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Trends in Cereal Supply, Demand, Trade, and Stocks

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Forces underlying commodity trade, capital movement, technology transfer, and political cooperation contribute to increased interdependence among nations. The policies of a country are influenced by the international policy environment, which represents the collective national policies of other countries. Thus, depending on the policy area, countries affect one another in varying degrees. This chapter discusses the past, present, and emerging global conditions of the supply and demand for cereals, an important element of agriculture and trade in this international environment.[1] These global conditions constitute a crucial part of the framework of agricultural policies of developing countries. A global backdrop is provided here for the chapters that address domestic aspects of price policies.

Adjusting global cereal supply to demand is a dynamic process that has to deal with fluctuations in production in both importing and exporting countries, changing patterns of domestic utilization, shifts in national production and trade policies, and other factors both economic and political. The growth of cereal production in developing countries has been much more rapid than population growth, but demand has grown even faster than production.[2] As a result, net cereal imports of developing countries have shown a steep upward trend.

PRODUCTION

Between 1961–65 and 1976–80, world cereal production increased by about 100 million metric tons every three years. Annual increments averaged 19 million metric tons in the developed countries and 15 million in the developing countries (including China). Developing countries, which con-

1. Based on 1976–80 data, cereals account for nearly 90 percent of the world's major food staples production and about 95 percent of their volume in world trade.

2. Unless otherwise stated, the term "developing countries" refers to these countries as a group.

tain three-fourths of the world's population, contributed less than half of the total world cereal production in the late 1970s. On a per capita basis, estimated output for developed countries was more than three times that for developing countries.

Growth of world cereal production, excluding China, averaged 2.8 percent a year during 1961–80 for both developed and developing country groups (table 2.1). Meanwhile annual growth rates of population were 1.0 percent for developed countries, 2.5 percent for developing countries, and 1.9 percent for the total. Thus while cereal production growth rate was 2.8 times the population growth rate for developed countries, it was only 12 percent greater than the population growth rate in developing countries.

It is notable that in the period 1961–80 the average annual percentage variations from trend of world cereal production were far larger in the developed countries, 4.5 percent, than in the developing countries, 2.5 percent. These greater fluctuations in developed countries may be caused in part by adjustments in their production and trade policies to volatile conditions in the world grain trade. Most developing countries, which are largely net importers, can more easily insulate their domestic production from external conditions and thereby smooth domestic production.

Production growth rates slowed significantly for both country groups from the levels of the 1960s, at the height of the green revolution, down through the 1970s. Compared to the growth during 1961–70, the average annual rate of increase of world cereal output fell 30 percent during 1971–80, with a drop of 40 percent for developed economies and only 10 percent for developing countries. The slowdown of the growth of cereal production in the developed economies occurred largely in the U.S.S.R. and Eastern Europe, where the annual growth rate declined from 4.0 percent in 1961–70 to only 1.2 percent in 1971–80. In the rest of the developed countries there was an 18 percent decline in the production growth rate. Consistent with that, world cereal output rose every year in the 1960s except 1965, but alternated between increases and decreases during 1971–80 except for two successive increments in the mid-1970s (fig. 2.1). Nevertheless, production was farthest above trend in 1971, 1973, and 1978, when it exceeded trend estimates by more than 4 percent.

Output performance during the second half of the 1960s clearly reflected the initial impact of the green revolution in Asia. Figure 2.1 also shows that world cereal output was significantly below trend in 1961, 1965, 1975, and 1980. During these two decades, simultaneous production declines in developed and developing countries occurred only in 1972 and 1977. Both groups showed increases in eight of the observed years, with total production increasing 8 percent or more in five of those years.

Practically all of production growth in developed countries is attributable to rising yields, while expansion of area has been a relatively impor-

Table 2.1 Growth trends of world cereal production, 1961–80, 1961–70, and 1971–80

Country group[a]	Annual growth rate of cereal production[b]		
	1961–80	1961–70	1971–80
		(percent)	
Developed countries	2.8	3.2	1.9
Developing countries	2.8	3.1	2.8
World total	2.8	3.2	2.2

Sources: Basic data from FAO production tapes, 1975, 1979, 1980; China (Taiwan Executive Yuan) 1982.

[a] Following the FAO classification of countries. Excludes China, whose production levels in the early 1960s were abnormally low on account of disruptions during the period. Use of data for the People's Republic of China would tend to exaggerate output trends for developing countries and the world as a whole. The country's cereal production data indicate average annual growth rates of 4.0 percent, 5.4 percent, and 3.9 percent in 1961–80, 1961–70, and 1971–80, respectively.

[b] The measures of annual growth rates were derived from the fitted semi-logarithmic equation $Y = e^{a+bt}$ to time-series data on cereal production, where Y represents production, t number of years from the base period of the series, and b the annual rate of change in the logarithm of Y.

tant factor in developing countries. But, as agricultural research systems mature in developing countries and the land frontier recedes, that contrast is becoming less. Thus, in the period 1961–80, about 90 percent of production growth in developed countries is explained by yield increases and only 10 percent by area; in contrast, for developing countries those proportions were 65 percent and 35 percent, respectively. But developing countries raised the proportion of production increases explained by yield from 50 percent during 1961–70 to 70 percent in 1971–80. That evolution can be expected to continue.

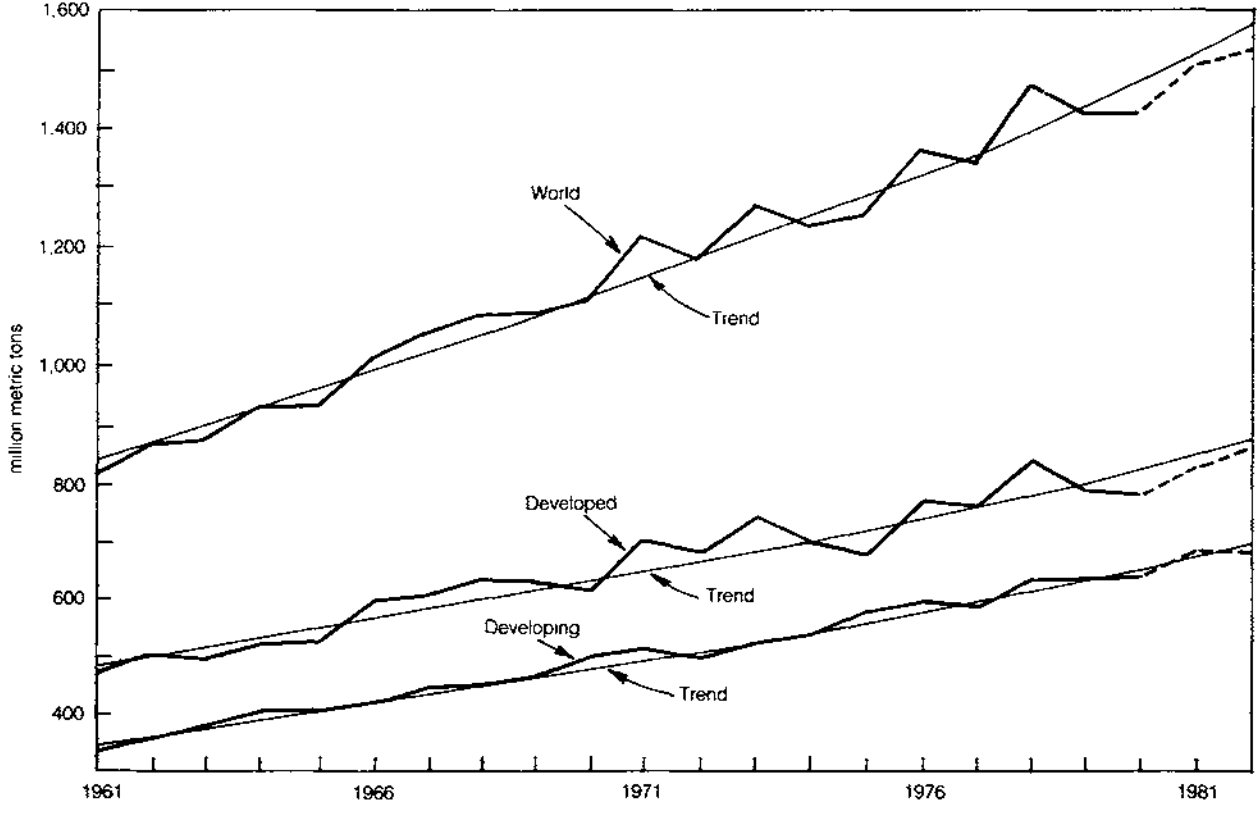
CONSUMPTION

While the production growth rate in the past two decades has been similar in developed and developing countries, there is a sharp contrast in their consumption trends.[3] It is that contrast which provides the dynamics of the major changes in trade to be discussed below and the possible favorable environment for agricultural investment in developing countries.

Cereal consumption between 1961–65 and 1976–80 expanded at 3.2 percent a year in developing countries and 2.5 percent a year in developed countries (table 2.2). Relative to their respective rates of production growth, consumption was 14 percent faster in developing countries and 11

3. Consumption here refers to total domestic utilization.

Figure 2.1 Actual world cereal production and trend estimates, 1961–82



Sources: FAO production tapes 1975, 1979, 1980; China (Taiwan Executive Yuan) 1982; Stone n.d.
Note: Broken line indicates data not included in the analysis.

Table 2.2 Trends in world consumption of cereals, 1961–65 to 1978–82

Country group[a]	Relative distribution of cereal consumption among uses						Average annual rate of consumption growth, 1961–65 to 1978–82		
	1961–65			1978–82					
	Food	Feed[b]	Other uses	Food	Feed[b]	Other uses	Total	Food	Feed[b]
	(percent)								
Developed countries	25	60	15	18	68	14	2.4	0.5	3.0
Developing countries	66	17	17	64	21	15	3.3	3.0	4.7
World total	39	45	16	36	49	15	2.7	2.2	3.3

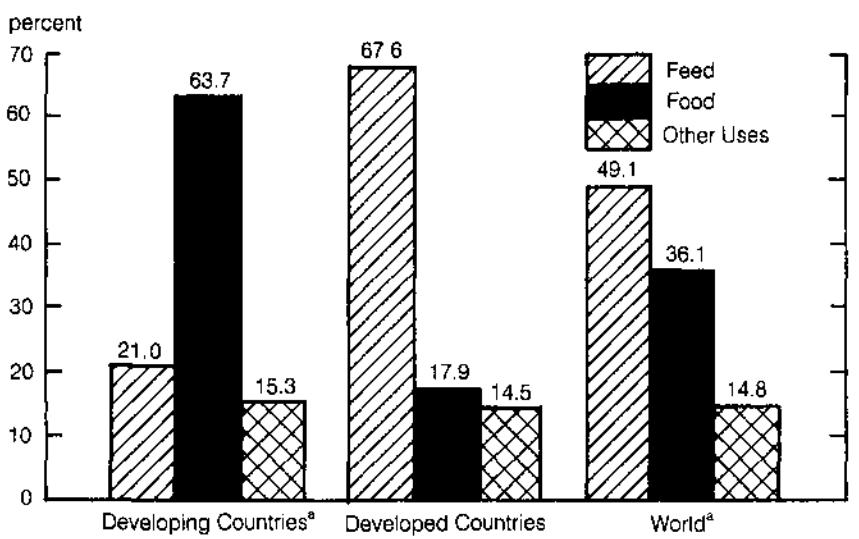
Source: FAO 1985.
[a]Following the FAO classification of countries. Excludes China.
[b]Estimates include cereal bran and cake.

percent slower in developed countries. The contrast is much sharper if the Soviet bloc is excluded from the estimates for developed countries, in which case the consumption growth rate of the group is 29 percent slower than production growth. The Soviet bloc has a comparable production growth rate to other developed countries, but with its lower per capita income there is much more scope for increased per capita consumption.

The dynamics of consumption are brought out more clearly by separating food and feed uses of cereals. In developed countries growth in food use is negligible, at 0.4 percent. It is only because of the growth in feed use at 3.4 percent a year that overall consumption grows. During 1978–82 feed use accounted for about two-thirds of cereal consumption in the developed economies, compared to one-fifth in developing countries (fig. 2.2). And we can see from the behavior of the highest-income countries that even their livestock consumption and hence feed use will also stop growing. It is clear why developed countries have been able to provide rapidly increasing exports of cereals to developing countries. Their production grows moderately fast through yield increases from cost-decreasing technological change, and demand grows hardly at all.

The feed story is also dynamic for developing countries. Growing at 1.5 times the rate of food use, the use of cereals for animal feed almost doubled from the early 1960s to the late 1970s. One of the major changes in the

Figure 2.2 World cereal utilization, 1978–82



Source: FAO 1985.
[a]Excluding China.

world cereals scene is the rapid growth in demand for feed in developing countries and the growth of the base of feed use from what began as a negligible quantity to a significant portion of total cereal consumption. Thus rapid growth in per capita incomes in developing countries is favorable to rapid growth in demand for cereals.

TRADE

The dynamics of differing supply and demand forces in developed and developing countries is reflected in the rapid growth of cereals trade with flows from developed to developing countries, a particularly striking aspect of the global scene.

World trade in cereals during 1978–82 averaged about 220 million metric tons annually (table 2.3). This was equivalent to about 14 percent of the average yearly cereal production in the period. Developed countries accounted for more than 85 percent of exports and 60 percent of imports. Average yearly exports of Third World countries were less than 30 million metric tons; imports were about 90 million metric tons (China accounted for 1.3 million metric tons of these exports and 16.8 million metric tons of imports). Based on trade estimates for these country groups, the net flow of grains from the developed economies to developing countries in 1978–82 was about 60 million tons a year, or more than one-fourth of the total moved by trade.

From 1961–65 to 1978–82, cereal exports of developed countries rose 2.5 times. This was equivalent to a rate of growth of 5.5 percent a year. The annual rate of increase in their grain imports was 4.6 percent. In the developing economies, grain imports increased at nearly twice the rate of exports. Net cereal imports by the developing countries rose 8 percent a year in this period.

Net imports of developing countries rose from 3.6 percent of cereal consumption during 1961–65 to 6.6 percent in 1976–80 and, based on later consumption data, to 7.4 percent during 1978–82. Cereal food aid to low-income countries, particularly those in Africa, has been a significant part of this net flow from the developed economies, although it dropped 30 percent from 1961–63 to 1981 (Huddleston 1984). The bulk of the increase in developing country imports has been on commercial account.

Examination of trade data of developing countries grouped by their 1980 per capita incomes indicates a tendency for an exception to the relationship between growing food imports and production for those countries belonging to the $250–$500 range. This group of countries has shown a tendency to become increasingly self-sufficient and is projected to have net exports in the future. This unexpected performance may occur because the group happens to include countries with poor employment growth policies.

Table 2.3 Trends of world cereal trade, 1961–65 to 1978–82

Country group[a]	1961–65 Average			1978–82 Average			Annual growth rate, 1961–65 to 1978–82	
	Exports	Imports	Net exports	Exports	Imports	Net exports	Exports	Imports
	(million metric tons)			(million metric tons)			(percent)	
Developed countries	77.3	59.8	17.5	191.9	129.5	62.4	5.5	4.6
Developing countries	18.6	33.4	−14.8	31.0	90.2	−59.3	3.0	6.0
World total	95.9	93.2	(2.6)[b]	222.9	219.8	(3.1)[b]	—	—

Source: FAO 1985.

Note: Data include trade in cereal bran and cake. For the 5-year averages of quantities traded, parts may not add to totals due to rounding.

[a] Following the FAO classification of countries.

[b] The statistical discrepancy between global export and import volumes results from traded quantities in transit and from lagged reporting of import data and other data-gathering problems.

Alternatively, it may be a function of their stage of development, when livestock consumption has not yet become large enough to affect demand significantly, and development generally is at too rudimentary a stage for rapid employment growth. In either case, with further development these countries can be expected to shift to rapid import growth behavior.

It is particularly important to note that, as a group, the developing countries that have done well in food production have tended to increase net imports. Likewise, the higher-income countries and the countries with faster overall growth rate tend to increase net imports. All these elements are interrelated. Countries that accelerate food production growth tend to do well in other elements of development as well, and so overall growth rates and employment growth rates are faster. There is also a causal link between agricultural growth and employment growth. This is an important set of relationships in looking ahead because they suggest that when developing countries succeed in agricultural growth, net imports of basic food staples tend to increase.

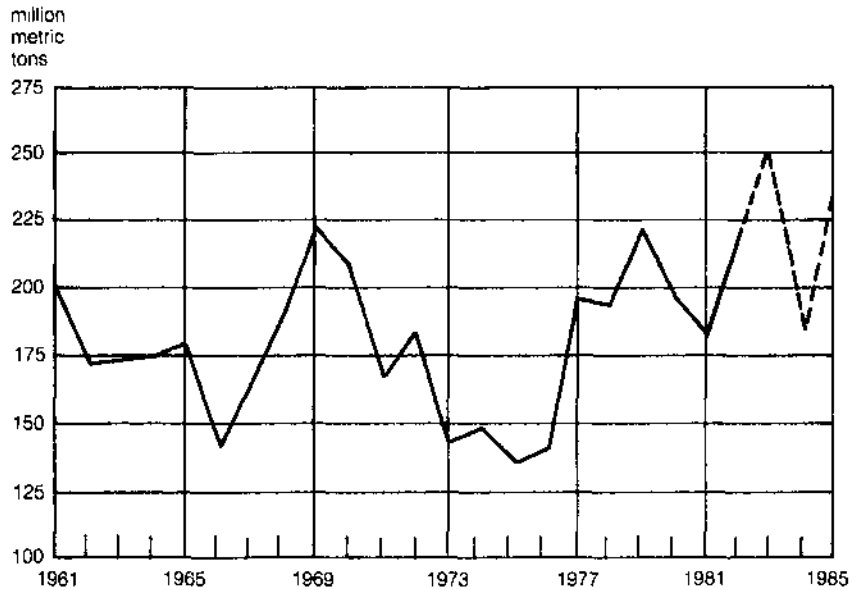
STOCKS

Indicators of the mid-year levels of world cereal stock in the period 1961–82 fluctuated widely from a minimum of 135 million metric tons in 1975 to a maximum of about 221 million metric tons in 1969 and 1979 (fig. 2.3).[4] The minimum and maximum levels of reported stocks were, respectively, 25 percent below and 23 percent above the average during 1961–65. Yearly stock averaged about 198 million metric tons during 1961–71 and 162 million metric tons during 1972–82. For the whole 1961–82 period, annual cereal stocks averaged about 180 million metric tons. These stock levels represented 22 percent of world production (excluding China) in the earlier decade and 14 percent in the later decade.

Cereal stocks rise and fall with annual grain output, thus serving as a buffer to production fluctuations. During 1961–82, annual grain stocks decreased nine times from the previous year, dropping by as much as 20 percent or more below the 1961–65 average in 1966, 1973, 1975, and 1976. Grain stocks were lowest in 1975, when the estimated level was only three-fourths of the 1961–65 average. As may be expected, cereal stocks rose following good production years. This occurred in 1967, 1972, 1977, and 1979, when gains in annual output of the preceding years exceeded 8 percent. In other years, however, this relation between stocks and production

4. Limitations of data on stocks are expected to result in underestimates. The reported figures mostly represent those held by the public sector and large private sector holdings. However, assuming consistent reporting procedures and generally unchanged proportions of reported and unreported quantities over the years, their trends can reasonably be taken to reflect those of grain stocks as a whole.

Figure 2.3 World cereal stock levels, 1961–85



Source: USDA 1986.

Notes: Stock levels are those at end of marketing year (mid-calendar year). Data are based on an aggregate of various local marketing years. People's Republic of China and parts of Eastern Europe are excluded. *Broken line* indicates data not included in the analysis.

was weaker. The relatively high levels of grain stocks in the late 1960s were associated with the production growth spurred by the green revolution in developing countries. The accumulations during the late 1970s were associated with the increases in cereal output that followed the high prices during the "world food cisis" in 1973 and 1974. (Later data show that in the mid-1980s, stocks again rose to very high levels, probably associated with major problems of structural adjustment, which particularly slowed growth in food consumption.)

Cereal stocks were apparently more effective in reducing the market impact of variations in total grain production in the 1960s than in the 1970s. The annual changes in world cereal production during 1961–70 did not lead to major price changes in the world market, as did those in 1971–80. The output decrease in 1965 caused a noticeable drawdown of cereal stocks but was less than those of the mid-1970s, when stocks fell to their record low and prices rose to their highest level since 1960. With the accumulation of cereal stocks in the late 1970s, prices remained low and seemed little affected by the changes in output. The data suggest that the relatively

lower level of cereal stocks during the 1970s than the previous decade was likely a major factor in the instability of grain prices in that period. Without cereal stocks as buffer, a decline of 3 percent in average world cereal production could mean a decline of 20 percent in the average volume of world cereal trade.

Most of the world's cereal stocks are held by the developed economies, especially the major grain exporters. However, many grain importers, especially the developing countries, view the concentration of stocks in a few exporting countries with concern and are alarmed when the exporters take measures to reduce cereal production.[5]

PRICES

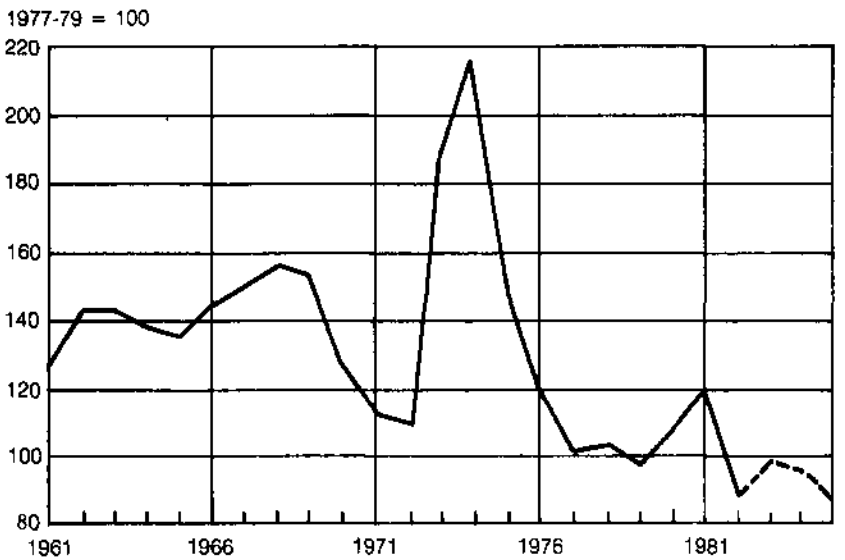
Over the very long run cereal prices have shown little trend one way or the other (Martin and Brokken 1983). There have been several substantial periods of decline in real prices and several periods of increase. There has been a tendency for superior cereals, e.g., wheat, to decline relative to inferior cereals, e.g., maize, reflecting in part the growing relative importance of livestock feed in cereal use. In the short run, however, cereal prices have fluctuated violently.

Grain prices were relatively stable in the 1960s (fig. 2.4). Annual price changes were less than 5 percent between 1962 and 1969, except for a 7 percent increase in 1966, when cereal stocks dipped due to a slight decline in world production in the previous year. Output and stock holdings rose in the late 1960s. In the 1970s, global grain demand increased steadily, but significant changes in production and stocks led to wide price fluctuations. During the food crisis years, the price index rose to 197 in 1973 and to its peak of 216 in 1974. The extraordinary rise in grain prices in these two years played a role in the rapid growth of output in the late 1970s that resulted in larger than average stock holdings and the sharp decline in prices. Cereal stock levels in 1982 were about 20 percent above and prices, in real terms, more than 30 percent below their 1961-65 averages.

The major swings in grain prices in the 1970s were largely compensating. The 1961-80 price trend declined only slightly, largely because of low prices beginning in 1977. The difference of just a few years in the period analyzed makes a substantial difference to the perception about trend. Thus, a simple linear trend equation fitted to the price indices in table 2.4 would show an average annual rate of change in the real prices of cereals of 1.1 percent during 1961-75, −1.3 percent for 1961-80, and −1.6 percent for 1961-82. This simply shows that the fluctuations are very largely relative to whatever trend exists. Although the 1973 and 1974 prices were un-

5. International Wheat Council 1983.

Figure 2.4 Index of world cereal prices, 1961–85



Source: World Bank 1984a.
Note: Broken line indicates data not included in the analysis.

Table 2.4 Index of world cereal prices, 1961–85 (1977–79 = 100)

Year	Price index[a]	Year	Price index[a]	Year	Price index[a]	Year	Price index[a]
1961	128	1968	156	1975	148	1982	88
1962	143	1969	153	1976	119	1983	98
1963	143	1970	126	1977	101	1984	95[b]
1964	138	1971	112	1978	103	1985	85[b]
1965	135	1972	109	1979	97		
1966	144	1973	187	1980	107		
1967	150	1974	216	1981	119		

Source: World Bank 1984a.
[a] Calculated from prices in constant dollars, which include those of rice, wheat, maize, and sorghum.
[b] Preliminary.

usually high for the two-decade period, they were not spectacular when viewed in the long term. Martin and Brokken (1983) analyzed real cereal prices for more than a hundred years ending in 1981 and found that 1973 and 1974 levels were exceeded 19 times in corn and 33 times in wheat. A World Bank study sees gains in cereal prices for the coming decade, especially those of wheat and coarse grains (World Bank 1985).

CONCLUSION

Agricultural development in developing countries is a long-term proposition requiring large public investment in the rural sector and major commitment with respect to development strategy. As will be brought out in chapters 4 and 7, resource productivity will be higher if advantage is taken of international trade with consequent adjustment of domestic production according to international prices. What does our analysis of global cereal trends tell us about longer-term price relationships as a basis for public investment decisions in agriculture? Only a few points are clear.

First, developing countries in general can be expected to face rapidly increasing net imports of cereals. Because demand for food tends to increase more than domestic production as a result of development processes, increases in their net import position seem inevitable. That provides a relatively favorable domestic price environment for developing countries that are net importers, as they price above international prices by their transfer costs. The developing country exporters, however, must compete in a market in which developed countries are generating increasing exports. At best, that will be a competitive environment requiring attention to reducing costs and taking maximum advantage of low-cost food to foster rapid growth in employment-increasing types of production.

Second, international prices are likely to be highly unstable, reflecting increasingly unstable production and a reluctance of the major exporters to hold larger stocks. Thus, at any given point in time, it will be difficult to judge the likely average international price. This also means that food security will be costly to achieve whether by domestic stock, domestic supplies, or foreign exchange. (One will note in chapter 5, however, the discussion of the success of Indonesia in ensuring food security in the face of an unstable global situation and at modest cost.)

Third, in view of the strong growth in demand in developing countries, it is reasonable to expect pressure for real food prices to rise. With their production resources and greater adaptability to changes in output policy, developed country exporters can be expected to provide most of the response to this market demand. Thus exportable supplies will also grow rapidly over time. As only a small proportion of total food production

moves in international trade, it is unreasonable to attempt to predict reliably the trend of cereal prices. But that should also warn us against trying to predict trend from sharp short-term movements one way or another.

Fourth, the market adjustment process for world grains involves various interacting forces, both economic and political, which affect world supply and demand. These include changes in output policies of the major exporting countries and in trade decisions of large grain importers, such as the U.S.S.R., that can alter market conditions considerably. The implications of these forces for the ability of developing countries to import cereals at prices they can afford can be very significant, particularly at a time when many countries have foreign exchange difficulties.

Finally, special concern needs to be given to the food situation of the world's poor and undernourished, as both developing and developed economies adjust their agricultural and trade policies to market changes. It is in the interest of developed countries as major exporters to use food aid to increase future markets. Food aid programs that increase consumption of low-income people beyond what they could otherwise afford is in line with those interests and facilitates development, food security for the poor, and long-term prices that favor more resources devoted to agriculture than would otherwise be the case.