From Farming to Food Service

The Food and Fiber System's Links with the U.S. and World Economies

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Abstract

The interrelationships among sectors of the U.S. and world economies are many and complex. The food and fiber system is one of the largest sectors of the U.S. economy, accounting for almost 16 percent of gross national product in 1989. The system provides an important example of how events in the U.S. and world economies--from recessions at home and abroad to oil crises--can affect sectors such as farming and inputs. Everything from the weather to Federal policy can mean changes that affect industries that rely on the sector, including farm machinery and financial services.

Keywords: Food and fiber system, inputs, linkages, farm financial crisis, input/output analysis, food marketing, rural economy, world markets

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Note: Use of commercial or trade names is for information only and does not imply approval or endorsement by the U.S. Department of Agriculture.
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Agriculture Is Linked to the Domestic and World Economies

Agriculture is an important example of how events in the U.S. and world economies—from recessions at home and abroad to oil crises—can affect a single sector. Furthermore, everything from the weather to Federal policy can mean changes in agriculture that affect industries that rely on the sector.

Farming employs only about 3 percent of the work force and accounts for 1.4 percent of gross national product (GNP). However, it remains important because of its links to a variety of industries, including feed, seed, fertilizer, machinery, food processing, manufacturing, and exporting.

Farming has always been tied to the larger economy. However, increased use of machinery, chemicals, and other technology and greater reliance on export markets have strengthened agriculture’s economic linkages. As a result, economic forces outside agriculture influence production costs and prices received as much as changes in weather do.

Changes in farming over the last 60 years, especially mechanization (tractors instead of horses and mules), mean farmers purchase most of the inputs (seed, feed, fertilizer, machinery) necessary for production. As more funds are spent on purchased inputs, the amount of borrowed capital increases. Greater debt exposes farmers to increased financial risks when credit tightens or interest rates jump. Extensive use of purchased inputs also increases agriculture’s vulnerability to rising costs and interruptions in supplies, such as the oil price increases of 1974, 1979, and 1990 and the runup in interest rates in the early 1980’s.

Since agriculture is linked to a wide variety of industries, its practices and policies can affect the general economy. For example, high farm prices can mean increased net farm incomes. In turn, farmers spend additional income on either consumer goods or capital equipment. This spending multiplies through the entire economy to bring about higher levels of production, income, and employment in other sectors.

From farming to food service, the agriculturally connected industries constitute the food and fiber system—one of the largest sectors in the U.S. economy. The system contributed nearly 16 percent of GNP in 1989.

The world economy, including agriculture, has become much more interdependent in the last several decades. The United States is the world’s largest exporter of agricultural products. USDA’s Economic Research Service estimates that each dollar earned from agricultural exports stimulates another $1.52 of output in the U.S. economy. Approximately 85 percent of this additional economic activity is earned by the nonfarm sector. In terms of employment, U.S. agricultural exports generated 1.06 million full-time civilian jobs in 1989.

The factors underlying the rapid changes in agriculture during the 1970’s and 1980’s clearly illustrate many of the interrelationships between agriculture and the domestic and international economies. The 1970’s, for example, was a boom time in agriculture as strong foreign demand pushed export volume and commodity prices to all-time highs. Farmers and nonfarmers invested vigorously in farmland as a hedge against inflation. Farmers relied on borrowing against rapidly rising equity values to meet cash-flow needs.

By the 1980’s, the world trade situation had weakened and interest rates were up. World trade stagnated over the first half of the 1980’s, while U.S. agricultural exports dropped by a third from the 1981 high. Reduced exports depressed commodity prices. Demand for farmland declined and farm asset values fell by more than a third between 1981 and 1986. The U.S. farm economy faced a significant financial crisis.

The dramatic swings in the farm economy during the last two decades affected many related industries. Agricultural input industries have undergone considerable changes, including extensive corporate reorganizations, mergers and acquisitions, reduced plant capacities, and plant closings.
Farming Is Integrally Linked to the Larger Economy

Agriculture is linked to a wide array of industries, from tractor manufacturing to food processing. As a result, forces outside agriculture influence production costs and earnings as much as changes in the weather do.

Until the Industrial Revolution, the U.S. economy was mainly agricultural. In 1810, 84 percent of the labor force was in farming, and farming accounted for 72 percent of GNP. By 1989, farming employed only about 3 percent of the work force and accounted for 1.4 percent of GNP (10).¹

Farming remains important to the economy because of its links to a variety of industries (fig. 1). Farmers acquire equipment, supplies, feed, seed, fertilizer, labor, financing, and other inputs necessary for production. Economic activity by the industries that supply farmers and marketers with inputs accounts for another 5.2 percent of GNP. Farmers, in turn, sell their products to the sectors that store, process, transport, manufacture, distribute, export, or retail farm products. These industries account for another 9.2 percent of GNP. Together, farming and the industries linked to it constitute the food and fiber system—one of the largest sectors in the U.S. economy.

Agriculture’s links to the general economy mean that macroeconomic factors, such as the interest rate and inflation rate, play a critical role in everything from the cost and availability of farm credit to the demand for farm products at home and abroad. At the same time, a growing dependence on export markets means that trade policies and factors affecting world supply and demand conditions also have important implications for agriculture.

This report describes the linkages between farming and the supplying industries and those manufacturing and distributing farm products. This is the food and fiber sector, a shorthand term which includes all the products of U.S. farms and their distribution. A major part of the information is derived from input/output analysis, a technique that measures the relationships between all the component parts of the U.S. economy. For a discussion of the methods of input/output analysis, see (10). Input/output accounts provide the base-year data for the National Income and Product Accounts prepared and published by the Bureau of Economic Analysis, U.S. Department of Commerce.

In this report, we will consider the role of farming in the food and fiber system, the interaction between the food and fiber system and the rest of the U.S. economy, and the linkages through trade with the world economy. The farm crisis of the 1980’s illustrates many of these linkages. The long-term rise in purchased inputs (as opposed to those produced on the same farm) and its effects on the farm sector are discussed. Changes in food processing and marketing and their effects on agriculture are also considered, as is the declining role of agriculture in rural economies.

¹ Underscored numbers in parentheses refer to sources listed in the References.
Figure 1
Examples of linkages of the food and fiber system

Source: (12)
Introduction

Linkages Stem Partly from Significant Advances in Farming

Farming was the dominant activity in the U.S. economy a century ago. Sharply increased farm productivity has allowed much of the economy's resources, especially labor, to shift toward nonfarm business and industry. Many inputs, such as feed and chemical fertilizers, are now purchased rather than produced on the farm, thereby increasing farming's links to a variety of industries.

Total farm production has almost doubled since 1947. Mechanization, improvements in farm management and pest control, and shifts in crops have boosted agricultural productivity while total input use has declined (fig. 2). The mix of land, labor, and capital also has changed substantially. Land in farms has declined by about 13 percent since 1947, while farm labor in 1990 accounted for only 29 percent of that in 1950. Farm employment has fallen as the use of purchased inputs has risen rapidly. Use of agricultural chemicals (fertilizer, lime, and pesticides) in 1988 was about eight times greater than in 1947; feed, seed, and livestock purchases were more than twice as high; and tractor horsepower more than tripled.

Many inputs used by farmers are now purchased rather than produced on the farm. Between 1947 and 1988, total inputs used in farming fell 18 percent. Those purchased by farmers rose 56 percent, while nonpurchased inputs--operator and family labor and the productive services of land, buildings, and machinery--declined by 53 percent.

A smaller share of the total work force met the food needs of a rapidly growing population because rising output per worker increased total farm production. Output per farmworker doubled between 1810 and 1880 and doubled again by the early years of World War II. One hour of farm labor produced nearly eight times as much food and other crops in 1988 as in 1947 (31). Today, each farmworker provides food for nearly 100 other people, compared with 13 other people in 1947.

The increasing productivity of farmworkers was a necessary condition for the development of the national economy. This increased productivity was one of the factors that made possible the shift of a major portion of the work force to the many other businesses that characterize the modern U.S. economy.

The transformation of the economy has meant not only great changes in the ability of farmers to supply agricultural products to consumers at home and abroad but also major changes in the demand for these products. As real income rose, most of the added income was spent for nonfarm products and services. In 1950, for example, 30 percent of disposable personal income was spent for products originating on U.S. farms, while the share was 14 percent in 1990.

Much of the work and many of the functions formerly performed on farms also have shifted to nonfarm firms. Construction companies, for example, now perform many of the tasks done by the farm family a century ago: clearing land, constructing barns, erecting fences, installing drainage systems, and digging wells. Horses and mules have been almost entirely replaced by petroleum- and electrically powered machines. Nearly 90 million acres (about a quarter of all cropland) which had been used to produce feed for these work animals have been transferred to produce human food or feed for food-producing livestock. That transformation also freed up 8 percent of farm labor that used to care for horses and mules (13). The mechanically powered machinery also made possible much of the subsequent increase in productivity of farm labor.

Much more feed, seed, and livestock is now produced on one farm and used on another. The entire cattle feedlot business, for example, was built on the separation of cattle-raising from cattle-feeding. Inputs produced on the farm are increasingly passed through nonfarm firms on the way to other farms. More and more feed is mixed by commercial feed processors or by large users in their own mills. Most seed is produced under careful quality control by or for seed companies.
Mechanization and other advances in farming have increased output, while total input has declined. As a result, productivity of farming has doubled.
Introduction

Trade Links U.S. Agriculture and World Economies

Reliance on modern technology and exports has strengthened the links between farm and nonfarm industries and the links to the U.S. and world economies. As a result, events beyond the farm gate increasingly affect agriculture's well-being, as well as the sectors that rely on farming.

Changes in the farming sector in recent decades, including increased adoption of capital-intensive technology and greater reliance on export markets, have strengthened its economic links. As a result, events in the U.S. and world economies—from recessions to oil crises—can influence farmers' production costs, the demand for their products, their competitiveness in domestic and international markets, and, ultimately, their incomes.

Because farming is closely integrated with a wide variety of industries, its practices and policies affect the general economy. For example, higher farm prices can mean increased net farm incomes. Farmers spend some or all of their additional income on either consumer goods and services or capital equipment. That spending multiplies through the general economy to bring about higher overall levels of production, income, and employment. In turn, consumers buy more food and fiber products, which raises farm prices and incomes, and farmers' spending from increased income stimulates employment and incomes in other businesses in the economy.

At the same time, the links between the farm and national economies are so close that conditions and policies beyond the farm gate affect agriculture's well-being. The dramatic advances in farming in the last 60 years mean producers now use more machinery, chemicals, and other purchased inputs to ensure greater productivity (fig. 3). In 1989, almost 15 percent of all farm production expenses, or $20.7 billion, went for pesticides, fertilizers, petroleum fuels, and electricity (30). The prices of many purchased items are determined outside the farm sector, primarily by factors affecting the general economy.

Extensive use of purchased inputs increases agriculture's vulnerability to rising costs and interruptions in supplies. Prime examples include the oil shortages and price increases of 1974, 1979, and 1990 and the runup in real interest rates (interest rates higher than inflation) in the early 1980's. Increases in oil prices were not very important to farmers when power was supplied by horses and mules.

Because more of the needed capital is financed, farmers are increasingly affected by developments in the general economy that determine the availability of loan funds and the level of interest rates. Greater use of borrowed capital, higher land prices, larger mortgages, and higher interest rates have meant major increases in interest expenses since the 1930's. Interest payments (on short-term debt for input purchases and long-term real estate loans) now account for approximately 11 percent of farm production expenses, compared with 5 percent in 1960 and 16 percent at their peak in 1982.

Agriculture is a prime example of how the world economy has become much more interdependent in the last several decades. Trade and financial links between nations mean that domestic and foreign economic policies affect U.S. agricultural exports, which, in turn, affect the farm sector. The interlocking of the world economy and the associated development of global capital markets mean that business cycles are no longer confined to national economies. Since farm exports depend so much on economic conditions abroad, global business cycles, which are closely tied to U.S. economic conditions, affect the demand for U.S. farm products. This is important because commodities produced on more than 30 percent of U.S. crop acreage now are exported (31).

The importance of exports to U.S. crop farmers is not new, however. Half of U.S. cotton, for example, was exported until the Great Depression. By the early 1960's, cotton exports had declined to about 20 percent of domestic production, but have since rebounded. Tobacco was also an important early export product.

U.S. exports consist mostly of crops and crop products. Only about 3 percent of livestock products are exported. Feed grains accounted for about 33 percent of exports in 1986-88, compared with 5 percent in 1926-30. Booming exports of feed grains
and oilseeds mean higher prices for crop farmers at the expense of livestock producers. As specialization in livestock production has increased, however, U.S. livestock producers, in competition with their counterparts abroad, also must pay higher prices for feed.

Exports of high-value agricultural products, such as manufactured foods and fresh fruit, have grown from 39 percent of U.S. farm trade in 1926-30 to about 51 percent in 1986-88. Trade in high-value processed products involves food processors, while exports of grains and other raw products use only transportation and handling services. Thus, exporting manufactured products rather than raw agricultural commodities means additional activity in the U.S. economy. For example, exporting soybean oil and meal rather than soybeans adds 25 percent to the value.

Exports and the Value of the Dollar

The international value of the dollar is important to U.S. farmers and exporters because it is a key factor in determining the international price of U.S. goods and, therefore, how well U.S. commodities sell in overseas markets. When the dollar's value rises, it takes more foreign currency to purchase a specific amount of imported American goods. Other factors being equal, this means consumers abroad buy less.

Like with any other commodity, if more dollars are offered for sale than are desired, the dollar's price—the exchange rate—will fall. On the other hand, an increased demand for dollars will cause the U.S. currency to rise in value.

The demand for dollars is generally determined by two factors. First, since dollars are used to purchase a wide variety of goods and services in international markets, an increase in demand for those goods would cause a rise in demand for dollars. However, the most important factor influencing foreigners to hold more or fewer dollars is the rate of interest. The belief that a bond denominated in dollars will earn a higher rate of return than its mark or yen equivalent will raise demand for U.S. currency.

Government policies that influence interest rates can, therefore, affect the dollar's exchange value and, consequently, have a strong impact on a country's competitive position in world markets.

U.S. agricultural exports have been very responsive to changes in the dollar's exchange rate during the last 30 years. As the value of the dollar dropped in the 1960's and early 1970's, export sales increased. The sharp rise in the dollar early in the 1980's curtailed a two-decade expansion of U.S. farm exports. A drop in the dollar's value after 1985 helped boost overseas sales (3).
Linkages and the Economy

Farm Crisis Illustrates Agriculture’s Linkages

The 1970’s and 1980’s brought boom and bust times to agriculture, both due in part to changing domestic and international economic conditions. The financial strength of the farm sector has since rebounded. But, industries tied to agriculture have undergone considerable reorganization which may, ironically, leave them and agriculture even more vulnerable to world events.

Increased foreign consumption in the 1970’s stimulated unprecedented growth in the world market for agricultural imports, particularly those produced in the United States. Strong foreign demand pushed export volume and commodity prices to all-time highs early in that decade. Annual growth rates in U.S. agricultural exports jumped from 4 percent in the 1950’s and 1960’s to more than 10 percent in the 1970’s. The value of exports increased nearly 500 percent during the 1970’s, and volume more than doubled. Boosted by strong exports in 1973, real net farm income (gross farm income minus total expenses, adjusted for inflation) reached its highest level since World War II (11).

The optimistic outlook for exports and a high inflation rate encouraged vigorous investment by farmers and investors in the late 1970’s. Many farmers purchased land to expand farm operations, and nonfarmers saw investments as a hedge against inflation. While the demand for land was increasing, more farmers held on to their investments, diminishing the supply of land for sale. As a result, land prices rose much faster than the inflation rate throughout the 1970’s.

Many farmers who financed land and machinery investments found they could meet cash-flow needs by borrowing further against rapidly rising equity values. With over half the returns on farm investment coming from capital gains, the strategy appeared sound.

The tide turned in the 1980’s, however, as the world trade situation weakened and interest rates rose. Foreign production grew in response to the higher prices of the 1970’s. Foreign per capita consumption rose at less than two-thirds the pace of the 1970’s, due largely to a worldwide recession induced by monetary policy adjustments designed to slow inflation. High real interest rates and the appreciating international value of the U.S. dollar contributed to a debt crisis in developing countries that stifled import demand. Many countries limited or reversed their growing dependence on imports. While world trade stagnated over the first half of the 1980’s, U.S. farm exports fared even worse, dropping by a third from the 1981 high.

Led by depressed commodity prices, deflated expectations of farmland appreciation, and sudden increases in real interest rates, farm real estate values fell by more than a third between 1981 and 1986 (30). The decline in land values after 1981 left little cushion for debt-burdened farmers, since land accounted for about 70 percent of farm assets. Rising real interest rates increased the cost of borrowing to finance debt, financially squeezing many farmers (fig. 4).

The farm sector began to rebound in 1986 as foreign demand increased and as legislative changes in Federal farm programs helped improve U.S. competitiveness abroad. The volume of U.S. agricultural exports grew by about 26 percent in 1986-88. Farmland values began to rise in 1987, reflecting higher expected returns from current operations and Government programs. Production costs also declined as interest rates and costs for energy and other manufactured inputs fell.

The dramatic swings in the farm economy during the last two decades have affected many farm-related industries. A booming farm sector in the 1970’s encouraged input industries to increase capacity and employment to meet the growing demand for inputs. By the 1980’s, input use had declined substantially as agricultural exports, land values, and farm prices fell and surplus stocks rose. Crop acreage, the most important determinant of input use, declined as acreage idled by farm programs grew from an average of 5 million acres in 1974-81 to over 38 million acres in 1982-86. Over 11 million corn acres, which otherwise would have used large amounts of purchased inputs, were set aside in 1982-86. That compares with just over 1 million in 1974-81.

The agricultural input industries have undergone considerable changes, including extensive corporate reorganizations, mergers, acquisitions, reduced plant
capacities, and plant closings. At the same time, imports of purchased inputs have increased. While the United States maintains a positive trade balance for total agricultural inputs, U.S. imports of certain inputs, such as nitrogen and potash fertilizers, exceed exports. These industries have undergone substantial restructuring as a result, though U.S. farmers should benefit through lower priced inputs (4). At the same time, U.S. farmers will become more vulnerable to international shocks to global input markets. For example, prices for crude oil and, to a lesser extent, nitrogen and phosphate are heavily influenced by demand, supply, and political factors outside the U.S. farm sector (2).

Figure 4
Debt-burdened farmers were hit hard by the 1980's farm crisis

Over 21 percent of farmers were highly leveraged (debts exceeding 40 percent of assets) in 1985 compared with 11 percent in 1989.

Debt/asset ratio¹

¹The debt/asset ratio compares the amount of money owed to creditors with total investment in the farm. The ratio is one indicator of a farm's long-term financial strength.

Source: (15)
Beyond the Farm Gate

The Food and Fiber System: From Fertilizer to Food Service

The food and fiber system is one of the largest sectors in the U.S. economy, accounting for almost 16 percent of GNP in 1989. The input industries—ranging from fertilizer and pesticides to salt and tin cans—form the largest component of the food and fiber system.

From fertilizer to food service, farming is linked to a wide array of industries. Together, these agriculturally related industries constitute the food and fiber system—one of the largest sectors in the U.S. economy. The total food and fiber system includes food, pet food, alcoholic beverages, tobacco, flowers, plants, seeds, farm firewood, clothing, and household textiles.

One way of looking at the economy is to consider the contribution of each segment to GNP. Since every segment buys goods and services from others, its contribution to GNP is calculated in terms of the value it adds to the goods and services that it purchases (see box). The value added throughout the economy adds up to the total GNP.

The food and fiber system contributed $820.6 billion, or nearly 16 percent of GNP, in 1989 (table 1). The input industries—ranging from fertilizer and pesticides to salt and tin cans—accounted for about 33.2 percent of the system’s contribution to GNP in 1989.

Other industries that provide financial services, insurance, communications, and so on totaled just over 20 percent of the food and fiber system’s contribution to GNP in 1989. The Government supplies resources (such as grazing land and irrigation water) and services (such as flood control and marketing information).

Labor is also an important input to food and fiber production. Putting food on the table and clothes on our backs requires many more nonfarmers than farmers. Farmers and their hired workers constituted only 11.7 percent of the people in the food and fiber system in 1989, and the farm sector contributed only 8.7 percent of the total value of the system’s products. Thus, while farming is a major source of income in over 500 rural counties, it furnishes only a small portion of national employment and income.

These 514 counties, where at least 20 percent of total labor and proprietor income comes from farming, are predominantly in the Plains and western Corn Belt. Food processors accounted for 11.4 percent of the system’s output in 1989 and employed 6.1 percent of the system’s workers. Manufacturers of textiles, leather products, and tobacco products added another 5.6 percent of the system’s contribution to GNP and employed 6.5 percent of the system’s workers.

Measuring the Food and Fiber System

The total food and fiber system includes all economic activities supporting farm production, such as machinery repair and fertilizer production, through food processing and manufacturing, transportation, wholesale and retail distribution of food products, and eating establishments (10). On the fiber side, the system includes all economic activities that link the production of plant and animal fibers to fabric, clothing, and footwear.

Because the food and fiber system is defined as involving all economic activities from the farm to the consumer, input/output analysis provides an appropriate economic procedure to trace the direct and indirect links. The contribution of each component of the system to the GNP is measured in terms of value added, which is, with some minor refinements, the difference between the sales of goods and the purchases of raw materials or services from other sectors.
Table 1--Value added by many industries determined the contribution of the total food and fiber system to GNP in 1989

The food and fiber system accounted for nearly 16 percent of GNP in 1989, the largest share of which came from inputs.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Value added to GNP</th>
<th>Share of food and fiber system's contribution to GNP</th>
<th>Share of GNP</th>
<th>Number of workers</th>
<th>Share of food and fiber system employment</th>
<th>Share of total U.S. employment</th>
</tr>
</thead>
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<tr>
<td>Billion dollars</td>
<td>Percent</td>
<td>Percent</td>
<td>Thousands</td>
<td>Percent</td>
<td>Percent</td>
<td>Percent</td>
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<td>Farming</td>
<td>71.4</td>
<td>8.7</td>
<td>1.4</td>
<td>2,458.9</td>
<td>11.7</td>
<td>3.0</td>
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<td>Total inputs</td>
<td>272.8</td>
<td>33.2</td>
<td>5.2</td>
<td>5,356.3</td>
<td>25.4</td>
<td>4.3</td>
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<td>Mining</td>
<td>24.9</td>
<td>3.0</td>
<td>.5</td>
<td>96.9</td>
<td>.5</td>
<td>.1</td>
</tr>
<tr>
<td>Forestry, fishing, and agricultural services</td>
<td>9.2</td>
<td>1.1</td>
<td>.2</td>
<td>107.7</td>
<td>.5</td>
<td>.1</td>
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<tr>
<td>Manufacturing</td>
<td>70.1</td>
<td>8.5</td>
<td>1.3</td>
<td>1,247.8</td>
<td>5.9</td>
<td>1.0</td>
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<td>Services</td>
<td>168.6</td>
<td>20.5</td>
<td>3.2</td>
<td>3,903.9</td>
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<td>3.2</td>
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<td>Total manufacturing and distribution</td>
<td>476.3</td>
<td>58.1</td>
<td>9.2</td>
<td>13,245.6</td>
<td>62.9</td>
<td>10.7</td>
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<td>Food processing</td>
<td>93.9</td>
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<td>1.8</td>
<td>1,292.1</td>
<td>6.1</td>
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<td>Textiles</td>
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<td>1,328.4</td>
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<td>7.4</td>
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<td>.1</td>
<td>36.5</td>
<td>.2</td>
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<td>Transportation</td>
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<td>3.8</td>
<td>.6</td>
<td>550.7</td>
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<td>.4</td>
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<td>Wholesaling and retailing</td>
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<td>5.0</td>
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<td>3,811.1</td>
<td>18.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Total food and fiber system</td>
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<td>100.0</td>
<td>15.8</td>
<td>21,060.8</td>
<td>100.0</td>
<td>18.0</td>
</tr>
</tbody>
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-- = Less than 0.05 percent.

Note: Detail may not add to totals due to rounding.

Source: Data from William Edmondson, ERS.
Inputs Tied to the Food and Fiber System Have Undergone Marked Adjustments

The input markets have undergone considerable changes in the last several decades. Land, labor, and capital markets have had to adjust to new directions in Federal policy, changes in farming, and events in the domestic and world economies. These adjustments have significantly affected the input industries.

Many inputs—from land and labor to energy and credit—are critical to food and fiber production (see box). With many of these inputs purchased from supplier industries, the food and fiber sector has become more tightly linked to the interdependent domestic and world economies. Major economic shocks such as an energy crisis or changes in interest rates can significantly affect the input industries.

Tracing the events of the last two decades provides clear illustrations of the linkages. Stronger ties to world markets, for example, mean that demand for exports can influence input use, including cropland harvested, capital purchases, and the demand for credit. After declining nearly 16 percent between 1954 and 1969, harvested acreage rose almost 23 percent by 1981 in response to rapid growth in export demand, as well as higher crop prices and the phaseout of diversion programs. As farmers expanded their operations and real interest rates fell, spending for new and used farm machinery increased. Financing the expansion in production capacity helped triple farm debt between 1970 and 1980.

Spurred by record growth in domestic and export markets for agricultural products, U.S. agricultural input manufacturing and distribution industries expanded in the 1970's. Production, capacity, and employment also grew. Employment in the fertilizer industry, for example, grew almost 1 percent annually during 1974-81.

The downturn in trade, coupled with high real interest rates and declining farm equity during the 1980's, spawned a new round of adjustments in input use and the associated industries. Land values declined at the highest rates since the 1930's, and prices received by farmers fell. The demand for inputs declined as acreage idled by farm programs rose from nearly 5 million between 1974 and 1981 to over 38 million in 1982-86.

With the sharp drop in demand, input manufacturers were left with large inventories. Capacity utilization in the farm machinery industry dropped from 74 percent in 1974-81 to 41 percent in 1981-85. Fertilizer industry employment declined over 5 percent per year, and the number of employees in the pesticide industries declined more than 3 percent per year. Declining demand, increased imports, and continuing shifts of production to other nations meant U.S. employment in farm machinery manufacturing dropped over 11 percent per year after 1981—a total of 45,000 jobs between 1974-81 and 1981-85.

The sections that follow illustrate in more detail how the input sectors have adjusted to new directions in Federal policy, changes in farming, and events in the domestic and world economies.
The Mix of Inputs: What's Behind the Farmer's Decisions

Farmers use land, seed, water, fertilizer, farm machinery, fuel and electricity, pesticides, labor, credit, farm supplies, animal feed, feeder livestock, and replacement livestock. While land remains an important input, its productivity now depends on the skill and knowledge with which capital is applied. Farmers today employ a sophisticated array of machinery, pest control techniques, fertilizers, and other technologies to conserve and enhance farmland productivity.

The farmer's decision as to which inputs to use depends on:

• The relative prices of the inputs,

• The prices of farm products, and

• The underlying technology which converts various combinations of inputs into outputs.

As much as possible, farmers will substitute less expensive inputs for those that cost more.

Changes in technology—whether a new machine or a new combination of techniques like reduced tillage—change the options available to farmers and cause shifts in the use of various inputs.

The total use of nondurable inputs such as fertilizers, pesticides, and seeds in the farm sector is determined by:

• Shifts in commodity prices,

• Input use per acre,

• The number and type of crop acreage planted, and

• The share of acreage on which inputs are used or applied.

Decisions regarding purchases of durable inputs, such as tractors, depend on:

• Farm sector equity,

• Income,

• Interest rates, and

• Producer expectations.
Land in Farms Follows Long-term Decline

The amount of land in farms has fallen 13 percent since 1945, while farm productivity and conservation efforts have increased. At the same time, changes in export demand, commodity programs, and crop prices have meant significant short-term shifts in the amount of land used to grow crops.

The portion of land used to grow crops has shifted considerably over the last several decades in response to the demand for exports, increasing concerns about soil and water conservation, and Federal farm program requirements. The 339 million acres harvested for crops in 1954, for example, fell to 286 million by 1969, as increasing amounts of cropland were idled for soil conservation and Federal land diversion programs (fig. 5) (27). A considerable amount of land was returned to crop production in the early 1970's, however, in response to increased export demand for crops, higher crop prices, and the phaseout of the diversion programs. Cropland harvested peaked at 351 million in 1981, when no acreage was idled under Federal programs.

Increased farmer participation in Federal programs aimed at limiting crop production or soil erosion reduced cropland used for crops to 327 million acres by 1988. Federal programs idled nearly 60 million acres in 1990, with the Conservation Reserve Program (CRP) accounting for over half of the acreage. The CRP was implemented in 1985 to reduce soil erosion. Producers who participate in the CRP sign contracts agreeing to convert highly erodible cropland to approved conservation uses for 10 years. Participating producers receive annual rental payments and cash or payments-in-kind of up to 50 percent of the cost of establishing permanent vegetative cover.

The CRP, with 34 million acres of highly erodible or environmentally sensitive land enrolled, is expected to annually reduce erosion by over 655 million tons, approximately 21 percent of all erosion from cropland prior to the program.

Land in farms remained relatively stable at about 1.2 billion acres through the mid-1950's, declining annually by about 0.7 percent until 1970 (fig. 6). The boom times in agriculture in the 1970's slowed the rate of exit of land from farming to about 0.4 percent per year. Land values per acre nearly quadrupled during the 1970's to almost $800 per acre.

Events in the U.S. and world economies prompted a rapid decline in farmland values after 1981. By 1986, farmland values per acre were down more than a third from the 1981 peak.
Figure 6
Cropland uses shift

Since the early 1980’s, the amount of farmland in production has decreased in response to Federal programs aimed at limiting crop production or soil erosion.

1Land supporting one or more harvested crops.
Sources: (22, 31).

Figure 8
Land in farms and farm real estate values respond to economic conditions

Land in farms has declined about 13 percent since 1945, while total land values have risen more than 1,000 percent.

Source: (32).
Farm Labor Has Declined, Become More Diversified

The agricultural work force is about one-third as large as it was 50 years ago. Family members still constitute the major portion of farm labor, though hired labor's share has grown.

New technology, nonfarm labor conditions, farm prices, and Government policies have altered the size and composition of the U.S. agricultural work force (18). Annual average employment in agriculture dropped from 9.8 million in 1945 to 2.9 million in 1990. The total hours of labor used for all farmwork in 1988 were less than one-fifth that of 1945.

Consistent with the overall trend in the farm labor force, the number of migrant workers declined from 420,000 in 1949 to 159,000 in 1985. The decrease in the number of domestic migrant farmworkers also reflects the general trend toward increased mechanization. However, the degree of mechanization has varied across commodity groups, with migrant workers continuing to be important where production techniques are labor-intensive, such as harvesting fruit and vegetables.

Family members (farm operators and unpaid workers) continue to provide the major portion of agricultural labor, but the share of total farm employment by hired farmworkers grew from 22 percent in 1945 to 31 percent in 1990. The share rose despite a decline in the total number of hired farmworkers from 4.3 million in 1950 to an estimated 2.5 million in 1987 (17). Most of the decline occurred in the 1950's and 1960's, with the hired farm work force stabilizing at around 2.5 to 2.7 million during the last two decades. Although the number of hired workers has declined, the number of family workers has fallen more; so hired workers have gradually replaced family labor over the last three decades.

The use of hired labor on a farm is determined largely by the commodities produced and the extent of mechanization. In 1987, hired and contract labor costs accounted for about:

- 44.1 percent of total production expenses on horticultural specialty farms;
- 38.4 percent on vegetable, fruit, and tree nut farms;
- 9.7 percent on field crop farms; and
- 6.7 percent on dairy, poultry, and livestock farms.
Contribution of Farm Machinery to GNP and Employment Fell Following Rapid Growth

Agriculture has become increasingly mechanized over the last 40 years, strengthening the links between farming, the domestic and world economies, and the farm machinery industry. With agriculture's expansion and then the financial crisis during the last two decades, the farm machinery industry has undergone major downsizing and structural changes.

Mechanization contributed to the nearly ninefold increase in labor productivity over the last 40 years. Large specialized farm machines have replaced smaller units, enabling one operator now to do what used to take several.

Spending for new and used farm machinery grew 6 percent per year from 1973 to 1979 as farmers sought to expand their operations in response to increasing exports, rising cropland values and farmer equities, falling real interest rates, and the declining value of the dollar relative to other world currencies (4). Sales reached a record $11.7 billion in 1979.

Over this period, the U.S. farm machinery industry underwent major structural changes. The industry began concentrating on producing large equipment in response to growing domestic, Canadian, and Australian demand. Japan increasingly accounted for larger shares of small tractor (under 40 horsepower) production, while medium-sized tractor (40-99 horsepower) production shifted to the European plants of U.S. multinational firms (23).

After 1979, lower incomes, record debt levels, reduced farm equity, and high interest rates diminished farmers' ability to assume additional debt. As a result, the demand for new farm machinery dropped and farmers kept their tractors and trucks longer. Farm machinery expenditures fell to $4.6 billion in 1986. Furthermore, more of the tractors, machinery, and equipment purchased were previously used. Spending for used equipment accounted for over 60 percent of total tractor expenditures in 1987, compared with 40 percent in 1979.

The drop in the demand for farm machinery after 1979 left the machinery industry with too much production capacity. To liquidate inventories, manufacturers offered sales incentives and price discounts. Reduced sales and profits required most manufacturers to cut production, lay off employees, and reduce capital expenditures. There have been several mergers among farm machinery manufacturers. The shift to overseas production also continued, as Ford Motor Company transferred its medium-sized tractor production to the United Kingdom.

Many manufacturers are now using foreign subsidiaries and private foreign companies to produce various types of farm machinery, especially smaller tractors and parts for them. Thus, the contribution of the farm machinery business to GNP and employment has declined substantially.
Input Markets

Oil Crises Helped Encourage Lower Agricultural Energy Consumption

With growing dependence on energy, agriculture has been significantly affected by rapid increases in oil prices, such as in 1974, 1979, and 1990. Since the 1970's, adopting energy conservation practices, using cheaper fuels, and removing farmland from production have helped reduce agriculture's energy consumption.

The shift to increased farm mechanization has made energy a critical input in the production process. Petroleum use in agriculture has risen more than 75 percent since 1945. Expenditures for fuels and lubricants accounted for 5 percent of farmers' total cash costs in 1989.

Higher fuel prices, such as those in 1974, 1979, and 1990, can have dramatic effects on agriculture. The impacts vary by commodity sector. In 1989, for example, diesel and gasoline totaled over 10 percent of tobacco farmers' cash expenses, versus 3.4 percent for dairy farmers (9). Fuel use for irrigation and crop drying boosted fuel costs for grain farmers to 7.7 percent of total cash expenses.

Significant gains in energy efficiency have been made since the energy crises of 1974 and 1979. Average imported crude oil prices paid by refiners skyrocketed from $4 to $13 a barrel in 1973-74 following the Organization of Petroleum Exporting Countries' (OPEC) decision to embargo crude oil shipments to the United States and other nations (22). The Iranian Revolution in 1979 sparked another runup in crude oil prices to $22 a barrel that year and to $37 a barrel by 1981. As a result, real (adjusted for inflation) onfarm energy expenditures rose 71 percent between 1970 and 1980.

Real expenditures for fuel and energy dropped 26 percent in 1985 due to a worldwide recession, a weakening of OPEC, and energy conservation. Growing adoption of energy conservation efforts in farming, such as minimum tillage, and increases in the amount of land idled under Federal programs helped reduce agriculture's energy consumption (fig. 7). Liquid fuel use in 1989 dropped more than 33 percent from the 1978 peak of 8.1 billion gallons.

Agricultural output per unit of liquid fuel input increased approximately 9 percent per year between 1978 and 1989 as a result of shifting to cheaper fuels and substituting other inputs for energy.

The replacement of gasoline-powered tractors and combines by diesel-powered units with lower maintenance and fuel costs also contributed to lower energy use in agriculture. Between 1978 and 1989, diesel fuel consumption declined by 23 percent, and use of gasoline fell by 63 percent. Gasoline, diesel, and liquefied petroleum (LP) gas are the three major fuels used on farms. Diesel fuel accounted for about 48 percent of the value of all agricultural fuel and lubricant use in 1989. About 75 percent of the total energy required for crop production was used for field operations and 25 percent to produce fertilizer and pesticides. Crop drying and irrigation operations, which rely primarily on LP and natural gas, accounted for about 13 percent. Irrigation also requires considerable amounts of electricity.

Farmers also adopted minimum tillage practices, used heat exchangers to reduce energy requirements for water heating, and, to a minor extent, substituted solar energy for LP gas in grain drying.

Rising energy prices affect farmers not only through higher prices for diesel fuel and gasoline but also through higher costs in the fertilizer and chemical industries.
Figure 7
With higher real expenditures on energy, farm fuel use has declined

Adopting conservation efforts has helped reduce agriculture's consumption of all fuels.

Source: (26).
Energy Costs Raise Fertilizer and Pesticide Prices, Encourage Lower Usage

Higher production costs and competition from imports have sparked major adjustments in the fertilizer and pesticide industries. Farmers have reduced fertilizer application rates for some crops, increased use of pest management, and lowered application rates for pesticides.

Increased energy costs have increased the cost of petroleum-based agricultural inputs. Even farmers with a small percentage of expenses for fuel are affected by increasing costs for fertilizer, agricultural chemicals, and transportation of commodities.

Coupled with rising domestic use and greater export demand, oil shortages mean higher fertilizer (primarily nitrogen) and pesticide prices, because petroleum accounts for a significant share of production costs. Pesticide prices jumped 238 percent during 1966-86, for example, due to increased research and development costs, regulatory requirements, and inflation as well as higher energy costs (7). Between 1973 and 1975, prices of most fertilizer products doubled (fig. 8).

Faced with higher costs, farmers have reduced fertilizer application rates for some crops. Phosphate used on cotton, for instance, has declined from an average of almost 53 pounds per acre in the 1970's to about 45 pounds in the 1980's. Potash use has fallen from 55 pounds per acre to 49 pounds. Nutrient application rates for corn have fallen 1 to 3 percent per year since 1981, except for increases in 1985 and 1988. Corn, cotton, soybeans, and wheat use about two-thirds of the primary plant nutrients. Corn alone accounts for over 40 percent of the total.

These declines follow a nearly 40-year upward trend in fertilizer use, which peaked in 1981 at 23.7 million tons. By 1988, farmers used 19.5 million tons of nitrogen, phosphate, and potash--the major plant nutrients.

Increases in production costs were significantly greater for U.S. nitrogen fertilizer firms than for other major petroleum-producing countries, putting the U.S. industry at a disadvantage. This was particularly true during the energy crises of 1972-74 and 1979-82. Lower priced imports also replaced U.S. products as the value of the dollar rose in the early 1980's. As a result, many high-cost U.S. nitrogen fertilizer plants closed.

Lower cost imports of Canadian potash have also replaced much of U.S. production. Potash imports now account for 90 percent of U.S. consumption, making the United States the world's largest potash importer (1).

In contrast, the United States became the world's largest exporter of phosphate fertilizer over the last decade, accounting for an average of almost 50 percent of world trade during the mid-1980's (table 2). However, the U.S. phosphate fertilizer industry is being challenged by expanded production in Morocco, Tunisia, Jordan, and other countries. U.S. exports currently account for about 40 percent of world trade.

Shifts in supplies and planted acreage have contributed to a pattern of highly variable fertilizer costs that began in the 1970's. Fertilizer consumption fell 25 percent in 1983, for example, as planted acreage declined largely because of the payment-in-kind (PIK) program. The PIK program offered surplus agricultural commodities owned by the Government in exchange for agreements to reduce production by cutting crop acreage. Federal programs aimed at reducing land in production and conserving erodible lands have also reduced planted acreage and, thus, fertilizer use.
Increased use of pest management, availability of more complex pesticides, and improved application techniques have contributed to reduced pesticide use in recent years. New insecticides introduced by the chemical industry, for instance, have meant lower application rates per acre. Pyrethroids helped reduce insecticide application rates for cotton from 78 million pounds of active ingredients (the material that actually controls pests) in 1964 to 18 million pounds in 1989 (19). Insecticide use peaked in the mid-1970’s at nearly 117 million pounds of active ingredients before falling to about 61 million pounds in 1989.

Reduced crop acreage resulting from low crop prices, acreage diversion, and land retirement programs also helped stabilize or reduce use of pesticides during the 1980’s, after rising dramatically the decade before. Market saturation is also an important factor in stabilizing pesticide use. By 1980, about 90 percent of corn, cotton, and soybean acreage was treated with an herbicide.

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Table 2--World and U.S. plant nutrient imports and exports

The United States is the largest exporter of phosphate fertilizer, but foreign competition has slowed U.S. exports.

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<tr>
<th>Year ending June 30</th>
<th>Nitrogen</th>
<th>Phosphate 1/</th>
<th>Potash</th>
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<td>World</td>
<td>United States</td>
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<td>Imports:</td>
<td>Million nutrient tons</td>
<td>Percent</td>
<td>Million nutrient tons</td>
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<tr>
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Exports:

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<tr>
<td>1988</td>
<td>NA</td>
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NA = Not available.

1/ For exports, does not include phosphate rock.

2/ The 1986-88 data are not comparable with 1985 and earlier years. Before 1986, U.S. phosphate exports included both wet-process phosphoric acid and superphosphoric acid. Superphosphoric acid exports were not reported after June 1985.

Source: (24).
Financial Markets Have Restructured Following the Farm Financial Crisis

The farm financial crisis of the 1980's illustrated agriculture's ties to national fiscal and monetary developments and national financial markets. When lower farm income and land values reduced farmers' capacity to repay record debts, many banks failed, restructured lending practices, and wrote off delinquent debt.

Linkages between farming and financial institutions have been growing in importance as farmers borrowed more money for investment and operations. Farmers have relied more on borrowing to finance increased use of purchased inputs over the last several decades. Total debt of farmers increased nearly twelvefold between 1950 and 1988, rising from 9 percent of assets to over 23 percent in 1988 (fig. 9).

Growing exports, low real interest rates, and rising land values encouraged farmers to expand their debt levels from $53 billion in 1970 to $179 billion in 1980 (5). By 1983, nominal farm debt (excluding household debt) was almost 400 percent above its 1970 level. Agricultural lenders relied heavily on appreciating land values as collateral for increased borrowing.

As prosperity in the farm sector faded in the 1980's, however, over 20 percent of U.S. farms were in serious financial difficulties, with debt/asset ratios exceeding 40 percent. Lending institutions also suffered, as the decline in both real net farm income and land values reduced farmers' repayment capacity. Delinquent farm loans totaled $23.1 billion in 1986--nearly 15 percent of total loans. In 1980, just 2.5 percent of farm loans were delinquent; these delinquent loans were valued at $4.2 billion.

The deregulation of commercial banks in the 1980's, coupled with significant declines in farmland and oil prices, meant that many small banks would go out of business. Almost 300 agricultural banks failed from 1983 through 1988.

The 1980's clearly demonstrated the agricultural sector's ties to national fiscal and monetary developments and national financial markets. Events of the last decade have meant changing attitudes about farm credit. The farm financial crisis made farmers and lenders alike more cautious about taking on or extending credit. At the same time, changes in the financial services industry have resulted in greater competition among farm and nonfarm borrowers for limited credit.

The decade brought substantial shifts among the four major institutional lenders providing credit to the farm sector: commercial banks, the Farm Credit System (FCS), the Farmers Home Administration (FmHA), and life insurance companies. Although total farm lending by commercial banks rose less than 2 percent between 1983 and 1990, for example, their share of total farm debt jumped from 24 percent to almost 35 percent. Commercial banks surpassed the FCS as the leading agricultural lender in 1987 (26). The FCS, which includes institutions such as production credit associations and Federal land bank associations, accounted for an estimated 27 percent of total farm debt in 1990, down from 33 percent in 1983.

The FCS, a specialized lender designed to provide funds to agriculture at the lowest interest rates possible, grew rapidly during the agricultural prosperity of the 1970's and declined precipitously as the farm financial crisis hit during the early 1980's. With a loan portfolio consisting almost entirely of agricultural and farm-related loans, the FCS had difficulty covering losses when the number of farmers who were unable to meet their loan repayment schedules grew.

Legislative changes were necessary in 1985 and 1986 to help the FCS survive. The Agricultural Credit Act of 1987 provided for an assistance corporation, through which a line of credit was made available to assist in the recapitalization of the FCS. The act also initiated streamlining and cost-cutting steps and created a secondary market for qualifying agricultural real estate and rural housing loans (5).

After posting a net income loss in 1987, the financial condition of the FCS has shown signs of improvement. During the period 1988-90, net income was positive, though stagnant, while net interest (income minus expenses) rose from $0.8 billion to $1.2 billion.
At the same time, FCS loan volume has been shifting away from long-term real estate credit to short- and intermediate-term credit and loans to cooperatives. The volume of long-term real estate loans dropped from $34.3 billion in 1987 to $29.4 billion in 1990. Short- and intermediate-term loans rose by more than $1 billion to nearly $11 billion in 1990, while loans to cooperatives increased almost $2.5 billion to $10.7 billion during the same period.

FmHA steadily expanded its share of total farm debt from 5 percent in 1974 to over 16 percent in 1987. Since then, its share has fallen to 11 percent in response to reduced new lending volume, greater loan restructuring, and loan writeoffs. The Food Security Act of 1985 mandated a shift to guaranteed, rather than direct, lending by the FmHA. The Food, Agriculture, Conservation, and Trade Act of 1990 also contains provisions that encourage the use of guaranteed loans. By fiscal year 1990, guaranteed loans accounted for a record 58 percent of FmHA's total farmer program obligations, up from 10 percent in 1984.

Under a loan guarantee, FmHA agrees to guarantee repayment of up to 90 percent of an approved loan made by a qualifying lender. Almost all loan guarantees are made for farm ownership and operating purposes, including refinancing of existing debt; financing of machinery, livestock, and real estate purchases; or payment of annual farm operating expenses.

Most guaranteed loans are made by commercial banks, but FCS lenders also participate. Operators of family-sized farms are eligible for guaranteed loans if they are unable to obtain credit without such a guarantee.

Life insurance companies have traditionally provided a small share of total agricultural lending, although farm real estate mortgages have been an important investment for insurance companies. About 15 life insurance companies held approximately 34,600 agricultural mortgage loans on June 30, 1990 (26).

Like other lenders, life insurance companies experienced a decline in agricultural loan performance during the 1980's. A record 19.9 percent of agricultural mortgage debt held by insurance companies was delinquent in June 1986. These delinquencies, as a percentage of total loans, were higher than for either agricultural banks or the FCS.

Individuals and others continue to be important, although declining, sources of both non-real-estate loans (18 percent) and farm mortgages (24 percent). These lenders accounted for 20 percent of real estate farm debt in 1990, down from 29 percent in 1983. The share for non-real-estate debt stayed at about 21 percent.

Real estate debt owed to individuals and others primarily reflects seller-financing of real estate transfers. This type of debt fell more than 51 percent in 1983-90, as lower sales prices and growing seller hesitancy to finance land transactions reduced outstanding debt levels.

**Figure 9**

Borrowed capital has become an important source of farm funding

*Total debt of farmers increased nearly twelvefold since 1950, rising from 9 percent of assets to over 18 percent, and interest paid on that debt more than tripled.*
Changing With the Times

Higher incomes, more dual-career households, smaller families, and increased health concerns have prompted significant changes in food processing and marketing. Manufacturers are responding with new/reformulated products and other advances that have transformed the industry.

The post-World War II period has brought dramatic changes in food processing and marketing as consumer incomes have grown, lifestyles have changed, and demographics have shifted. With more money and less time, consumers' purchasing, preparation, and consumption patterns have changed. Convenience has become the key, as the average time spent for meal preparation in households where all the adults work outside the home has fallen from 30 minutes a few years ago to 20 minutes. Health issues have also become a major influence on food choices.

In response to these concerns, manufacturers have significantly altered the types and varieties of products offered. Technological developments have created new products and industries and transformed existing ones. Fat substitutes, corn sweeteners, and other "ingredient substitutes" have redefined many traditional foods, such as sodas and ice cream. Advances in packaging and preserving foods, including aseptic packaging and shelf-stable products, have meant new levels of convenience for consumers.

With shifts in consumer lifestyles, where we eat has also changed considerably. The advent of the fast food restaurant in the 1950's helped propel food service into one of the fastest growing food industries. With greater consumer incomes and more dual-career households, the share of total food dollars spent away from home nearly doubled in the last 40 years.

As growth opportunities in the U.S. fast food market have slowed in recent years, several large chains have looked to foreign markets. U.S. foodstore and restaurant affiliates overseas rang up sales of more than $11 billion in 1988, compared with $9.7 billion in 1987.

Food marketing increasingly is going international. Around the world, food processors, wholesalers, and retailers, as well as food service firms, are looking to foreign nations to expand their markets. U.S. companies' sales from their foreign food processing, wholesaling, retailing, and food service operations totaled $82 billion in 1988, up from $74 billion in 1987 (9).

Foreign firms are also gaining ground in U.S. markets by purchasing U.S. firms and establishing new affiliates. Foreign-owned food marketing affiliates in the United States had sales of $72.6 billion in 1988, rising from $59 billion the year before.
Food Marketing

Food Manufacturers Have Become Larger and More Diversified

Food manufacturing has changed markedly in the last four decades. Large companies that are more diversified—both in the variety of food products and nonfood and foreign operations—now manufacture a greater share of food.

Large firms account for a greater share of food manufacturing than they did four decades ago. Increasingly, large companies are specializing in one segment of the market: foods for the grocery store, products for food service, or ingredients for other manufacturers. Much of the change has occurred through mergers, acquisitions, leveraged buyouts, and divestitures.

Only 21 companies, with 19 percent of food and tobacco sales, were diversified into other food or nonfood industries in 1950, compared with 99 companies accounting for 54 percent of sales in 1989 (14). Food service, particularly fast food operations, has been attractive to many large food manufacturers. General Foods, for example, purchased Burger Chef, then the second-largest hamburger chain, in 1967. The chain was then sold to Hardee’s in the early 1980’s. By 1989, 9 percent of fast food sales were made by units owned by food manufacturers and an additional 11 percent by their franchisees.

Foreign plants give an edge in sales abroad

Food processing firms cite a number of reasons for establishing production facilities in foreign countries rather than exporting from domestic plants (8). Foreign production avoids most tariff and nontariff trade barriers, while making it easier to deal with local governments and regulatory agencies in the host country. Transportation costs are also lower, which is particularly important for products where consumer packaging adds considerable weight. In addition, foreign production allows manufacturers to keep abreast of local tastes and opportunities for new product development or reformulations.

Some firms prefer to acquire established brands in foreign countries and use those facilities as a base for further expansion. In addition, manufacturing a product in a foreign plant may improve access to local food distribution firms and facilitate marketing and promotion of a branded consumer product.
Food Marketing

Food Service Is Growing at Home and Abroad

Food service nearly doubled its share of total food dollars spent away from home to 46 percent during 1948-90. Fast food accounted for most of the growth in the food service market.

Food spending away from home has risen steadily over the last four decades. The share of total food quantities also increased from 21 percent in 1948 to 33 percent in 1990 (fig. 10). The growth rate for quantities has been less than for expenditures because prices of food away from home rose 18 percent more than prices of food to be used at home.

Fast food accounted for most of the growth in the food service market, rising from 8 percent of the away-from-home dollar in 1948 to 32 percent in 1989. The share of table-service restaurants, lunchrooms, cafeterias, and caterers declined from 48 to 38 percent.

U.S. restaurant firms now operate nearly 7,000 establishments overseas, mostly in fast foods, up from 900 in the early 1970's. Many of these are franchises or joint ventures. Canada, Asia, and particularly Japan accounted for almost 60 percent of these foreign outlets. Nearly 40 percent of the total Kentucky Fried Chicken system and 25 percent of McDonald's outlets are located outside the United States.
Changing preferences induce striking increases in spending for food away from home

The share of food spending for snacks and meals away from home rose from 24 percent in 1948 to 46 percent in 1990. The quantity of such food purchased also increased from 21 percent to 33 percent.

Source: (14).
Advances in Food Marketing Affect the Entire Food and Fiber System

The food service industry has shown the most striking advances in domestic and international food marketing and consumption. The many changes in food marketing have affected, and will continue to significantly affect, a number of sectors tied to the food industry, especially commodity markets. Changes in services and products have prompted marked changes in labor, prices, and demand.

Labor

Growth in the food service industry here and abroad has prompted changes in service and products. Reduction of labor has been an important goal in all types of food service operations. Streamlined menus have greatly reduced kitchen labor in fast food establishments, while self-service has meant less need for counter help. In many more conventional restaurants, full service is maintained in the dining room, but the emphasis on reducing labor in the kitchen is nearly as great as in fast food outlets.

This emphasis on reducing labor has created demand for "fabricators"—suppliers who provide prepared and semiprepared foods. Meats are being cut, wrapped, and boxed at the packing plant and delivered, ready to cook, to the kitchen. Other operators are providing main courses or complete meals, which require only heating, to airplanes, lunchrooms, and other operations where time and space are limited.

Prices

The growth of fast food and other "fixed menu" restaurants has also meant that the demand for food service has become more inelastic—quantities purchased are much less responsive to price changes. Lettuce and poultry provide examples of this phenomenon.

The salad bar has become almost a standard feature in restaurants, including many fast food places, in recent years. When weather or disease sharply reduces the lettuce crop in one California district, as happens every few years, prices shoot up to ration the remaining supply. While many households will temporarily quit buying lettuce until prices fall, an eating place with a salad bar cannot. With food service demand unable to adjust, grower prices rise much more than they used to. From November 1987 to February 1988, weather and insect damage reduced U.S. lettuce production by nearly a half. As a result, iceberg lettuce prices jumped from $4-$6 per carton to $42 per carton in some eastern terminal markets.

Similarly, in 1988, the dramatic increase in hamburger outlets offering chicken, coupled with declining broiler production, drove wholesale prices of boneless chicken breasts (the principal source of the white meat needed for nuggets, fillets, and similar cuts) from $1.55 per pound in January to $2.79 in June.

Many of the changes in food processing and marketing have significantly affected the ways in which market prices are formed through the multiple levels of the food system. The relationships between farm, manufacturer, wholesaler, grocery store, and restaurant prices have been altered and demand relationships are different.

Food service price margins are much wider than those for food sold through stores. In 1990, the farm value accounted for 16 percent of the food service dollar, compared with 30 percent for foodstores. Thus, restaurant prices tend to be substantially more insulated from farm price changes than are foodstore prices.

Restaurant prices have trended upward compared with store prices. But in periods of rapid food price inflation, as during 1972-74, store prices rose more rapidly. Restaurant prices generally tend to rise at about the rate of the consumer price index for nonfood goods and services. This indicates that cost increases for labor and other nonfood items are more important than food costs in determining restaurant prices.

Products

Many restaurants and food processors are offering new or reformulated products in response to consumers' interest in more healthful foods. Three of
the largest fast food chains—McDonald's, Wendy's, and Burger King—switched from cooking with beef tallow to cooking with vegetable oils to reduce the saturated fat content of their french fries by about 50 percent. The Economic Research Service estimates that this change will realign the demand for vegetable oils by about 250 million pounds per year. The demand for corn oil will increase by about 150 million pounds, and demand for cottonseed and soybean oil will rise by 50 million pounds each (29).

The demand for beef tallow, on the other hand, will decline to about 650 million pounds, compared with 841 million in 1989-90. Adjustments in the market for edible tallow will include an increase in exports and a diversion from edible to inedible uses, such as displacing a small amount of tropical oils used in soaps. Exports of edible tallow are forecast to total 375 million pounds in 1990-91, up from 240 million in 1988-89.

The market for traditional fats and oils could also be affected by manufacturers' development of fat substitutes for use in processed products, such as ice cream, shortenings, and salad dressings. Three types of fat substitutes in current use or under development include starch-, protein-, and fatty-acid based.

Compounds, such as olestra, made from traditional vegetable oils would have a smaller economic effect on the oils industry than would those made from other ingredients (16). Vegetable oil-based substitutes would also raise the demand for other ingredients, including sugar, used to make the substitutes. If the fat substitute causes demand for fat-containing foods to increase substantially, sales of vegetable oil would rise.

Conversely, protein-based substitutes would reduce the demand for vegetable oils while increasing the demand for ingredients used to make the substitutes. For example, Nutrasweet's Simplesse is made from egg whites or milk proteins. If it were used in 25 percent of U.S. ice cream, Simplesse would displace about 123 million pounds of milkfat with 40 million pounds of milk or egg protein, adding to the surplus of milkfat.

Using Simplesse in retail low-calorie salad dressings would displace about 9.5 million pounds of vegetable oil. If 10 percent of regular salad dressings, which contain more than five times as much oil, also switched to Simplesse, another 17.6 million pounds of vegetable oils would be displaced.
Greater foreign demand for U.S. crops has increased the role of agricultural exports in the U.S. economy and the stake of U.S. farmers in foreign markets. For example, $40 billion in U.S. exports of farm products in 1989 generated an additional $61 billion in business to the economy, representing the cost of activities required to produce and transport items for export.

Most exports of U.S. agricultural products are of unprocessed grains, soybeans, cotton, and tobacco. U.S. exports of high-value products (such as manufactured foods) grew during the 1970's, but not as much as exports of raw commodities. The high-value processed products involve food manufacturers, workers, and machines in the United States, whereas exports of grains and other raw products utilize only transportation and handling services within the United States.

Agriculture’s contribution to the U.S. balance of trade with the rest of the world has been substantial, and grew through the 1970's. It peaked in 1981 when the agricultural trade balance offset nearly half of the trade deficit in nonagricultural goods.

USDA’s Economic Research Service estimates that each dollar earned from agricultural exports stimulates another $1.52 of output in the U.S. economy. Thus, the $40 billion worth of exports in 1989 generated an estimated additional $61 billion in supporting activities required to produce and transport products for export. Approximately 85 percent of this additional economic activity is earned by the nonfarm sector. The food processing sector earned $4.8 billion from exports. Other manufacturers, including petroleum refiners and tobacco and fertilizer manufacturers, accounted for $18.8 billion. The value of additional trade and transportation totaled $7.4 billion. The value of other services, such as utilities, amounted to $19.3 billion.

U.S. agricultural exports generated 1.06 million full-time civilian jobs in 1989. Of these, around 426,000 farmworkers—13 percent of the farm labor force—could have been considered as producing for export.

U.S. agricultural imports grew from $4 billion in 1959 to $21.8 billion in 1989. However, agricultural imports still accounted for less than 5 percent of total U.S. consumer spending on food.

At the same time, agriculture’s share of total U.S. imports fell from 25 percent to 5 percent as Americans devoted more of each dollar earned to television sets, cars, VCR’s, and other import items.

U.S. consumers spent more than $6.5 billion in 1989 for commodities that cannot be produced profitably in the United States. These noncompetitive imports include coffee, cocoa, and bananas. While spending for noncompetitive imports remained fairly constant in 1977-89, competitive imports more than doubled to $15.6 billion by 1989. Competitive imports compete directly with U.S. products, including meat, dairy products, fruits, nuts, vegetables, sugar, and wine.

In some trade categories, the United States offset the value of competitive imports with exports of other types of products in the same category. For example, growth in meat exports outpaced the increase in meat imports during the 1980's, even though meat imports surpassed coffee to become the largest single U.S. agricultural import in 1988 and 1989. Most imported beef comes from low-cost, range-fed animals raised in Australia, Argentina, or Canada and is destined for further processing. U.S. beef exports, in contrast, are largely high-quality, grain-fed cuts.

The United States also exports more oilseeds and oilseed products than it imports. At the same time, large imports of coconut, palm, and palm kernel oils nearly offset U.S. soybean oil exports.

Use of imported commodities, instead of available domestic ones, implies a potential reduction in national income and employment. The estimated loss
to the U.S. economy from the $15.6 billion worth of competitive imports in 1989 was around $40.4 billion. That is, for each dollar spent on these imports, approximately another $1.50 in supporting goods and services would have been spent in the United States if those items had been produced domestically.

An offsetting influence not reflected in the estimate, however, is the interdependence of U.S. trade with some U.S. trading partners. Because U.S. imports may provide foreign exchange for other nations to buy U.S. exports, the effect on the economy of importing competitive products may be less than estimated.

Excluding farming and food processing, the U.S. economy received a direct net total (exports minus imports) of $4.9 billion from agricultural trade in 1989. Even after considering the domestic output forgone through competitive agricultural imports, the total increase in economic output generated by agricultural trade activities was $34.4 billion.

Figure 11
Exports are a growing percentage of gross farm output

Foreign demand for U.S. crops rose sharply after 1973, greatly increasing the role of agricultural exports in the U.S. economy and the stake of U.S. crop farmers in foreign markets.

* Agricultural exports and gross farm output are at constant farm prices.
Figure 12

Farm exports stimulate added economic activity

*Billion dollars, 1989*

<table>
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<tr>
<th>Category</th>
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<td>Transportation and trade</td>
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1 Additional economic output includes the business activity needed to produce the supporting goods and services for export.

Source: Compiled from ERS data.
Farming and the Rural Economy

Farming’s Role in Rural Economies Has Diminished as Reliance on Other Industries Has Grown

The rural economy relies less on agriculture and more on industries such as manufacturing and services for jobs or income. Shifts in the farm economy have been felt by agribusinesses in rural areas, including farm supply retailers, crop service firms, and grain elevators.

Fifty years ago, agriculture was the dominant economic activity of rural America. But years of farm consolidation, accompanied by widespread migration of farm and nonfarm people out of rural areas dependent on farming, and the growth of rural nonfarm jobs have changed that situation. Today, most rural people do not depend on agriculture as a principal source of employment or income. Even farmers depend less on agriculture; income from off-farm jobs, investments, and transfers accounted for over half of all U.S. farm household income in 1984-88.

Farm earnings accounted for only 8 percent of total rural earnings in 1987. Instead, the rural economy increasingly depends on industries other than farming, mining, forestry, and fisheries. Private services and construction have been the fastest growing industries since 1969. In the 1980’s, private services accounted for all net new jobs in the rural economy, while growth in the number of Government jobs helped offset job losses in other industries.

Residents of an estimated 514 farm-dependent counties (those counties where farming generated at least 20 percent of labor and proprietors' income) rely more heavily on agriculture. Because they lack industrial diversification, these counties are more susceptible to fluctuations in the domestic and international economies that affect the farm sector. Farmland owners in farming-dependent counties, for example, bore the brunt of declining asset values in the mid-1980’s.

The agribusiness sector--farming, farm input, and processing and marketing activities--accounted for one-third or more of total employment in 785 rural counties in 1986 (20). About 30 percent of total agribusiness employment is located in rural areas.

In 1986, about 62 percent of farmworkers' jobs (including farm proprietors) were in nonmetropolitan areas. About 48 percent of the jobs in agricultural input industries, 36 percent in agricultural processing and marketing industries, and almost 18 percent in food and fiber wholesale and retail trade were also located in rural counties.

Some agribusiness firms, like crop service firms, prepared-feed manufacturers, farm supply retailers, grain elevators, and livestock auctions, tend to be located near farms and within small trading areas. Meatpackers, flour mills, soybean oil mills, nitrogen fertilizer plants, and agricultural credit institutions are also present in agricultural areas, but are often located in the larger towns and cities of nearby agricultural production regions.

Events of the last several decades have spurred considerable changes in rural areas. Rural areas saw record population shifts to metropolitan areas during the 1980’s, after a decade of migration from urban to rural areas (21). Population losses were concentrated in farming and mining areas. In 1981-86, farm production employment in rural areas declined by around 430,000 jobs.

The farm problems of the 1980’s also significantly affected agriculture-related employment in rural areas. The rate of change dropped 2.3 percentage points from growth in 1975-81 to a decline of -1.1 percent in 1981-86 (20). Nonagricultural employment growth in rural areas slowed from 2.9 percent during 1975-81 to 1.4 percent in 1981-86. Rural growth in nonagricultural jobs slowed to less than half the rate of 1975-81, reflecting the tendency for rural areas to recover less quickly from downturns in the general economy.

Rural employment in every agribusiness sector, except wholesale and retail trade, declined in 1981-86. The wholesale and retail sector grew at only half the 1975-81 rate.


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