# 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.

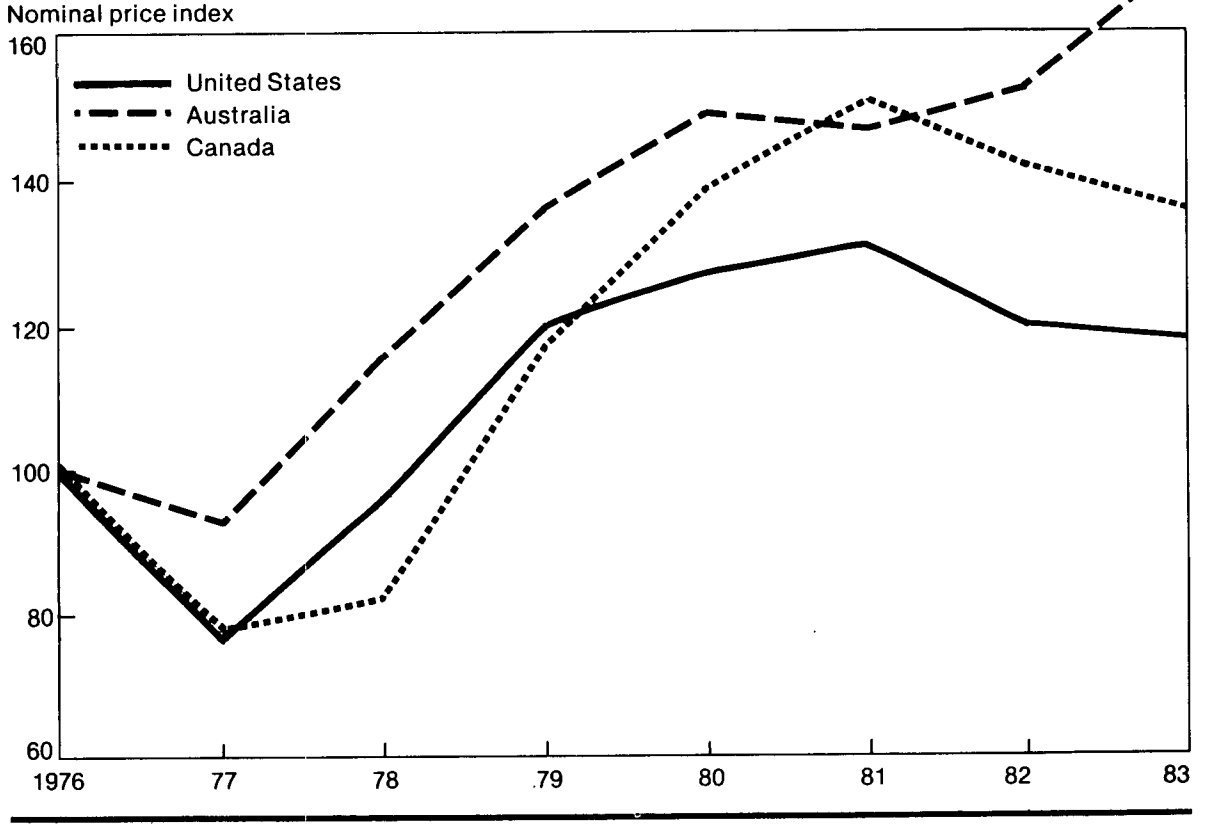
In terms of the relationships developed above, the decline in the U.S. price after 1981 suggests that the return to inputs specific to agriculture in the United States would fall. The inputs specific to agriculture are land, farm machinery, farm buildings, and farmers. Thus, U.S. owner-operator farmers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

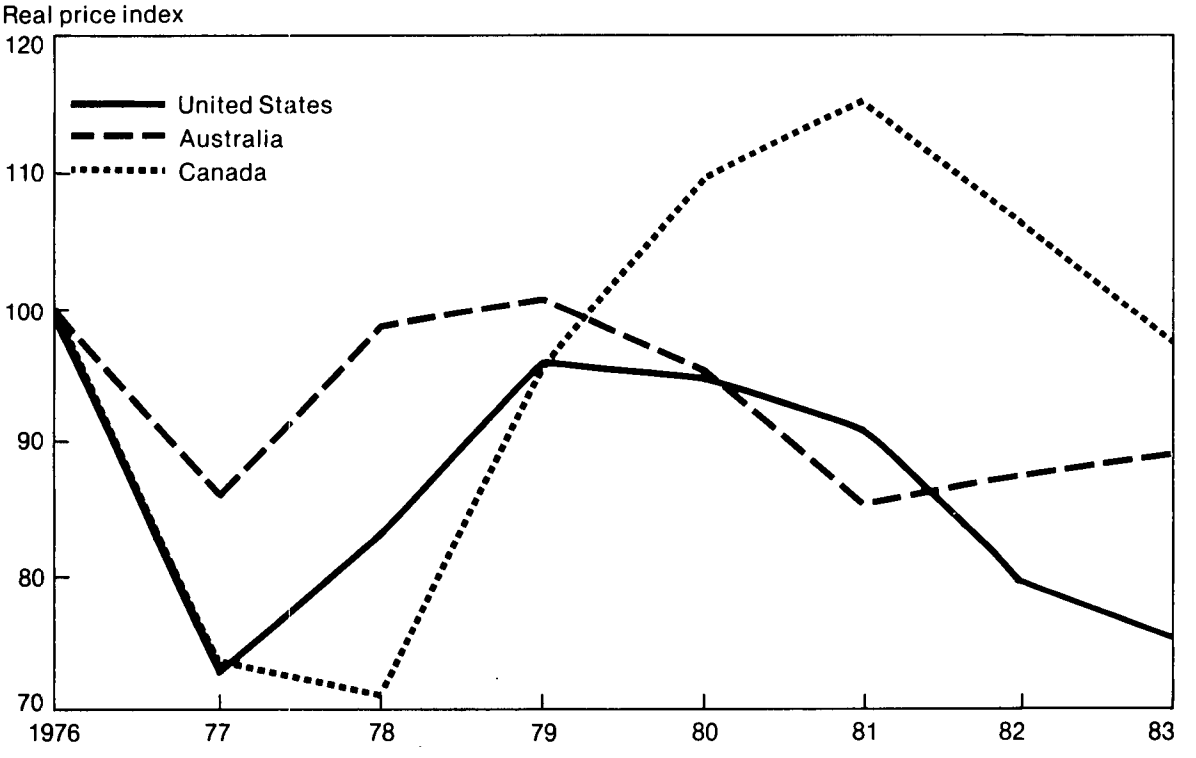



Table 16--Indices of nominal land values in the United States and for selected regions in Canada

| 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.

## REFERENCES


(1) Australian Bureau of Agricultural Economics. Trends in the Australian Rural Sector, various issues.

(2) Baumes, H. S., and W. H. Meyers. The Crops Model: Structural Equations, Definitions, and Selected Impact Multipliers. NED Staff Rpt. U.S. Dept. Agr., Econ., Stat., Coops. Serv., Mar. 1980.

(3) Bredahl, M.E., W.H. Meyers, and K.J. Collins. "The Elasticity of Demand for U.S. Agricultural Products: The Importance of the Price Transmission Elasticity," American Journal of Agricultural Economics, Vol. 61, No. 1, 1979, pp. 58-63.

(4) Council of Economic Advisers. Economic Report of the President. various issues.

(5) Deardorff, A.V. "The General Validity of the Law of Comparative Advantage," Journal of Political Economy, Vol. 88, No. 5, 1980, pp. 941-957.

(6) Dixit, A.K., and V. Norman. Theory of International Trade. Cambridge: Cambridge Univ. Press, 1980.

(7) Dunmore, J., and J. Longmire. "Sources of Recent Changes in U.S. Agricultural Exports." Staff Report No. AGES831219. U.S. Dept. Agr., Econ. Res. Serv., Jan. 1984.

(8) Food and Agriculture Organization of the United Nations. Production Yearbook. Rome, various issues.

(9) Longmire, J., and A. Morey. Strong Dollar Dampens Demand for U.S. Farm Exports. FAER-193. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1983.

(10) Paarlberg, P.L., and others. "Impacts of Policy on U.S. Agricultural Trade." Staff Report No. AGES840802. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1984.

(11) Schuh, G.E. "Theoretical Considerations for Cost of Production Studies." Presented at the International Seminar on the Cost of Production, Institute of Agricultural Economics, State Secretariat of Agriculture, Sao Paulo, Brazil. January 27, 1976. Draft Apr. 1976.

(12) Spriggs, J. An Econometric Analysis of Canadian Grains and Oilseeds. TB-1662. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1981.

(13) Spriggs, J. An Econometric Analysis of Export Suppply of Grains in Australia. FAER-150. U.S. Dept. Agr., Econ., Stat., Coops. Serv., June 1978.

(14) Statistics Canada. Farm Input Price Index. 1984.

(15) _____. Farm Net Income. 1983.

(16) U. S. Department of Agriculture. Agricultural Statistics, various issues.

(17) _____, Economic Research Service. Economic Indicators of the Farm Sector: Costs of Production, 1982. ECIFS 2-3. Dec. 1983.

(18) _____, Foreign Agricultural Service. Foreign Agriculture Circular: Grains, various issues.

(19) Wharton Econometric Forecasting Associates. World Long-term Economic Outlook. Phila. PA, Jan. 1984.

(20) The Western Producer, Nov. 1, 1984.

(21) Zellner, J.A. "Direct Payments and Acreage Reduction: An Estimate of Program Induced Export Subsidies and Taxes." Unpublished paper. U.S. Dept. Agr., Econ. Res. Serv., Feb. 1985.