of land by denying base-acreage status to land not recently used to produce program crops.

- USDA soil and water conservation cost-share and technical assistance programs, while generally targeted towards regions that typically experience resource problems, are not targeted towards those cropping systems most likely to induce high rates of erosion and water-supply degradation.

- The voluntary nature of soil and water conservation programs favors implementation of conservation practices for productivity gains rather than for reduction of off-farm consequences of erosion and water depletion.

Some commodity program participants who have erosion problems apply conservation measures to reduce soil erosion to acceptable levels. Others, however, till erodible soils without conservation measures. Since commodity programs are not linked with resource problems, the latter group enjoys program benefits at the same time that it contributes to soil erosion problems. This group's participation in commodity programs helps achieve commodity price objectives but adversely affects achievement of conservation goals.

Land set-aside features of supply control programs require participants to maintain a "normal crop acreage" base. The base is used to calculate set-aside payments when a paid land diversion option is implemented. Basically, the larger the base, the greater a participant's potential payments. Grassland that has not been cultivated within 3 years cannot be counted as part of this base. Thus, some farmers who practice longrun soil conservation strategies may not be eligible for certain commodity program benefits. This feature of current commodity programs may encourage continuous cultivation of some land areas.

While in recent years both SCS and ACP funds have been better targeted towards those areas that have the most severe resource problems, funds within these areas still are not allocated on the basis of severity of individual applicants' soil or water conservation problems. Selection criteria are not tied to cropping systems which help maintain land productivity or measures of erosion or water quality.

Public clamor for improved soil and water conservation at this time focuses more on environmental than productivity issues. Evidence suggests that the costs of off-farm erosion damage are much higher than the costs of lost productivity (4). If program participants are active in conservation primarily for productivity benefits, the major, off-farm benefits may not be accruing to the extent possible.

The extent to which participants in USDA programs contribute to the Nation's soil erosion problems must be known before the success of various options for increasing program consistency or policy goal achievement can be judged. Accordingly, USDA collected information linking soil erosion rates with farm operators' USDA program participation histories for a sample of cropland points in critical soil erosion areas.

The USDA study examined eight areas of the country in which critical cropland erosion problems are concentrated (fig. 1). For each of a random sample of 2,882 NRI points from 68 counties within these study areas, SCS data on the sum of sheet and rill erosion plus wind erosion estimated for 1982 were compared with ASCS and SCS data on USDA program participation and other characteristics of operators of the land on which the samples fell. Program participation information included the history of operators' participation in Federal conservation programs administered by ASCS and SCS, as well as their enrollment in commodity programs.

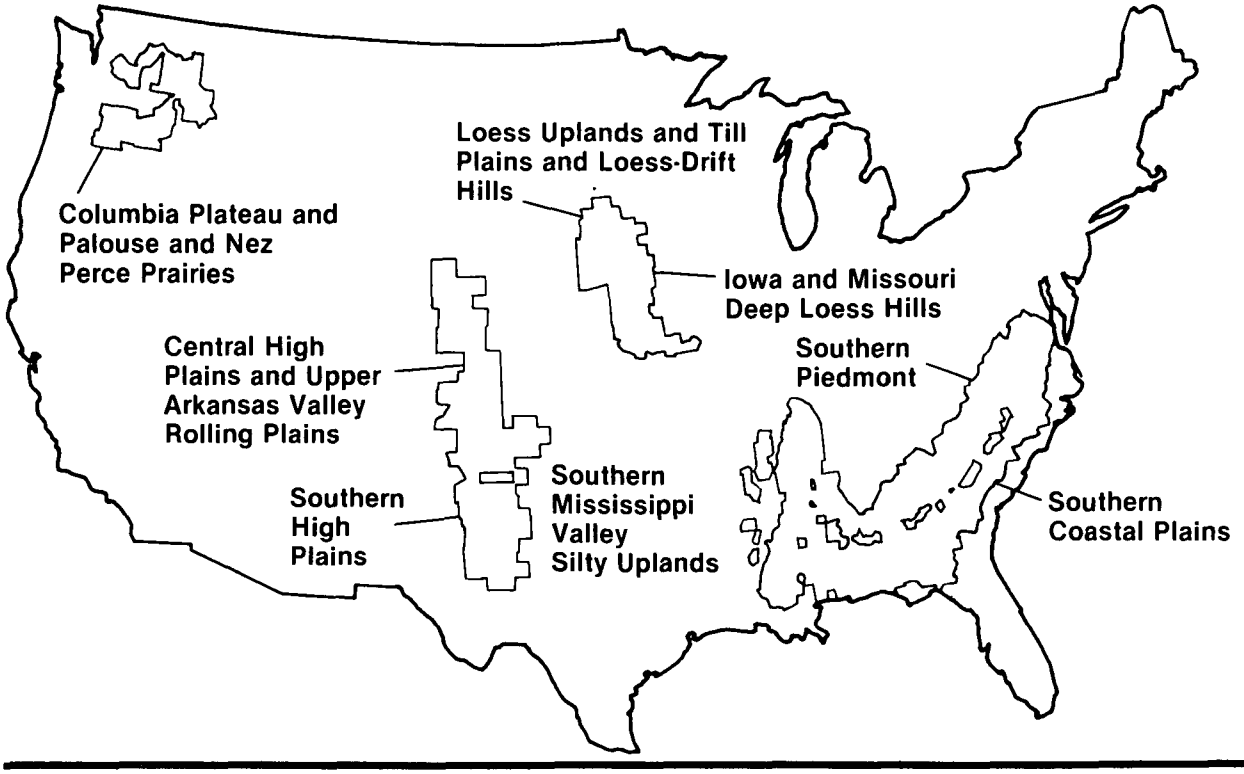
More than half the sampled cropland points in the critical erosion study areas eroded more than 5 tons per acre per year, the rate considered tolerable on average, to maintain the longrun productivity of most U.S. soils (table 6). By contrast, only about 34 percent of total U.S. cropland erodes above the 5 tons per acre per year.

In the study areas, 62 percent of the 1982 cropland eroding above 5 tons per acre per year was operated by individuals participating either in commodity or USDA conservation cost-share or technical assistance programs in that same year (table 6). The other 38 percent of the operators of land eroding above 5 tons per acre per year were neither commodity nor conservation cost-share nor technical assistance program participants.

The common, overriding characteristic of highly eroding land in the eight areas was that the land was most frequently on farms producing food grains, feed grains, or cotton--the major commodity program crops. High erosion rates commonly occurred on land operated by young farmers (under 40 years of age). High erosion in the study areas also occurred more frequently on land of

Figure 1

Location of Study Areas Covered by USDA Program Consistency Study Data Assembly



operators whose primary source of operating loans was FmHA or a Production Credit Association, as opposed to those who borrowed from commercial sources. Land operated by short-term tenants in the study areas was more likely to be eroding at high rates than that of owner-operators or tenants with long-term leases.

Commodity and conservation program participation in the study areas was distributed fairly evenly between land eroding above and below 5 tons per acre per year. Concurrent participation of commodity program participants in conservation programs was slightly lower on land eroding above 5 tons per acre per year (table 6).

About 45 percent of the sampled cropland was operated by commodity program participants (some of whom also participated in conservation programs). Of this land, 58 percent was eroding above the tolerable level. However, 42 percent of commodity program participants maintained tolerable rates of soil loss, even though a majority of these operators did not participate in conservation cost-share or technical assistance programs (table 6).

Compared with national averages, the critical erosion areas studied contained higher proportions of land eroding above tolerance levels, acres in commodity programs, and funds available for Federal conservation programs. Recognizing this bias and adjusting for year-to-year program variation, the following deductions may be made 1/:

1/ The estimates presented here differ from preliminary estimates published in (14), because updated data on 1982 commodity program participation were used to derive final deductive estimates.

Table 6--Participation by farmland operators in USDA commodity and conservation programs, by soil erosion levels in eight critical erosion areas, 1982

1982 program participation	Land eroding below 5 tons/acre/year	Land eroding above 5 tons/acre/year	Total, all cropland sampled
	Percentage of all operators in areas sampled		
Commodity program only	11.6	16.2	27.8
Both commodity and conservation programs	8.0	9.0	17.0
Conservation programs only	7.1	7.0	14.1
Neither type of program	19.0	22.1	41.1
Total	45.7	54.3	100.0
	Percentage of operators in erosion category		
Commodity program only	25	28	
Both commodity and conservation programs	17	18	
Conservation programs only	16	16	
Neither type of program	42	38	
Total	100	100	

- Within any given year, roughly 40 to 65 million acres of U.S. cropland eroding above 5 tons per acre per year are operated by participants in USDA commodity and/or conservation cost-share or technical assistance programs.

- Individuals participating in neither commodity nor USDA conservation cost-share nor technical assistance programs operate between 75 and 110 million acres of cropland eroding at rates greater than 5 tons per acre per year.

- Roughly 65 to 105 million acres of U.S. cropland are operated by USDA program participants and erode at rates below 5 tons per acre per year.

- Between 150 and 230 million acres of U.S. cropland erode at rates below 5 tons per acre per year and are operated by individuals participating in neither commodity nor USDA conservation cost-share nor technical assistance programs.

It appears that, in a given year, between one-half and three-fourths of cropland eroding above the 5-ton-per-acre-per-year level is operated by individuals who are not participating in commodity or USDA conservation cost-share or technical assistance programs. These farmers would not be directly influenced by changes in conservation or commodity programs designed to reduce erosion or increase program consistency. The remaining one-fourth to one-half of the erosion problem, in terms of acreage with erosion exceeding 5 tons per acre per year might, however, be addressed through modifications in USDA's commodity or conservation programs. The extent to which operators of this problem acreage might be influenced by program changes is not clear.

There are two distinctly different types of cropland erosion problems: (1) the problem of poorly managed land on which erosion could, with proper crop choice and conservation practices, be maintained at tolerable levels, and (2) the problem arising from cultivation of inherently erodible land (2). The groups of farmers contributing to erosion problems in each of these two ways may react differently to given commodity or conservation program changes. Each group responds to various economic incentives.

Many things other than farm programs affect farmers' behavior. Federal programs outside USDA, such as tax provisions, influence farmers' choices regarding type and intensity of operation. General economic conditions strongly affect farmers' decisions. Research in the Palouse region of the Pacific Northwest indicates that while deficiency payments and set-aside programs have strengthened disincentives to conserve soil, it is basically the strong relative prices of grains relative to livestock that create the incentive to intensively cultivate land. Farming erodible land in that area still would offer profit advantages in the absence of the opportunity to participate in farm programs (7). Similar results are suggested in recent studies of the grassland plowout phenomenon in Montana and Colorado. The decision to cultivate rather than to conserve erodible land, while supplemented by the availability of farm program benefits, is driven by relative commodity prices and land values (8, 21).

FUTURE DIRECTION OF RESOURCE POLICY

Various interest groups are advancing new policy options to achieve increased soil and water conservation. Some options are designed to improve current

conservation policies while others are meant to accomplish both farm commodity and conservation program objectives. In this section a few of the more prevalent proposals will be highlighted and their consequences summarized.

First, expanded targeting of conservation spending within the context of current conservation programs would improve program cost-effectiveness. SCS and ASCS efforts to target cost-sharing funds and conservation technical assistance have increased program efficiency. For example, the average cost per ton of sheet and rill erosion reduction under ACP declined from $2.22 during the 1975-78 period to $2.05 in 1983 (19). Soil and water conservation efforts are significantly greater in targeted than in nontargeted areas. Also, the cost-effectiveness of given conservation practices is higher in the targeted areas. More improvement in program effectiveness would be possible if more restrictive criteria were used in targeting. There is wide variability in erosion rates within even the most erosion-prone areas. Improved targeting could focus on reduced usage of production practices that present the greatest erosion hazards. Individual farm types and locations of erosion hazards could be targeted not just to areas, but within them. However, more intensive targeting could increase program administrative costs.

Developments that should permit improved targeting include the information advances made through the recent NRI inventory and modeling activities such as EPIC. Critical erosion can now be identified, and the net value of the productivity loss associated with soil erosion can now be estimated. These developments could permit SCS and ASCS to implement a productivity-based targeting scheme for the Nation's cropland to achieve greater program effectiveness and efficiency. However, targeting does nothing to insure consistency with other USDA programs. If targeting schemes were to focus on crop production systems, the efficiency of conservation programs would be increased. But the farmers receiving the largest share of targeted funds to maintain cropland productivity are more likely to be receiving commodity program incentives to produce.

Second, to reduce the inconsistencies between conservation and other USDA programs, cross-compliance initiatives, such as the "sodbuster" provision, have been proposed. Such provisions may require a farmer to implement a conservation plan for the farm as a requirement for commodity or credit program participation or may disallow commodity program participation for cropland or whole farms if certain erodible soils are cultivated. These proposals could lead to greater consistency between programs, but may also have some less desirable impacts. They may prevent programs from achieving their participation objectives. For example, farmers on erodible cropland who wish to participate in commodity programs will incur more substantial conservation costs. The costs of commodity program participation may exceed the potential benefits unless substantial increases in cost-sharing funds are made available. Also, the consistency study described in the previous section indicated that a significant share of farmers do not participate in commodity programs. Linking conservation assistance to commodity programs could ignore a large population of farmers whose land or production practices contribute to aggregate soil erosion or water depletion problems. Nonparticipants also benefit from supported commodity prices, which provide incentives to all producers to expand irrigation (6) and plowout rangelands to grow program crops.

Third, an integrated conservation and commodity program approach is being advocated by various groups (1). The approach uses long-term retirement of erodible cropland both to reduce soil erosion and enhance commodity price levels. As Ogg, Webb, and Huang (12) discuss, a number of potential options are available

in designing such a program. Three conservation reserve options were studied, each compared to a base solution which limited crop production below 1982 levels in various regions of the country. Crop prices were set equal to their respective 1985 target price. The results tended to indicate that the least productive cropland could be retired to achieve the commodity price objectives, but unfortunately, the erosion control impacts would be limited because the most erodible cropland is not necessarily the least productive. Another option would be to retire the most erodible cropland. While the reduction in erosion would be substantial, the reduction in surplus productive capacity might not be sufficient to accomplish commodity price goals within current budget constraints.

If land retirement is targeted to highly erodible cropland removed from production on a competitive-bid basis, it may be possible to satisfy farm income objectives and make a significant contribution toward conservation goals. Such a program could retire over 20 million highly erodible acres, cost approximately $1 billion, reduce soil erosion about 20 percent, and achieve commodity price objectives. The least-cost retirement option would reduce program costs over 10 percent but would only reduce soil erosion by about 12 percent and accomplish the same commodity price objectives. If the 20 million most erodible acres of cropland were retired into a conservation reserve, program costs would be over 35 percent above the targeted option but total soil erosion would decline over 30 percent. Also, the commodity price objectives would not be achieved, even though significant price adjustments would occur. The long-term land retirement approach could be extended to conserve scarce groundwater supplies in the Ogallala Region and similar drawdown areas.

While an integrated approach may offer one means for realizing consistent, effective, and efficient farm commodity and conservation programs, markets and market signals in soil and water use decisions may also be helpful in guiding future program decisions. For example, past farm commodity programs have artificially constrained the land input, raised its relative price, and induced the development of land-saving technologies. In turn, these relative price distortions alter the profit-maximizing combinations of production inputs as well as the bias of technological development. If such distortions are removed, market prices for soil and water resources can be used as signals of resource scarcity, indicators of profitable input substitution opportunities, and inducements for technological change. From such information the need for and role of conservation programs in allocating soil and water resources over time might be ascertained.

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III. EMERGING AGENDA

Alternative Tools and Concepts

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ABSTRACT

A moving average of past prices allows loan rates to adjust to changes in market trends, yet provides a safety net for farmers. The development of options markets and the legalization of trade options would be important to the commercial viability of revenue insurance for individual crop producers. Revenue insurance would not necessarily involve income transfers to producers. However, income transfers could be linked to transactions dealing with insurance of individual producers' revenue. An alternative could be joint producer and Government activities providing income "assurance" to a group of producers as contrasted to insurance for individual producers.

KEYWORDS: Agricultural policy, commodity options markets, moving-average loan rates, price and income support, revenue insurance.

INTRODUCTION

It is apparent that the blend of farm programs now in place has worked with mixed results. That should come as no surprise considering the diverse character of the farm sector and the dramatic changes that have taken place in both our domestic economy and world markets for agricultural products.

Proposals for new commodity legislation often fall into three categories: (1) finetuning or modifying existing programs, (2) adapting new ideas within the framework of current programs, or (3) drafting new concepts with new goals. This article offers examples of proposals currently being discussed which fall into each category. The first is a suggestion to implement price support based on a moving average of past market prices--a moving-average loan rate. In a different thrust altogether, the second example describes a support structure based on trading options, an idea that explicitly transfers risk to willing participants in the market. And, in an attempt to preserve the existing program framework, the last example blends a new concept of revenue insurance with the constraints and guidelines offered by the crop insurance program and a similar concept used by the Canadian Western Grain Stabilization Board. All of the proposals have their pros and cons; their value lies in shedding new light on perennial policy questions.

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MOVING-AVERAGE LOAN RATES

Several criteria have been used over the years to establish nonrecourse commodity loans, such as parity, cost of production, and, more recently, minimum levels set by the Congress. Since relatively inflexible loan levels set in legislation can easily fall out of line with eventual market trends (as with the loan rates specified in the 1981 act), interest has grown towards establishing a flexible rule that would be used to announce loan rates before each crop year. One such rule receiving increased attention is basing loan rates on past movements in market prices.

Rationale for a Moving-Average Loan Rate

The rationale for basing loan rates on a moving average of past market prices is that the marketplace represents the most efficient means of sending farmers the proper production and resource allocation signals. Loan rates should serve as a price floor only in those instances when prices fall substantially below expected longrun market trends. Supporting farm commodity prices above market-clearing levels over a period of years often leads to an accumulation of stocks with the subsequent need for additional policy tools to limit production, such as acreage diversion programs. Another major problem of relatively high and rigid loan rates set above market prices is that they place an implicit tax on U.S. exports, causing the U.S. export market share to be reduced. In raising the price that foreign consumers must pay to acquire U.S. commodities and thereby reducing the quantity they purchase, foreign producers are provided an incentive to increase production. These outcomes can involve increased U.S. consumer and Government expenditures.

If loan rates are to be announced in advance of farmers' production decisions, one way to avoid domestic and foreign market interference is to set loan levels in accordance with long-term market-clearing levels. But, it is not always possible to correctly anticipate future price trends because of the uncertainties associated with production and international markets. A moving average has been suggested as a method of following long-term movements in farm prices. While this article concentrates on setting nonrecourse loan rates according to an historical moving average, the principle could also be applied to direct purchase and other types of price and income supports.

In general, a moving-average loan rate for a particular crop equals a specified percentage of an average of past market prices. Qualifications include the specified percentage, the number of past annual or seasonal market prices to be covered, and how the average should be computed. For example, the loan rate could be based on 75 percent, 85 percent, or some other percentage of a moving average of past market prices. The past 3 or 5 years of season-average prices, or 5 years excluding the prices of the highest and lowest years might be used. Thus, the concept of a moving-average loan is highly flexible, depending on the time period used, the weight or percentage applied to past prices, and the decision to include all or some prices during the specified period. Futhermore, the concept can be applied to individual commodities on a national or regional basis. Some people also suggest that a lower limit be specified to restrict how low a moving average loan rate could fall.

Compared to relatively higher, more rigid loan levels, setting loan rates using a moving average of prices can have several advantages:

- Loan rates are more market oriented.

- Support rates are less likely to hinder U.S. competitiveness in export markets.

- Loan rates are available to eligible producers as a safety net and yet are less likely to act as a rigid floor for extended periods of time.

- The tendency for relatively high and inflexible loan rates to be capitalized into the value of fixed assets is reduced.

- Less political influence is exercised in setting loan rates.

There are potential disadvantages as well:

- Loan rates that react only to past market prices do not account for current or anticipated market conditions. For the moving-average rule to reflect future marketing conditions, the Government would be required to project commodity prices. If current prices were used as a basis for loan rates (for example, an average of the first 5 months of the marketing year as with deficiency payments), the loan rate could not be announced until after farmers had made their production decisions.

- Loan rates can exceed the cost of production and long-term market prices when a period of short supplies and high commodity prices is followed by a period of excess supplies and low market prices. However, basing loan rates on some fraction of past prices and excluding price extremes would most likely minimize the extent of market interferences.

Past Experience with Moving-Average Loan Rates

The Agriculture and Food Act of 1981 includes provisions for setting loan rates for soybeans and upland cotton using past movements in market prices. Beginning with the 1982 marketing year, the loan level for soybeans is 75 percent of the simple average price of soybeans received by farmers over the preceding 5 years, excluding the high and low years. The minimum soybean loan rate is $5.02 per bushel. However, when the market price exceeds the loan rate by 5 percent or less, the Secretary may reduce the loan level as much as 10 percent, but not below $4.50 per bushel.

Loan rates for upland cotton are set at the lower of either 85 percent of the preceding 5-year moving average of spot market prices for upland cotton, excluding the high and low years; or, 90 percent of the average Northern Europe c.i.f. price of cotton quoted for the 15-week period beginning July 1 of the year in which the loan level is announced. The minimum is $0.55 per pound.

The minimum loan rates for soybeans and cotton specified in the 1981 act have been above the levels determined by the formulas since 1982 for soybeans and since 1983 for cotton. Hence, the effectiveness of these formulas has not truly been tested.

Alternative Moving-Average Rules

Several forms of a moving average are possible. Figure 1 compares actual corn prices received by farmers for 1960-83 with the loan rates which would have occurred if they had been set at 100 percent of three different moving-average

loan rate formulas (3 years, 5 years, and 5 years excluding high and low prices). Figure 2 illustrates a similar set of loan rates for wheat. The corn and wheat examples of the relationship between farm prices and 100 percent of these moving-average loan rates are indicative of what the relationships would have been for other crops. However, caution should be used in interpreting the historical period, because if loan rates had been calculated as a moving average, then the market prices also would likely have been different. This is especially true during the midsixties and late seventies when 100 percent of the moving-average loan rates illustrated in figures 1 and 2 would likely have supported market prices above their actual levels for wheat and to a lesser extent for corn.

For 1960 to 1970, all three moving-average formulas gave similar results. That is, it made little difference in the loan rate if 3 or 5 years were chosen as the basis for loans. But in the seventies, the loan rates diverge. A 3-year moving average tends to overreact to sharp increases or decreases in commodity prices. Using a 5-year average with the high and low years excluded caused lower loan rates than a simple 5-year moving average following a series of unusually high prices (for example, 1975) and higher loan rates after a sharp downturn in market prices (for example, 1978). Thus, in a market characterized by highly variable prices, excluding high and low years from the moving average offers farmers more stability and hence, a slightly higher safety net during periods of a sharp decline in commodity prices. If in fact a 5-year moving average excluding high and low prices had been used from 1960 to 1983, the calculated percentage weight that would have ensured that market prices would have been equal to or above the loan rate every year was 84 percent for corn and 68 percent for wheat. The lower weight for wheat is due to a relatively low farm price in 1977. Ignoring 1977, the percentage weight for wheat would have been 87 percent. If a 3-year moving average had been used, these calculated weights would have been 79 percent for corn and 67 percent for wheat.

Potential Impacts of Moving-Average Loan Rates

Based on assumptions about yields, production, and use, the impact of a moving-average loan for corn and wheat for the 1986-90 crops can be illustrated using two examples (4). Alternative I uses a loan rate based on 75 percent of a 5-year moving average of past market prices, excluding the high and low years (table 1). Alternative II sets loan levels based on 75 percent of a 3-year moving average. No minimum is imposed in either alternative. Each alternative is compared to a situation which assumes that current programs continue until 1990. In the continuation of current programs case, loan rates for wheat and corn are fixed at $3.30 and $2.55 per bushel--equal to those announced for the 1985 crops--until 1990. Target prices are also maintained at their 1985 levels. Both a 20-percent acreage reduction program (ARP) and a 10-percent paid diversion program are assumed to be in effect for wheat. Corn assumes a 10-percent ARP and a 10-percent paid diversion program. Trend yields are used in each alternative.

Results presented in table 1 are an average of estimates for the 1986-90 crop years. Setting loan rates at 75 percent of a 5-year moving average excluding the high and low years or using a 3-year moving average, with no minimums imposed in either case, results in lower average loan rates for wheat and corn than if loan rates had been frozen at their 1985 level until 1990. Lower average price supports allow prices to adjust to market trends. As farmers make production decisions more in accordance with market prices than with Government loan rates, average production declines somewhat. Lower market prices also help to increase the quantity of wheat and corn exported. With lower average production and higher average exports, ending stocks also decline in the flexible price support

Figure 1

Alternative moving average loan rates for wheat

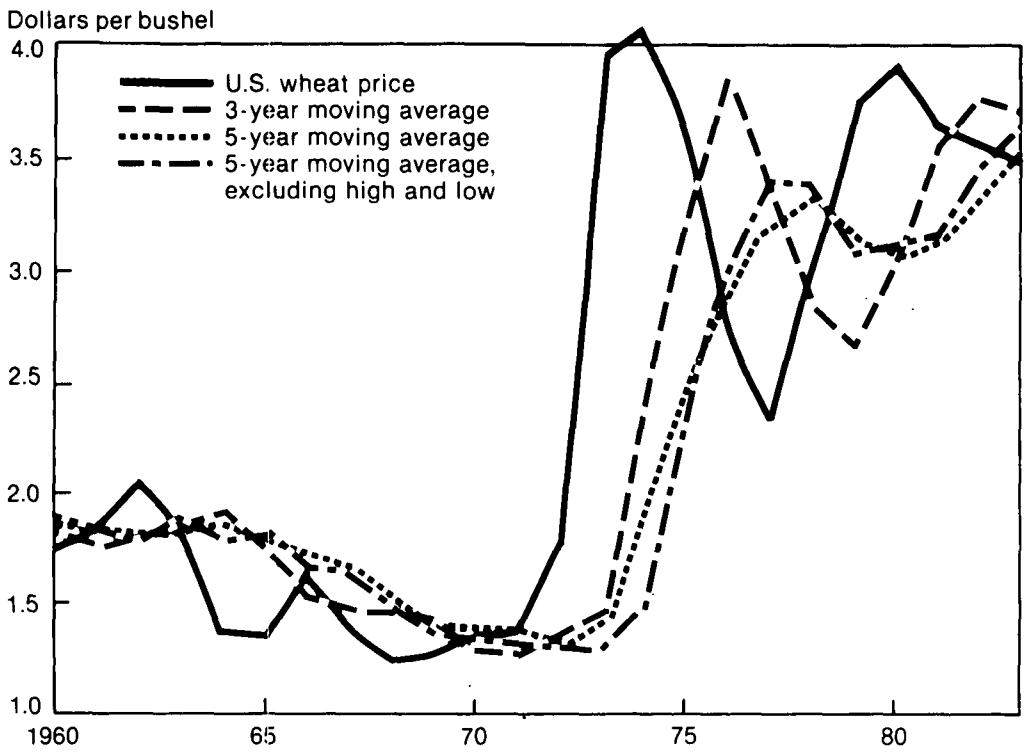
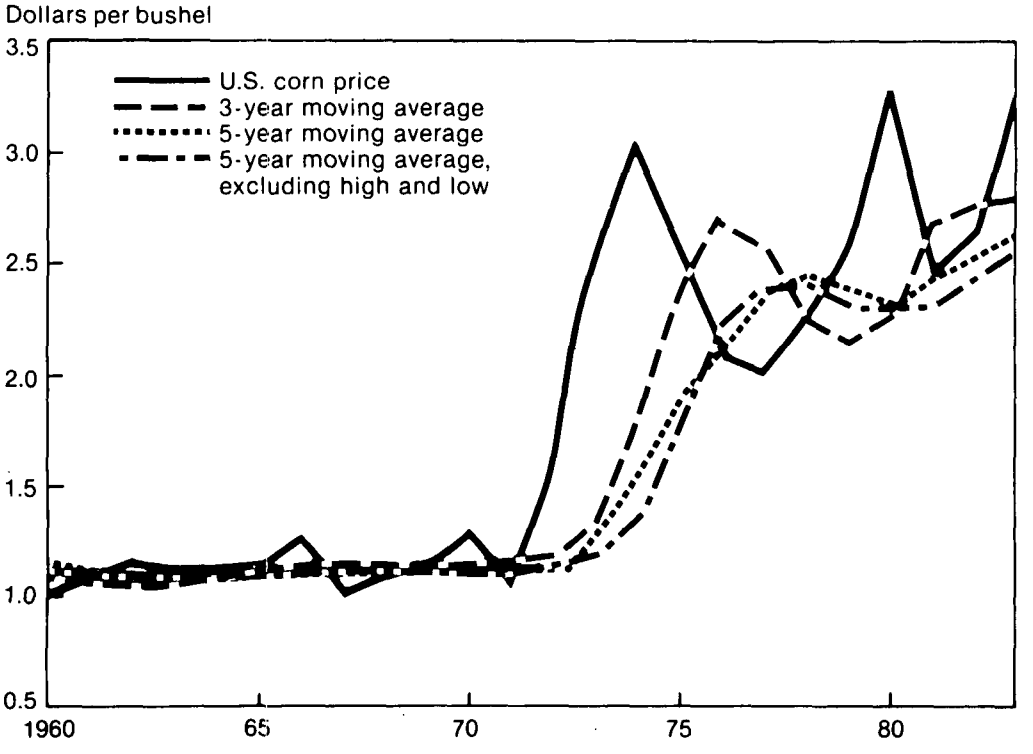


Figure 2

Alternative moving average loan rates for corn



alternatives, compared to the base alternative that fixes loan rates at their 1985 level. Deficiency payments increase under these assumptions because target prices were fixed in this analysis. In general, a 3-year moving average formula was found in this analysis to result in lower average price supports for wheat and essentially the same for corn, compared to a 5-year average excluding the high and low.

Conclusions

These two illustrations have several implications. First, setting a lower bound under the formula-determined loan rates could have a significant effect. For example, floors above $2.34 for wheat or $2.02 for corn under the 3-year moving average would tend to reduce the flexibility of the moving average adjustment rule, on average.

These examples also imply that allowing the moving-average adjustment rule to operate without lower bounds would tend to help expand exports and reduce the need for Government stock accumulation. At the same time, the absence of minimum loan rates increases the likelihood of periodic large direct Government deficiency payments by widening the difference between loan rates and target prices (assumed to be fixed at their 1985 levels). Tying target prices to market trends would tend to lessen this possibility.

Closely related to the question of minimum loan rates is the percentage weight to be used in the adjustment formula. Only one weight--75 percent--was used in these examples. The assumption that acreage limitation programs would be used also was important, since if they were not in place, increased production would likely have resulted in lower market prices and, hence, the possibility that the estimated loan rate occasionally would become the effective price floor.

Table 1--Simulated results for wheat and corn, averaged over the 1986-90 crop years

Alternative	Loan rate	Farm price	Production	Exports	Ending stocks	Deficiency payments
	Dollars per bushel		Million bushels			Million dollars
			Wheat			
Continuation of 1985 programs	3.30	3.41	2,714.2	1,499.9	2,535.7	1,282.1
5-year 1/	2.45	3.10	2,669.5	1,573.5	2,145.7	1,755.2
3-year	2.34	3.07	2,662.4	1,582.0	2,082.6	1,817.9
			Corn			
Continuation of 1985 programs	2.55	2.88	8,314.1	2,340.0	2,447.7	877.0
5-year 1/	2.01	2.74	8,211.6	2,390.9	1,764.9	1,610.4
3-year	2.02	2.74	8,217.8	2,388.1	1,819.5	1,569.4

1/ Excludes the high and low years.

OPTIONS MARKETS FOR AGRICULTURAL COMMODITIES

Trading in options for major domestic agricultural commodities started in the fall of 1984. This trading expands a pilot program which permits trading of options on futures of world sugar, gold, and Treasury bonds. 1/ Among the issues raised by these developments, two are especially relevant to farming: the possible interaction between options markets and U.S. farm commodity policies, and whether arrangements will be made for "trade options" (put and call type contracts transacted by private parties, not on a licensed exchange).

Any institutional change raises questions concerning its compatibility with present institutions. Thus, it is appropriate to ask if trading in farm commodity options would be compatible with current price support programs and with transfers from the public to individual producers such as deficiency payments.

Premiums on options contracts could reflect a variety of institutional arrangements. For example, the combination of exercise prices (that is, strike prices) and premiums with the Government facilitating the withholding of 50 million acres from production would be different from the combination of exercise prices and premiums if the Government were not involved in such activities. The availability of price supports would influence the probability distributions of prices, alternatives available to producers, and therefore, the combination of exercise prices and premiums in the options markets. In fact, provision of price insurance by the public, such as with price supports, could erode interest of farm producers and commercial traders in option markets and contribute to a perceived "failure" of the pilot program.

Current Status of Options Trading

The initiation of options trading in the fall of 1984 came after nearly half a century during which trading in options was banned or limited. The impetus for the 1936 ban on trading in options on domestic agricultural commodities was an attempt in 1933 to manipulate the wheat futures market in which options were involved. This ban did not prohibit trading by Americans in options on commodities in other countries. However, scandals in the United States involving options on London futures occurred in the seventies, early in the life of the newly formed Commodity Futures Trading Commission (CFTC). In turn, practically all options trading was administratively banned. The pilot programs for sugar, gold, and T-bonds, and now domestic agricultural commodities, represent a relaxation of these earlier bans. Under these pilot programs, each organized commodity exchange in the United States will be permitted to conduct trading on futures options for two domestically produced commodities for a trial period of 3 years.

Options Markets and U.S. Farm Commodity Policy

The role of options is narrower and much more limited than the role of commodity programs. Options markets will not generate net market prices different from those warranted by supply and demand conditions. Writers of options are not in business to transfer income. They do accept risks of changing supply and demand conditions and related changes in the expected prices, but they accept these risks at a "price"--the premium they receive in compensation for writing the options. Therefore, option markets have some characteristics that are similar

1/ Readers unacquainted with options trading may want to see (3) or read the explanatory appendix at the end of this article.

to those we generally associate with insurance. Risks are transfered and premiums are paid and received.

Essentially, options markets deal with the intramarketing-year risk that prices at a later time will be different from current market prices. In practice, exchanges are expected to initiate trading of options with strike prices that approximate the current prices of the corresponding futures contracts. As the prices of futures contracts adjust over time in response to supply and demand conditions, exchanges are expected to initiate trading of options with correspondingly different strike prices. Thus, put options simply will not be available at strike prices inconsistent with supply and demand conditions. As supply and demand conditions change, prices may be below strike prices for currently traded put options. In such cases, the premium for the put will reflect the differences between the strike price and prices of the futures contract to which the option is linked.

Price support programs also involve transfers of price risks and as Gardner (2) points out, they essentially involve put arrangements. The public, through a government agency, accepts the risk of prices being below price support levels. However, there are two important differences between options and price supports. First, price supports are provided without cost or at a "minimal cost" to producers, such as diverting acreage from production. In contrast, options are not free and the premium of the option is a market determined value of the price insurance provided by the option.

Second, price support levels generally have not been selected to approximate market conditions. Instead, price supports have often been designed primarily to transfer income. Historically, when market conditions resulted in downward pressure on prices, steps have been taken to place stocks of the commodity under Government control, to restrain the use of resources, and to expand product demand in order to protect the levels of price support.

In times of Government stock accumulation, price support levels probably have been higher than market-determined options exercise prices would have been. Obviously, the market system could set exercise prices equivalent to current support prices. However, the premiums for such options would reflect the difference between expected market prices consistent with anticipated market supply and demand conditions and the exercise prices incorporated in the options contracts.

The operation of price support programs could have adverse effects on the operation of options markets. The volume of trading on options markets will be heavily dependent on price variability of corresponding futures markets. The greater the variability of prices, the greater the risk of price changes, and the greater will be the interest by producers and trade firms such as merchandisers of grain in seeking price risk protection. Therefore, if commodity programs substantially limit price changes, potential buyers of calls and puts have little interest in dealing in options. Similarly, producer interest in buying, say, puts would be influenced by the availability and level of price supports, as would the interest of potential writers of puts. The volume of futures trading declined significantly in the fifties and sixties as large Government stocks limited price fluctuations.

The specific rules for options trading and the selection of commodities for trading will influence the success or failure of the options pilot program for domestic agricultural products. But the success or failure will also be geared

closely to the expected variability of prices of the corresponding futures contracts.

The Importance of Trade Options

The extent to which most producers can benefit from options markets could well be related to the rules the CFTC devises for "trade options." Past scandals have created great wariness about trade options, however, and the CFTC has deferred decisions about them. Abuses and scandals developed when individual traders absconded with premiums collected from customers. The danger is that the sellers of the options may have neither offsetting positions in the options or futures markets to protect themselves financially, nor the capital to carry the risk. These are some of the reasons why the CFTC insists that the trading of options be done on a licensed exchange and that the transactions pass through clearinghouses.

However, unless arrangements can be worked out whereby intermediaries between producers and options writers can legitimately buy puts (for example) and then resell them to producers, the benefits to producers will be limited to producers who are sufficiently large that they can afford to deal in options markets through brokers. As in the futures markets, most producers seem unlikely either to devote the resources to understand options trading or to produce enough to economically deal in options on the exchanges. On the other hand, they may find it advantageous to deal in an options-type arrangement (trade options) with the local elevator or other buyer.

If and when trade options are permitted, the "use" of options by producers may be similar to the "use" of futures by producers. Some producers, but not many, trade directly in futures markets through brokers. Many more use the futures markets indirectly when they arrange forward sales contracts with their local elevators. The managers of local elevators are able to conclude the forward contracts at reasonable margins because they can hedge the purchase of the cash commodity in the futures markets.

Options may be more attractive to producers than futures because of the "known" nature of the transaction and the cost associated with it. As stated above, the purchase of an option provides a very specific right to the purchaser and for a price which is fixed at the time of the transaction. In contrast, with futures contracts, price changes can lead to margin calls even if combined price movements of the cash commodity and the futures position do not result in financial losses. Margin calls are inconvenient and disliked.

At the same time, it is important that some perspective be maintained with regard to the use of options markets. Paul (6) argued, in commenting on Gardner's paper on options (2), that conceptually the use of futures could accomplish producer objectives as well as the use of options could accomplish them. However, farmers have not used futures in the ways to which Paul refers. Also, insurance companies have not developed price insurance programs based on such techniques.

Options markets could be relevant to the possible commercial offering of revenue insurance for individual producers. There is no known way to develop actuarial standards for price changes. Consequently, even if it were legally possible to do so, insurance companies might not seek to assume the speculative role that is necessary to cover the price component of revenue insurance. On the other hand, the availability of an options market would make it possible for insurance companies to write policies for crops that would insure against price as well as yield losses. The risk of price losses could be transferred to writers of

options through the options markets, while the risk for yields could be retained by the insurance companies, as many do now.

And to repeat, trade options would facilitate producer use of options through an intermediary such as the local grain elevator. They could thus be important to the prospects for commercialization of revenue insurance. However, an insurance policy with a clause or rider on price losses, as opposed to yield losses specified at a price, is construed as a trade option and is presently illegal.

Possible Use of Options by Farm Producers

There are two types of circumstances in which producers may want to buy options as an extension of their farming activities. One would be as part of a marketing strategy for commodities produced and owned by the producer. Buying a put--the right to sell--would be an alternative way to transfer risk and might be more attractive than forward contracting or hedging the commodity in the futures market.

For example, imagine a corn producer who in April anticipates production of 10,000 bushels of corn in October, available for delivery in December. Suppose further, that in April the price for forward-contract December delivery is $2.25 per bushel, and that a December corn futures put option has an exercise price of $2.25 and a premium of 20 cents per bushel. These conditions implicitly say three things: (1) some people are willing to pay 20 cents for the right to sell December futures at $2.25; (2) some others are willing to sell ("write") this option for 20 cents and undertake the responsibility to buy December corn futures at $2.25, if buyers of the put options decide to exercise their option; and, (3) the 20-cent premium equates the number of put options demanded (purchased) with the number of put options supplied (written).

The producer could forward contract, but then would have to forgo the opportunity to sell corn above $2.25 per bushel. Further, there is some risk as to whether the producer would actually have 10,000 bushels to sell. A producer unable to fulfill the contract for 10,000 bushels would have to make up the shortfall at the market price. In contrast, the producer might be willing to pay $2,000 (20 cents times 10,000 bushels) for the right to sell the 10,000 bushels at $2.25. In doing so, the risk (on 10,000 bushels) of prices going below $2.25 is transferred in exchange for $2,000; the opportunity to realize gains from prices going above $2.25 is retained, and the obligation to deliver 10,000 bushels as with the forward contract is avoided.

Another circumstance in which a producer might want to buy options would be as part of a purchasing strategy for buying commodities to feed livestock. Buying a call--the right to buy--may be an attractive way to transfer the risk associated with possible price changes for the commodity. And, as with the previous example, it might be more attractive than forward buying or hedging in the futures market by buying a futures contract.

Imagine a cattle feeder in April anticipating the need for 10,000 bushels of corn in December. Assume market prices as above and a premium for a $2.25 December futures corn call options of 20 cents per bushel. The feeder could forward contract, but then would have to forgo the opportunity to buy corn at prices below $2.25, if they should occur. In turn, the feeder might be willing to pay $2,000 for the right (but not the obligation) to buy the 10,000 bushels at $2.25 per bushel.

Conclusions

There are two types of circumstances in which farm producers might want to buy options as an extension of their farming activities. Producers of farm commodities could buy a put as a way to transfer risk of price declines, or might want to buy a call to transfer the risk of price increases for feedstuffs.

The volume of trading on options markets will be heavily dependent on price variability of corresponding futures markets. The greater the variability of prices, the greater the risk of price changes, and the greater will be the interest by producers and trade entities, such as merchandisers of grain, in seeking price risk protection. Therefore, if commodity programs are operated in ways that substantially limit price changes, the risk from such changes will be limited. In turn, potential buyers of calls and puts would have little interest in dealing in options.

Unless arrangements can be worked out whereby intermediaries between producers and options writers can legitimately buy options and then resell them to producers, the benefits of options to producers will be limited. However, there is great wariness about trade options and the CFTC has deferred a decision to approve them. In addition, options markets and related trade options have great relevance to the possible commercial offering of revenue insurance for individual producers, as the risk of price losses could be transferred to speculators through the options market.

REVENUE INSURANCE

Revenue insurance for farmers is usually viewed as allowing individual farmers to pay premiums in exchange for the opportunity to receive indemnities if their individual revenues from selected crops are less than the insured amounts. Discussions often include the possibility of the Government contributing a portion of the indemnities.

Since the value of crop production of farm producers consists of two components, quantity produced and price received, there are several ways in which revenue-type insurance might be specified. For example, programs could be in terms of insurance against:

1. loss of yield at designated or selected prices as is done with the current Federal Crop Insurance Corporation (FCIC) program;

2. price shortfalls for designated or selected yields;

3. shortfalls of value of production (price times production);

4. loss of yields plus price shortfalls (1 and 2 above); or,

5. loss of yields plus value-of-production shortfalls (1 and 3 above).

The second option, price shortfalls, and the third, loss in the value of production, will be examined here.

The current crop insurance program uses prices but only to value yield losses. Prices are specifically agreed upon when the policy is written. Crop insurance is essentially for yield losses below selected percentages of the yield history

for the individual producer. Premiums are, in turn, linked to the percentage of yield protection desired and the price selected by the producer.

Suppose a corn producer chooses $2.50 a bushel and the insurance policy calls for protection against shortfalls of yields below 90 bushels per acre. With an actual yield of 70 bushels, the payment would be $50 per acre (20 bushels times $2.50) regardless of the market price for corn. In contrast, the producer would receive no payment if the yield was 90 bushels or more, even if the price was below $2.50. Thus, while the FCIC uses commodity prices, there is no price or revenue protection unless the yield falls below the insured level. And then the price and related revenue protection apply only to that portion of the crop represented by the difference between the insured level and the yield. This distinction between the way price is used in present yield insurance programs and the fact that price shortfalls would be "insured" with revenue insurance is critical.

Status of Proposals

Revenue insurance has received increased attention in recent years. In 1980, Schuh (8) proposed a subsidized income insurance program whereby individual producers of crops could select a percentage of their individual normal yield and a price for which they wish to be insured. Impressed with the balance between commodity demand and supplies in the seventies, he argued that, "The secular income problem arising from excess labor in agriculture is essentially behind us." However, he anticipated a ". . . severe problem of instability, and a problem of rural poverty associated with disadvantaged families and regional stagnation." The proposal for insurance is related to the first of these conditions, income instability (8, p. 14). The Agriculture and Food Act of 1981 directed the Secretary of Agriculture to appoint a task force to study the "concept of farm income protection insurance." The report of the task force released in the summer of 1983 recommended that a farm income insurance program not be substituted at the present time for "all Federal agricultural support programs." But, it did recommend that a pilot program providing income insurance be initiated for 3 years (9).

In the meantime, a report on "Farm Revenue Insurance" was released by the Congressional Budget Office in August 1983 (10). It concluded that, in spite of many difficulties, revenue insurance is worth exploring. It suggested that the Congress authorize studies of program design and approaches to implementation. And, based on these studies, Congress could ". . . authorize a pilot revenue insurance program in selected areas or crops."

Prospects for Commercial Revenue Insurance for Individual Producers

The prospects for the commercialization of revenue insurance relate in large part to price risks 2/. Development of actuarial data for prices, as distinct from actuarial data for yields, is particularly difficult. Probability distributions for commodity prices are substantially different from probability distributions for yields. For example, probability distributions for future yields are applicable to specific geographic areas and specific crops. These distributions are sufficiently stable over time so that commercial insurance firms have

2/ This discussion is oriented to commercial insurance in order to point up the unique financial implications of income insurance for the entity (private or public) that writes the insurance, as well as those who are insured. See the 1983 USDA report of the Task Force for a discussion that starts from the premise that the public underwrites the program and a Government agency administers it.

translated them into actuarial standards applicable to individual crops grown by individual producers on particular parcels of land. These standards can, in turn, be used as a basis for specifying insurance premiums for selected levels of production and related indemnities.

In contrast, the probability distribution of the price of a particular commodity in the future is unique at any specific point of time. It changes over time as weather and other conditions affecting demands and supplies change. Further, since markets over wide geographic areas are closely linked together, price losses could be more widespread than is the usual case for yield losses.

In addition to the need to be able to anticipate the probability distribution of prices, potential insurers of prices would have to deal with the extent of interdependence of losses among those insured and over time. An insurer, by writing crop yield insurance over a wide area, can generally avoid risk of widespread losses. In contrast, if corn prices dropped below insured levels, price insurance policywriters would simultaneously incur claims over large market areas. In addition, prices in one time period have some influence on the following year's prices through adjustments of inventories.

The price insurability issue is also related to various institutions and their actions. For example, decisions on price supports, loan levels and related program provisions affect the behavior of prices. Further, random production outcomes and administrative events may lead to policy changes. For example, low prices typically have affected policy program decisions. State trading agencies abroad have not always responded to price changes in the expected way. The combination of these considerations could suggest that commercial insurance companies could only provide indemnities linked to market prices if there were some way for them to transfer the price risk associated with the insurance policies that they write. Unless this was possible, the risk to the insurer of widespread losses associated with prices could be quite large. These possible losses are related to the inability to predict prices, the behavior of institutions, and the effect of institutions on prices.

Compatability of Revenue Insurance for Individual Producers and Options Markets

Effectively operating commodity options markets and legalizing trade options could facilitate the transfer of price risks from insurance companies to others. Thus, they could make important contributions to the success of revenue insurance activities by commercial insurance companies. An insurance system against price shortfalls for selected yields might work as follows: Suppose the current market price for corn is $3.00 per bushel. Suppose, also, that producer A wishes to have insurance that the price for 20,000 bushels of grain will be at least 100 bushels per acre. Responding positively to such a producer, a commercial insurance company writes an insurance policy with the corresponding commitments.

In turn, the insurance company buys corn puts that correspond to the $2.50 insured price. The premium paid by the producer to the insurance company for the insurance policy would reflect the actuarial standards for yields for the particular farm plus the premium for the put option plus related administative costs. With this approach, the yield risk is transferred from the producer to the insurance company. The company "carries" the yield risk because the related premiums can be based on actuarial standards. In contrast, the price risk is shifted from the producer to the insurance company and then to the speculator who writes the put option. In the event that prices go below $2.50, the put

would increase in value, generating profit for the insurance company which, in turn, would offset the payment of price indemnities by the company to the farmer.

This approach, as outlined, does not encompass income transfers from the public to producers. It deals with yield and price risks and the commercialization of the transfer of these risks. The U.S. insurance industry has had substantial experience with placing values on the transfer of yield risks. The premiums required by commercial companies for yield insurance are indicative of the economic value of this transfer. We are less certain about how to place values on the transfer of price risk. However, the premiums for risk of price change from then-current levels are likely to be sizable.

The premiums for combined yield and price risk may be greater than many producers would be willing to pay for the protection offered. They might prefer to carry such risks themselves and their creditors might permit them to do so.

Government Subsidies of Revenue Insurance

A variety of arrangements could be utilized to subsidize commercial revenue insurance if it were deemed appropriate to do so. Reimbursement of insurance companies for all or some portion of the indemnities associated with price shortfalls is one possible approach. Such an approach would essentially involve the merger of yield insurance with selected price protection features of present support programs.

Alternatively, government could share the costs of premiums paid by producers who buy insurance containing price protection features. Payments could also be made to those who are willing to write put contracts in options markets which, in turn, facilitates the writing of insurance policies that provide commodity price protection.

Insurance of Producers as a Group

Revenue insurance is usually thought of in terms of insuring individuals. However, it has been suggested that this concept could be extended to focus on the possibility of assuring a group of producers as a whole for a given level of total revenue or net income. The Western Grain Stabilization Program of Canada performs this function 3/. The program assures participating farmers as a group that their combined net cash receipts in any one year will be at least equal to the average of the past 5 years. This assurance is the same regardless of the participation in the program. If the estimated net cash receipts indicate that a payout is necessary, individuals draw from a pool of money in proportion to their contribution to it.

For purposes of this paper, the important parts of the Canadian program are that:

- the assurance is to a group, not to individuals,
- participation is self-selecting, limited to producers who make the required contributions,

3/ Some features of the Canadian program and, in turn, the description in this paper of a possible revenue assurance program are similar to those developed by Norton and Working (5, 12), and by Froker in the forties (1). See also Vertrees (11).

- the Government contributes $2 for each $1 contributed by producers, and,

- contributions of individual producers in turn serve as the basis for distribution of benefits among producers.

Participating individual producers contribute 2 percent of their first $60,000 of gross marketings with a maximum contribution of $1,200. The Canadian Government also contributes to the pool at the rate of $2 for each $1 contributed by producers. The drawings from the pool are set so that the drawings plus the net cash receipts realized in the market are equal to the assured level of net cash receipts for the participants as a group. Producers who do not contribute do not receive payments from the pool.

It is important to recognize that the payout is tied to marketings. Production not marketed, such as when export markets for Canadian grain do not "permit" marketings of all production, is not considered in calculations; nor are the costs of producing the unmarketed grain.

In years when no payout from the pool is made, the money is carried into following years. If claims are greater than the pool, money is borrowed from the Government and repaid from pool receipts in following years. Contribution levels are adjusted over the long run to reflect the status of the pool.

From the start of the program in 1976 to January 1, 1983, the Canadian Government contributed $568 million (Canadian) and producers $284 million (Canadian). Distributions to producers were $368 million (Canadian).

A similar approach to the Canadian program might be possible in the United States. If desired, it could be designed to maintain gross revenue rather than net cash flow, as it does in the Canadian program. Producers would contribute regularly to a pool according to their individual farm receipts (up to some maximum, if desired) and draw from the pool in the years in which receipts of all producers are below the targeted level. The Government, in turn, might match the producer contributions or, as the Canadian Government does, contribute $2 for each $1 of contributions by producers.

Several decisions would be involved in addition to the relation between producer and Government contributions. The more important ones would concern the commodity coverage and the institutional arrangement for administering the pool or pools.

Establishing separate pools for major individual or groups of commodities would appear to be most consistent with present U.S. farm programs. For example, there there might be separate pools for cotton, wheat, feed grains, and rice. Alternatively, there could be a single pool covering several commodities. The more inclusive the commodity coverage, the less likely that the program would stifle adjustments among products by producers.

Producer groups, however, might be more interested in individual commodity pools. The administrative arrangements for producer contributions, procedures for distributing pool resources, and the amount of the public contribution to the pool would be important in any event. The assurance could be in terms of percentages of historic gross receipts or net incomes. For example, payments from the pool could be triggered if receipts for specific commodities dropped

below, say, 80 percent of the average of the previous 5 years 4/. Boards consisting of public officials and producer and consumer representatives might oversee the administrative decisions and procedures for collecting and distributing pool resources.

With the assurance to the group as a whole, individual producers would have the incentive to be as efficient as possible in their production and marketing activities, since only the average price to all would be supported. Benefits from the program to an individual producer would not be affected significantly by actions of that individual. Self-selection through contributions by producers and tying benefits to these contributions would lead to less administrative requirements than with current price support and diversion programs. However, this type of approach would not be a convenient mechanism for directly influencing production or marketings of individual producers, as is done now by linking eligibility for direct price support to compliance with acreage diversion programs, if that was considered desirable. To administer the program to attract producers to "voluntarily" adjust production or marketing would involve many of the administrative complexities of the present programs.

Conclusions

Revenue insurance for farmers is usually assumed to involve individual farmers paying premiums in exchange for the opportunity to receive indemnities if their individual revenues from selected crops are less than the insured amounts. This need not be the case. Indemnities could be geared to revenue of a group of producers.

One of the keys to discussions of commercial revenue insurance relates to the noninsurability of the risk of price changes because price risk cannot be computed actuarially. This is the critical reason why revenue insurance for individual producers is not commercially viable without something like organized options markets and the legalization of trade options. Even if it were legal to do so, there seem to be some questions as to whether insurance companies would be willing to write insurance policies involving price protection unless it were possible to shift the risk of price changes to others such as speculators in options markets.

By allowing price risks to be transferred to speculators, well-functioning options markets and legalized trade options would facilitate in practice the commercialization of revenue insurance. The acceptability of commercial insurance to producers would depend significantly on the premiums for such insurance and the availability of comparable protection through Government commodity programs. For example, it seems unlikely that anyone would pay a premium for commercial insurance that protects producers from corn prices going below $2.50 if the Government offered a price support at $2.50 with no strings attached. A system of commercial revenue insurance for individuals would not intrinsically involve income transfers to producers as do price supports. One way to provide for income transfers could be a program of revenue assurance to groups of producers as a whole as contrasted to programs of specific comodity price supports or availability of revenue insurance for individuals. The Western

4/ See (7) for a discussion of how tax credits might be used to support the net farm income of producers as a group. That article also includes estimates for the "tax credit" costs under an assumed program covering all commodities. Such a program could be limited to selected commodities. Conceivably a system of tax credits would be utilized for distribution of pool proceeds associated with a revenue assurance program such as that outlined in this paper.

Grain Stabilization Program of Canada is such a group-based program. Several decisions would be involved with the implementation of a similar program in the United States, including the relation between producer and Government contributions, the commodity coverage, and the institutional arrangements for administering the pool or pools.

APPENDIX. WHAT ARE OPTIONS?

Options trading is a formal system that enables people to purchase a right (without the obligation) to sell an "item" at a set price or to purchase a right (without the obligation) to buy an item at a set price, regardless of what happens to prices over time. The price paid by the producer and received by the seller (option writer) is the cost of shifting the risk of price changes from the purchaser of the option to the seller (writer) of the option. The seller of a put option accepts the risk of prices being above the set strike price; the seller of a call option accepts the risk of prices being below it.

Several terms have particular meaning in options trading:

- Put option: A contract that conveys the right (without the obligation) to sell a particular commodity futures contract at a particular price until a stated expiration date.

- Call option: A contract that conveys the right (without the obligation) to buy a particular commodity futures contract at a particular price until a stated expiration date.

- Exercise or strike price: The price at which the buyer of a put option can sell the commodity futures contract and, in the case of a call option, can buy the commodity futures contract.

- Premium: The transaction price for the options contract (the amount the buyer pays and the writer receives for an options contract).

- Options seller or writer: An individual who sells the option to the buyer and therefore assumes the opposite side of the transaction if the buyer of the options chooses to exercise the option. For example, if a buyer of a put option for December corn futures at a $3-per-bushel exercise price decided to sell a corn futures contract at $3 per bushel, the writer of the put option would be obligated to buy a December corn futures contract at $3 per bushel from the holder of the put option without regard to the price of December corn futures at that time. And, if a buyer of a call option for December corn futures at a $2.50-per-bushel exercise price decided to exercise the option, the writer of the call option would be obligated to sell a December corn futures contract at $2.50 without regard to the price of December corn futures at that time.

The way options work is illustrated by the quotations for sugar futures and related options on the Coffee, Cocoa, and Sugar Exchange in New York City. The futures contract calling for delivery in October 1984 closed on June 15, 1984, at 6.10 cents per pound. It is useful to note that: (1) "put" and "call" options are traded on four of the nine futures contracts for sugar, and (2) the

highest strike price for which October 1984 put options were traded was 11 cents per pound, which was less than 15.30 cents per pound, the highest life-of-contract price for the October futures contract. Similar relationships exist for the other options.

Trading is initiated in options with strike prices that correspond to the market price of the futures contract if the prices are maintained over a significant period of time. Over time, as the market price changes, trading at corresponding strike prices is initiated, making a range of strike prices available.

Interest rates, risk of price change, as well as the relation between the strike price of the option and the current market price, influence the premiums that writers require and purchasers are willing to pay. The difference between the strike price and the current price of the futures contract is reflected in the premium. Note the following closing prices and premiums for sugar on June 15:

	Cents per pound
October futures contract	6.10
Premium for October put option:	
6-cent-per-pound strike price	0.55
10-cent-per-pound strike price	4.05

The price for the October futures of 6.10 cents per pound reflects the combined judgment of those in the market as to the market value of that futures contract. Thus, any writer of an option with a strike price greater than this current price of the futures contract will need to be compensated for the difference--otherwise the option could be immediately exercised at a profit for the buyer (and loss for the writer).

With either of these examples, hedging in futures contracts could be used instead of options to transfer price risk. However, hedging with futures requires margins, and price are "locked in". Therefore, the hedger is unable to take advantage of favorable price movements of the commodity. These conditions contrast with those associated with options. In options trading, the buyer pays the initial cost of the option--the premium. But, there are no margin requirements and the options buyer can take advantage of any favorable price movements.

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Toward a Broader Agenda

Although traditional commodity programs still command most attention, the focus of discussion for farm policy has broadened considerably. Besides consideration of alternatives or modifications to current policy tools, the farm bill discussions now encompass issues that are critical to the performance of U.S. agriculture but that are not directly controllable by the agricultural sector (or any other). Some of the issues which arise in this regard--international trade; credit, tax, and macroeconomic policies; and resource conservation--are addressed here.

AN INTERNATIONAL FARM POLICY

U.S. crop producers export much of their production. Hence, maintaining a strong export market is important to the overall health of the agricultural sector. But, events outside the realm of price and income support programs significantly affect the demand for U.S. imports.

Many countries tend to insulate their domestic markets from changes in foreign supply or demand. They become "adjustment exporters," using the world market as a residual supplier or buffer to ease internal adjustments in prices, stocks, or supplies. Unexpectedly good crops mean an exportable surplus, especially if storage is inadequate. Bad crops may invite a scramble for sudden importing. The result is that uncertainty--over the terms of trade, sources of demand and supply, and the duration of the buying and selling--pervades the world market. Political tensions and foreign relations also add variation in agricultural trade. This uncertainty, together with the importance of exports to the domestic agricultural sector, point to the desirability of incorporating flexibility into farm program legislation to allow U.S. export sales to respond to prevailing world market conditions.

A second observation that can be drawn from recent experience is that establishing relatively high and rigid price floors for U.S. farm commodities may reduce U.S. exports. Relatively high price supports tend to encourage foreign producers to expand their own production. A similar reaction usually follows implementation of production control programs designed to increase domestic farm prices. In most instances, the United States is alone in practicing supply control.

Despite the present rigidities in commodity programs, there are several policy instruments at hand that can help improve the United States' export market share: trade negotiations, food aid programs, credit extended to customer nations, bilateral and multilateral trade agreements, and even barter. When the terms of trade deteriorate, there is often a temptation to implement programs to offset adverse events in the world market. Two-price plans are one example. Under a two-price plan, domestic prices are higher than foreign prices. Domestic producers receive higher returns, assuming a more price-responsive foreign than domestic market. But, consumers also pay higher food costs. In addition, it is difficult to simultaneously advocate free trade and erect a two-price plan.

Perhaps the key international trade issue for U.S. agriculture is the value of the dollar in foreign exchange markets. The rapid increase in the value of the dollar relative to other currencies--an increase of about 70 percent in nominal

terms since 1980--raises the prices other countries must pay for U.S. exports. Hence, not only does the demand for U.S. commodities drop, but the import demand for commodities from countries which peg the value of their currencies to the dollar (as do many Latin American countries) also declines. The decline in Latin American exports has caused their debt problems to continue to mount.

The relatively high value of the dollar tends to be caused in part by the flow of foreign investment capital into the United States to take advantage of our unprecedented high real interest rates. Many attribute these interest rates to the large Federal budget deficit. Thus, U.S. agriculture has an important stake in attempts to control the budget deficit, not only in terms of the interest rates domestic producers must pay for operating loans, but also for the possible repercussions in world commodity markets.

As increased attention is given to the role of exports in U.S. agriculture, several issues arise. What should be the objectives of a U.S. trade policy? What are the most cost-efficient means of promoting exports? What effects, both in the short and long term, would export credit programs have in expanding exports? What is the likelihood of reducing trade barriers around the world for U.S. products? What are the likely reactions of our export competitors to U.S. efforts to expand export sales? What are the potential impacts of third-world debt problems on efforts to expand U.S. exports? What are the prospects for changes in the value of the dollar relative to other currencies and the subsequent effects on U.S. trade? Policy decisions regarding these questions will likely play a role in efforts to strengthen the United States' share of world trade.

RESOURCE USE AND CONSERVATION

The initial purpose of resource conservation policy inaugurated 50 years ago was to stop the erosion of the domestic natural resource base, but the problem was how to accomplish this. Over time, the problem was perceived as a tradeoff between protecting environmental quality and sacrificing productivity. The problem has since evolved from how to stop environmental deterioration to how to identify and provide the incentives that will lead farmers to adopt effective conservation techniques.

Studies have found that while soil erosion remains a significant problem in aggregate terms, the most serious effects tend to be found on a relatively small percentage of total cropland. Gross soil loss of 40 to 50 tons per acre per year is not uncommon and it has reached levels as high as 200 tons per acre per year in some areas. Soil loss of 100 to 150 tons per acre translates into approximately an inch of topsoil across an acre of land being lost due to erosion.

During the seventies, when U.S. agriculture was producing near capacity with the technology then available, a key question was what impact soil erosion would have on environmental quality and on future food and fiber production. As export growth dampened and surplus production accumulated in the eighties, conservation program evaluations began to address the issue of the consistency between conservation and commodity programs.

Inconsistencies between current programs and land stewardship have recently become more pronounced. For example, farmers have been paid to retire land from production while erosive land has been permitted to be drawn into production. Commodity price support programs may provide an incentive to continue farming

operations on marginal land. These and other inconsistencies incur costs to society. In the short run, society incurs costs in the form of taxes and higher food prices; and, in the long run, future productive capacity is diminished as soil and water resources are depleted.

Conservation proposals may be evaluated on the basis of targeted effectiveness. That is, is the program targeted to be effective on the most erosive land? A 1980 analysis by USDA estimated that more than half of Agricultural Conservation Program (ACP) payments went for conservation practices applied on land with soil losses of below the tolerable level (5 tons per acre or less). Hence, tax dollars were not spent in a manner that assured maximum impact. Conservation reserve programs, or conservation coupled with acreage reduction, was found to entice the most erosive land out of production in exchange for some form of Government rental payment.

Conservation and resource programs may also be evaluated with regard to their cost-effectiveness. By definition, using conservation programs to carry out policy objectives implies an inequitable distribution of costs and benefits to be effective. Soil productivity is not equally distributed and neither is erosion. Some farmland, under normal conditions, is not likely to experience any appreciable erosion problems. At the other extreme, even with sound farm management practices, soil loss on some farmland would be considered excessive. This lends credence to a localized, targeted approach to conservation and resource policy.

A number of conservation issues likely to be widely discussed during the 1985 farm bill debate include the following. What incentives are needed to encourage farmers to adopt effective conservation techniques? Can soil erosion efforts be effectively targeted to the most critical areas of the Nation? What approaches can be implemented to address the apparent inconsistencies between current commodity and conservation programs? Should producers who cultivate fragile lands be eligible for program benefits? What effect will efforts to expand exports have on soil and water conservation initiatives? What are the potential conservation implications of reduced emphasis on acreage reduction and other forms of of supply control programs? What are the pros and cons of longterm retirement of highly erodible lands? These issues will require attention as we attempt a balance between production and conservation.

CREDIT POLICY ISSUES 1/

A number of issues are likely to arise during future discussions of commodity programs. These concerns may be overriding: Is there an economic rationale for Federal credit assistance to farmers today given the progress in performance of commercial sources of credit; and, will short-term credit assistance improve the financial viability of farmers currently experiencing financial stress?

Is there an economic rationale for credit assistance? That depends on whether farmers are discriminated against in capital markets. Such discrimination can result from artificial barriers arising from legal and institutional restrictions, inadequate information, habit, or tradition. Some evidence suggests that discrimination may have existed before farm credit legislation was enacted in the thirties.

1/ Information on credit policy issues was contributed by Ronald Meekhof, chief, Finance and Aggregate Analysis Branch, National Economics Division.

There are no definitive studies of credit market performance which address how well farm credit markets work today. However, there have been major changes in those markets over the last 50 years, and agricultural finance experts agree that it is no longer apparent that farmers are seriously disadvantaged in their access to loanable funds relative to borrowers in other business sectors.

For farmers producing price-supported commodities, the flow of funds from the Commodity Credit Corporation (CCC) has been very important at times and enables them to meet short-term cash or debt repayment needs. CCC funds have also found their way into bank deposits, thereby increasing bank liquidity and making new credit available to bank borrowers, including farmers. The CCC has also provided loans, almost always at subsidized interest rates, for building farm storage and for other purposes.

Perhaps the most significant recent development affecting the credit supply and performance of credit institutions is the phased deregulation of financial institutions stemming from the Financial Deregulation and Monetary Control Act of 1980 The purpose of the act (as well as follow-up legislation in 1982) is to provide a more market-oriented, competitive financial environment. This should increase economic efficiency, allowing sources and uses of funds to flow more smoothly to and from economic sectors, geographic locations, and individual enterprises according to their ability to earn competitive rates of return.

For agriculture, deregulation has led to a closer interlocking of rural credit conditions with national, rather than regional and local, financial markets. Farmers are now less insulated from national monetary shocks, and increased interest rate volatility nationally has translated into increased volatility in local rates. Management strategies at rural banks must now include hedging against future changes in interest rates, as well as more traditional portfolio and balance sheet considerations. Also, because Farm Credit System banks have not been deregulated, deregulation should make commercial banks more competitive and halt or reverse their recent trend of declining market share. Deregulation implies that credit crunches--a complete shut-off of credit to certain sectors--are a thing of the past, being replaced by less harmful credit squeezes whereby credit is rationed by price. Finally, financial deregulation means that U.S. agriculture will have to earn its access to credit in more direct competition with other sectors.

A large share of farmers are experiencing financial stress brought on by aggressive investment practices, high interest rates, natural disasters, an unfavorable turn in commodity markets, and other causes. The most widespread type of financial stress is an inability to meet cash flow obligations for operating expenses, debt repayment, taxes, or family living expenses. Cash flow stress is different in concept from other types of financial stress such as low income or profitability, although the actual outcome may be the same.

Short-term credit assistance has been widely discussed as a means for the Government to ease farmers' cash flow stress. Private lenders have voluntarily provided financially troubled farmers with assistance, primarily in the form of forbearance. The Farmers Home Administration (FmHA) has also worked with its borrowers to ease financial stress. The deepening farm financial situation has brought additional demands for Government assistance. Short-term credit from lenders or the Government could take several forms.

Forbearance

Forbearance is a strictly voluntary approach taken by the lender to assist borrowers who are in financial stress. Forbearance would most likely take the form of waiving some portion of principal, interest payments, or both. After market conditions improve, the waived portion of the loan can be repaid. The carrying costs to the lender are high when interest rates are high. Generally, other options to assist the borrower, such as debt restructuring and reduced payment, would have been taken prior to forbearance. Forbearance is an approach that can work for some farmers under limited conditions. It is most likely to have favorable results if conditions underlying financial stress are short-lived and if the farmer does not have a severe cash flow problem.

Subsidized Interest

Subsidized interest rates have been widely used in the past by FmHA to assist farmers. Generally, interest subsidies are provided as a means of addressing social objectives--assisting farmers who can't obtain credit elsewhere at a reasonable cost and terms, helping young and limited-resource farmers become economically viable, or easing the financial impact of natural disasters.

Various criteria could be established for determining eligibility for obtaining a subsidized rate on new loans or refinancing existing loans. The extent of the subsidy could be fixed or vary on the basis of financial stress. A subsidy program could be administered only by FmHA to its borrowers or it could be administered with participation of private lenders to assist other farm borrowers. The period over which the subsidy is in effect could vary, as could the extent to which the subsidy is be repaid after conditions improve. An interest rate subsidy program could be employed in a number of ways.

The primary issue concerning an interest subsidy is equity. Society at large may rightfully question why farmers and not other financially stressed sectors should have available such a potentially costly program. Other questions may raise concerns about the appearance of providing additional interest subsidy to a sector in financial stress in part because of its availability in the past. Lastly, concerns may be raised concerning the extent to which private lenders can or should be able to shift their financially stressed borrowers to the public lenders.

Debt Restructuring

Debts can be restructured through rescheduling loan obligations over a longer repayment period, by refinancing the loan at a lower market interest rate, or both. The result for the farm borrower is a reduced annual payment since the principal due each year and debt service costs are reduced. Consequently, there can be some immediate improvement in the farm's cash flow situation depending on the extent of restructuring. Over the rescheduled term of the loan, the farmer's total obligation would increase.

Most indications are that a significant amount of restructuring has taken place and that little more remains for those farmers in financial difficulty. Debt restructuring is a voluntary action that a lender is likely to take at the first signs of repayment difficulty and many lenders have reached the point where further restructuring may not be possible due to the impact on bank profitability and their loan portfolio collateral structure. Some recent proposals would provide incentives for the lender to extend debt restructuring further. Government guarantees on restructured debt would be the primary incentive.

Loan Write-Downs

A loan write-down is a voluntary action taken by a lender to reduce some portion of the loan principal. The lender may take this action in response to lower loan collateral values, to ease the repayment schedule of a borrower, or both. Obviously, if the loan principal is only reduced on the bank's books, it is of little assistance to the farmer.

A loan write-down is costly from the lender's viewpoint and is not likely to be employed voluntarily on a widespread basis. Some proposals have combined the write-down option with action by the Government that would provide an incentive to the lender that would, in part, compensate for the costs. For example, the lender would write down some portion of the loan to a farmer in exchange for a Government guarantee on some portion of the remaining principal.

Farm borrowers would realize improvement in cash flow. Write-downs might not be available to farmers in the most severe financial stress because the cost to the lender and Government of providing such borrowers an adequate cash flow would be substantial. Also, questions of equity among farmers and other sectors arise, because a write-down eliminates a previous obligation.

Interest Rate Buy-Downs

In this option the Government and the lender would share the cost of reducing the interest rate on outstanding loans to financially stressed farmers. The Government could compensate banks directly for lost revenues or, in exchange for the interest rate reduction, offer banks a loan guarantee or security that would reduce the future potential for loan losses. The action to reduce the interest rate on a farm loan would be initiated by the lender and would thereby determine which farmers would benefit from such assistance. The loan interest reduction could be for the remaining life of the loan or could end when economic conditions improved. The effectiveness of the policy would depend upon the degree of Government cost.

A major issue in the effectiveness of short-term credit assistance is whether the general economic downturn in agriculture is transitory. If it is not, adjustments farmers make in the form of balance sheet restructuring or trimming costs will not likely bring about a long-term improvement in liquidity. Many farmers will likely experience continued shortfalls after the benefits of short-term assistance run out.

Significant excess capacity in the sector will not decline as a result of debt restructuring or interest rate buy-downs. Capacity will decline only if resources committed to production decline. If this does not occur, income will remain at low levels and many farmers will have difficulty servicing their debts.

Federal credit policies shift resources to those sectors of the economy that society believes have been disadvantaged or have had restricted access to credit because of a market imperfection. When resources are shifted to activities that would otherwise not have received them, the economy may incur a cost in the form of reduced economic efficiency.

To the extent that farmers are not restricted and, in fact, have easier access to loan funds, the sector will be larger than otherwise, consuming greater amounts of fertilizer, tractors and other inputs, producing more, and receiving lower prices. Consequently, this assistance aids farmers, owners of farm assets,

input manufacturers, foreign and domestic consumers, and marketing firms handling large volumes of output.

There are losers, too: other sectors of the economy that must pay higher prices for financial and physical resources, farmers and nonfarmers not receiving credit assistance who may benefit from the use of resources held by those who do, tenant farmers, and parts of the labor force affected by reduced growth. These tradeoffs will likely be judged in light of more general economic policy issues: how to reduce and finance the deficit, whether to reduce Federal credit activities, how to improve the administration of credit programs, and whether specialized Government lending institutions are needed.

FEDERAL TAX POLICY 2/

Agriculture and most other industries benefit from a variety of special tax provisions. It is not clear whether agriculture benefits more or less than average and, in farming, the relative importance of tax policy versus commodity and credit programs and other Government policies is uncertain. However, it is clear that tax policies have played a role in the changes that have occurred within the sector and that they will continue to affect the organization, allocation, and control of farm resources. This section examines Federal income tax provisions such as special farm tax provisions, the treatment of land investments, the corporate income tax, and emerging issues with respect to agriculture in light of the renewed interest in general tax reform.

Since 1915, farmers have been able to use the cash method of accounting for Federal income tax purposes. Under cash accounting, expenses are deducted in the year they are paid, income is recognized in the year it is received, and changes in the values of inventories are ignored. This greatly simplifies the recordkeeping requirements for farmers. However, it also permits investors to mismatch income and associated expenses by generating deductions in the early years of an investment while delaying the recognition of income by building inventories that are not taxed until they are sold. This can cause the accumulation of larger inventories than would otherwise be justified.

As a result of the abuses of cash accounting by tax-shelter investors, Congress has attempted to limit its application. The Tax Reform Act of 1976 prohibited farm syndicates from deducting prepaid expenses for feed, seed, fertilizer, and other supplies. It also prohibited the use of cash accounting by corporations with gross receipts in excess of $1 million. However, the scope of this provision was greatly reduced by a number of exceptions intended to avoid its application to closely held family corporations.

Another feature of Federal income tax law that applies primarily to farmers is the current deductibility of various capital expenditures. Normally, expenditures that are made to acquire or to develop assets that will contribute to the production of income over a long period of time must be apportioned over the period during which they can reasonably be regarded as contributing to the production of income. However, a Treasury regulation issued in 1919 permitted farmers to deduct the cost of developing certain farm assets in the tax year in which they are incurred or paid. For example, the costs of raising dairy, draft, breeding, or sporting livestock to maturity, the costs associated with caring for

2/ Information on Federal tax policy issues was contributed by Ron Durst, agricultural economist, Finance and Aggregate Analysis Branch, National Economics Division.

orchards and vineyards prior to their producing crops, the costs of clearing land, and expenditures for lime, fertilizer, and other materials may be deducted in the tax year in which they are paid.

This "expensing" of development costs results in a distortion or mismatching of expenses and income from the developed assets. This mismatching has been used to generate losses which can be written off against income from other sources. Thus, farm assets for which development expenses may be deducted have attracted tax-motivated investment. Legislation has since been implemented to control tax-motivated investment in orchards and vineyards.

Certain assets, even though they are not capital assets for tax purposes, are eligible for capital gains treatment. These assets include depreciable property and real property used in the trade or business of farming. Thus, most agricultural land, farm machinery, equipment, and livestock held for draft, dairy, breeding, or sporting purposes are eligible for capital gains treatment. When these assets are held for more than 6 months (24 months for cattle and horses and 12 months for other livestock), 60 percent of the gain from sale is excluded from taxation.

The capital gains treatment for these farm business assets provides the most beneficial results when combined with the cash method of accounting and the deductibility of capital expenditures. For example, the cost of raising livestock held for draft, dairy, breeding, or sporting purposes is currently deductible, while the proceeds from the sales of such livestock are eligible for capital gains treatment. The result is a reduction in current tax liability, an increase in the amount of potential income eligible for capital gains treatment, and a deferral of the taxation of such gains until the assets are sold. Thus, the tax benefits from the early deductions often exceed future tax liability on the income from the investment.

In some cases, farm management practices have been altered to ensure that a large amount of the income from current farm operations is taxed at the more favorable capital gains rates. Such alterations in management practices can increase an investor's after-tax income, but may adversely affect productivity.

The tax policies which affect investments in land are particularly important for the agricultural economy. Those provisions of primary importance include the deductibility of nominal interest payments, the capital gains treatment of appreciation in land values (only 40 percent of long-term capital gain is taxed), and the deferral of such gains until they are realized as a result of a sale or other disposition. The combination of these provisions makes farmland an excellent tax shelter during times of inflation.

Generally, inflation raises interest rates by the expected rate of inflation in the general economy. However, since nominal interest rates are fully deductible for tax purposes, an increase in the nominal rate could cause a reduction in the real after-tax rate. This reduction in the real cost of borrowing is greatest for those individuals with the highest marginal tax rates. In some cases, the real cost of borrowing may actually be negative. This increases the incentive to finance investments with debt, particularly those which generally appreciate in value during inflationary periods.

During inflationary periods, both farm and nonfarm investors have considered farmland as a good hedge against inflation. Inflation creates the expectation that returns to assets will grow over time. Expected growth in returns to assets leads to increases in current asset values and hence, capital gains to owners of

those assets. As expected inflation in land values and the net returns to land increase, the price paid for land becomes more a function of expected inflation than of current returns. Thus, inflation may lead to a persistent division of economic returns between current cash returns and deferred capital gains returns. With low current returns relative to asset values and high rates of interest, payments on debt-encumbered assets can exceed the cash flow from those assets. The resulting negative cash flow provides a tax shelter, further increasing the value of the assets by their potential return from tax sheltering.

The net effect is to restrict land purchases to those with sufficient outside resources to meet the negative cash flow which occurs when a large portion of the total return to land is capital gains rather than current income. This creates barriers to entry into farming and increases the concentration of land ownership. It also may contribute to the instability of land prices.

Between 1974 and 1978, the number of corporate farms increased from 28,442 to 51,270. This growth can almost entirely be attributed to an increase in the number of family and other closely held farming corporations. In fact, widely held corporations actually declined over this period. A substantial portion of the growth in family farm corporations can be attributed to Federal tax policies.

A corporation is a separate taxable entity for Federal income tax purposes. While many of rules with regard to the computation of net farm income are the same for corporations and individuals, various aspects of the corporate form of business have encouraged the incorporation of farm businesses. Those aspects of the corporate income tax which have encouraged family farms to incorporate include lower and less progressive tax rates, the ease of transferring the farm business and other estate planning reasons, and the availability of business deductions for various fringe benefits.

An important feature associated with the corporate form of organization is the ease with which annual gifts of farm property can be made. Current estate and gift tax laws permit an individual to transfer $10,000 per year to any individual free of tax. A married couple can make gifts of $20,000 per year to any individual free of tax. Thus, a substantial portion of the farm business can be transferred through the gift tax exclusion. However, the transfer of the actual farm assets can cause problems due to the difficulty in partitioning the farm business. By incorporating, the transfer of the farm business can be accomplished by transferring shares of stock in the corporation. This avoids the partitioning of farm assets and allows the individual to transfer a substantial amount of farm property without losing control of the farm business.

The corporate form of business organization permits a number of fringe benefits to be provided to the shareholder-employee at a lower aftertax cost. The cost of many fringe benefits including health insurance, meals and lodging on business premises, and pension and profit-sharing plans are fully deductible to the corporation and often not included in the taxable income of the shareholder-employee. This incentive to incorporate has been reduced somewhat by expanding the fringe benefits available to noncorporate businesses and by limiting those available to corporations.

The shift to the corporate form of organization which has occurred over the last decade may have allowed farms to expand more rapidly as a result of the reduced taxes and retained earnings to the corporation. It may also have facilitated the transfer of the farm business to the next generation, resulting in the continuation of many farm businesses.

The examination and revision of Federal tax policies has occurred with increasing frequency in recent years. In fact, in 3 of the last 4 years major tax legislation has been enacted. With the growing dissatisfaction with the current tax system, an increasing awareness of the various agricultural tax issues, and a continuing need to generate additional revenue to reduce the deficit, either limited agricultural tax reform or general tax reform are possible. This potential raises a number of important issues for agriculture. Two of these issues which may resurface in 1985 include the potential inconsistency of farm commodity polices and tax policies and the continued existence of tax-sheltered investments in agriculture.

The use of the tax system to implement economic and social policies has increased the potential for conflicts between tax policies and farm commodity policies and programs. A recent example of potentially inconsistent policies involves the paid diversion program for dairy farmers, and those tax incentives which encourage increased investment and expanded production. With the growing need to achieve public policy goals for agriculture in a cost-effective manner, various tax policies may be reexamined in light of prevailing agricultural policies and programs.

The existence of tax-shelter investments in agriculture is not a recent development. However, over the last 15 years the number of farms reporting losses for tax purposes has increased from one-third to two-thirds of all farms. These losses are often used to offset income from other sources, resulting in a substantial loss in Federal tax revenues. Unless this trend is reversed, proposals to limit tax-loss farming or to reduce or eliminate various tax preferences could receive increased attention.

With regard to general tax reform, a number of options for a fairer and more efficient tax system have been suggested. One option involves a broadening of the tax base accompanied by a reduction in marginal tax rates. The impact of the implementation of such a system on the agricultural sector would depend upon those exclusions, deductions, and credits either reduced or eliminated, the changes in the timing of income recognition (if any), and the manner in which various tax provisions were adjusted for inflation.

Another type of tax which has been suggested as a tax reform option is the value-added tax (VAT). A VAT is a multistage sales tax that is collected at each stage or point in the production and distribution process based on the value added at that stage. Implementation of a VAT could have a significant impact on capital intensity, tax liability, and efficiency of U.S. farms. The European VAT taxes contain special provisions for agriculture, but arguments can be made for and against a VAT exemption for U.S. farmers. Reasons to exclude agriculture from a general VAT scheme include the substantial compliance costs to small farmers for keeping adequate records and the substantial administrative costs to the Internal Revenue Service for handling a large number of returns. Also, a large portion of agricultural production is exported. Since a VAT on exported goods is refunded, revenue gain would be reduced. Advantages of a VAT are that it is simple, neutral, leads to stable tax revenues for the Government, and does not discriminate with regard to type of business or method of financing. Disadvantages are that a VAT is regressive, causes a one-time price increase as the tax is passed on to consumers, and could potentially conflict with State sales taxes. Impacts of a Federal VAT tax on U.S. agriculture would depend upon the nature of any tax exemption, and upon whether the VAT revenues were used to offset reductions in other taxes or to reduce the Federal deficit.

The enactment of major changes in the tax code eliminating tax shelter opportunities throughout the economy would alter the relative rates of taxation for various investments. Generally, the relative rate of taxation of investment in industries which currently receive relatively favorable tax treatment would be increased. This could result in sudden and substantial changes in investment patterns and asset prices. The identification of these potential changes and the development of transitional rules to minimize these changes could be particularly important for the agricultural sector.

IV. GLOSSARY OF AGRICULTURAL POLICY TERMS 1/

Acreage Allotment. An individual farm's share, based on its previous production, of the national acreage needed to produce sufficient supplies of a particular crop; currently used only for tobacco.

Acreage Reduction Program (ARP). A voluntary land retirement system in which farmers reduce their planted acreage from their base acreage. This is generally an unpaid reduction, although it can be required for participation in other agricultural programs.

Agricultural Stabilization and Conservation Service (ASCS). An agency of the U.S. Department of Agriculture responsible for administering farm price and income support programs as well as some conservation and forestry cost-sharing programs; local offices are maintained in nearly all farming counties.

Basic Commodities. Six crops (corn, cotton, peanuts, rice, tobacco, and wheat) declared by legislation as requiring price support.

Bilateral Agreement. A two-country agreement for the exchange of specified products.

Carryover. The supplies of a farm commodity not yet used at the end of a marketing year. Marketing years generally start at the beginning of the new harvest for a commodity.

Commodity Credit Corporation (CCC). A wholly owned Federal corporation within, and managed by officials of, the U.S. Department of Agriculture. It functions as the financial institution through which all money transactions are handled for farm price and income support.

Deficiency Payment. Government payment made to farmers who participate in feed-grain, wheat, rice, or cotton programs; payment rate is per bushel, pound, or hundredweight, based on the difference between a target price and the market price or the loan rate, whichever difference is less. See Target Price.

Disaster Payment. Federal aid provided to farmers for feed grains, wheat, rice, and upland cotton when either planting is prevented or crop yields are abnormally low because of adverse weather and related conditions.

Export Allocation or Quota. Control applied to exports 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 Subsidy. A government grant, made to a private enterprise, for the purpose of facilitating exports. In Europe, it is often termed "restitution."

Farm. Starting in 1978, defined by the Bureau of the Census as any place that has or would have had $1,000 or more in gross sales of farm products.

1/ Compiled by R. Thomas Fulton, social science analyst, Food and Agricultural Policy Branch, National Economics Division, Economic Research Service.

Farmer-Owned Grain Reserve. Program designed to provide protection against wheat and feed grain production shortfalls and provide a buffer against unusually sharp price movements. Farmers place their grain in storage and receive an extended nonrecourse loan for 3 to 5 years. Interest on the loan may be waived and farmers may receive annual storage payments from the Government. Farmers cannot take grain out of storage without penalty unless the market price reaches a specified "release price." When the release 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 Crop Insurance. A voluntary risk management tool, available to farmers since the thirties, that protects them from the economic effects of unavoidable adverse natural events. Administrative costs are appropriated by the Congress and 30 percent of the insurance costs are federally subsidized.

Federal Marketing Orders and Agreements. To promote orderly marketing, a means authorized by legislation for agricultural producers to collectively influence the supply, demand, or price of particular commodities. Approved by a required number of a commodity's producers--usually two-thirds--the marketing order is binding on handlers of the commodity. It may limit total marketings, prorate the movement of a commodity to market, or impose site and grade standards. Currently 41 marketing orders are in effect.

Food Stamp Program. A USDA program designed to help low-income households buy an adequate and more nutritious diet. The program began as a pilot operation in 1961 and was made part of permanent legislation in the Food Stamp Act of 1964.

General Agreement on Tariffs and Trade (GATT). An agreement negotiated 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. Seven sessions have been held, including most recently, the Tokyo Round Multilateral Trade Negotiations, begun in 1973 and ended early in 1979.

International Trade Barriers. Regulations used by governments to restrict imports from, and exports to, other countries. Examples are tariffs, embargoes, import quotas, and unnecessary sanitary restrictions.

Import Quota. The maximum quantity or value of a commodity allowed to enter a country during a specified period of time.

Loan Rate. The price per unit (bushel, bale, or pound) at which the Government will provide loans to farmers to enable them to hold their crops for later sale. The 1981 Farm Act established minimum loan rates for wheat, feed grains, and rice; and set soybean and cotton rates by formula reflecting an average of previous years' market prices. See Nonrecourse Loans.

Marketing Quota. Under certain agricultural programs, that quantity of a commodity that will provide adequate and normal market supplies. When marketing quotas are in effect (only after approval by two-thirds or more of the eligible producers voting in a referendum), growers who produce in excess of their farm acreage allotments 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 sixties; rice quotas were abolished in 1981. Quotas are still used for domestically consumed peanuts,

but not for exported peanuts. For certain tobaccos, a poundage limitation is applicable as well as acreage allotments.

Multilateral. Agreements or programs involving three or more countries, such as the General Agreement on Tariffs and Trade. See Bilateral.

National Farm Program Acreage. The number of harvested acres of feed grains, wheat, and cotton needed nationally to meet domestic and export use and to accomplish any desired increase or decrease in carryover levels.

Nonrecourse Loans. Price support loans to farmers to enable them to hold their crops for later sale, usually within the marketing year. The loans are nonrecourse in that farmers can forfeit without penalty the loan collateral (the commodity) to the Government as settlement of the loan. See Loan Rate.

Normal Crop Acreage. The acreage on a farm normally devoted to a group of designated crops. When a set-aside program is in effect, a farm's total planted acreage of such designated crops plus set-aside acreage cannot exceed the normal crop acreage, if the farmer wants to participate in the commodity loan program or receive deficiency payments.

Normal Yield. A term designating the average historical yield established for a particular farm or area. Normal production would be the normal acreage planted to a commodity multiplied by the normal yield.

Paid Diversion. A voluntary land retirement system in which farmers are paid for forgone production from their base acreage.

Parity Price. Originally, the price per bushel, pound, or bale that would be necessary for a bushel today to buy the same quantity of goods (from a standard list) that a bushel would have bought in the 1910-14 base period at the price then prevailing. In 1948, the parity price formula was revised to make parity prices dependent on the relationship of farm and nonfarm prices during the most recent 10-year period for nonbasic commodities. Basic commodities, including wheat, corn, rice, peanuts, and cotton, use the higher of the historical formula or the new formula.

Payment Limitation. A limitation set by law on the amount of money any one individual may receive in farm program payments, such as deficiency and disaster payments, each year under the feed grain, wheat, cotton, and rice programs. The limitation, currently $55,000, does not include the value of loans received.

Permanent Legislation. The statutory legislation upon which many agricultural programs are based (for the major commodities, principally the Agricultural Adjustment Act of 1938 and the Agricultural Act of 1949). Although these laws are frequently amended for a given number of years, they would once again become law if current amendments, such as the 1981 farm act, were to lapse or new legislation not be enacted.

Public Law 480. Enacted in 1954 to expand foreign markets for U.S. agricultural products, combat hunger, and encourage economic development in the developing countries. Makes U.S. agricultural commodities available through low-interest, long-term credit under Title I of the act, and as donations for famine or other emergency refief under Title II. Under Title I, the recipient country agrees to

undertake agricultural development projects to improve its own food production or distribution. Title III authorizes "food for development" projects.

Set-Aside. A program to limit production by restricting the use of land. Restriction is placed on amount of a farmer's total cropland base used for production rather than on the acres used to produce a specific crop.

Target Price. A price level established by law for wheat, feed grains, rice and cotton. If the market price falls below the target price an amount equal to the difference (but not more than the difference between the target price and price support loan levels) is paid to farmers who participate in commodity programs. See Deficiency Payment.

Tariffs. A system of duties imposed by Government on imported goods. Sometimes used as a means of generating revenue.

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