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WORLD GRAIN TRADE AND ITS FINANCING: PAST PATTERNS AND FUTURE PROSPECTS

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World Grain Trade and Its Financing
Past Patterns and Future Prospects

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Chapter I

Introduction

World trade in grain is small relative to either total world trade or total world grain production. Nevertheless, small changes in grain trade flows can have powerful effects on the welfare of multitudes of consumers and producers. As a consequence, governmental policies affecting international grain trade often seem to generate controversies that are grossly inconsistent with the amounts of money or commodities involved. Governments have understandably become sensitized to these reactions and have devised ingenious means to avoid the negative and curry positive responses especially from politically powerful groups. But national policies oriented to powerful domestic political interests often conflict with those of other countries that are competitors either as exporters or importers.

Over the past decade these conflicts about grain trade policy have escalated. They have figured prominently in the "Cold War" confrontations between the U.S. and the U.S.S.R. They have led to a breakdown in trade negotiations among the OECD countries, and they have even been suggested as threatening the survival of the European Community. Finally, cutbacks in food aid for poor countries have been seen as threatening the survival of millions in drought-prone parts of Africa.

If these conflicts are to be resolved, or at least reduced in intensity, there must be a greater appreciation of the underlying forces and trends in world grain markets and of the consequences of pursuing narrow group or national interests at the expense of a broader world interest. This study attempts to provide a basis for such an understanding.

For almost three decades after World War II, the United States and the Canadian governments implemented policies that stabilized world grain prices and supplied grain on favorable terms to countries in need of imports. Several countries did have problems with their domestic grain supplies or prices, but these often resulted from internal or external political confrontations rather than instability in world markets. There was criticism of the North American grain policies on the grounds that they kept grain prices too high in the exporting countries and too low in many importing countries, thereby discouraging grain production in some import-dependent countries while supporting inefficient producers in the exporting countries.

Partly in response to these criticisms, the United States and Canadian governments cut back on their price support and food assistance programs in the early 1970s. They sought thereby to make both production and trade more responsive to market forces and to reduce the dependence on government for direction and financing. That shift in policies might reasonably have been

expected to lead to greater self-supply among the grain importing countries and reduced dependence on imports from North America. In fact, just the reverse has happened. There has been a substantial increase in world grain trade, and North America has increased its position as the predominant supplier of grain to all other continents except Australia. At the same time, instability has increased. World market prices of grain have been more volitile than at any time since the Great Depression. Many countries were severely buffetted by food shortages and sharply rising prices in the years 1972-74. But in the last few years there has been a return of surpluses and falling relative prices in the main exporting countries and in world markets. Since 1972, food aid has been significantly reduced, and other, more costly, forms of financing have emerged to take its place.

While the North American countries have reduced price supports and export subsidies since 1972, the European Economic Community (EEC) has moved in the opposite direction. This divergence of policies has generated much disagreement both within the EEC and between the EEC and the United States and Canada. The EEC is accused of depressing world grain prices, expanding its markets unfairly and protecting inefficient producers. Within the EEC there are complaints from those countries that have to pay the subsidies for the inefficient producers. But the benefitting countries within the EEC contend that the policies are critical for their political stability.

The North American countries, having failed to obtain any moderation of the EEC stance, are now exploring various forms of counteraction, prominant among which are some new financing programs that would subsidize interest rates or ease financing costs in other ways.

While the United States, Canada, and the EEC are in confrontation over their export-related policies, the IMF and the World Bank have been devising new measures to deal with the problems of the grain-importing countries. Recently the IMF introduced a new Compensatory Financing Facility to finance short term increases in the costs of grain imports resulting from either shortfalls in domestic production or higher world market prices. The World Bank's structural adjustment loan programs, on the other hand, can be used to promote longer run basic structural changes that may result either in increased agricultural production or increased export capacity to pay for food imports. A concern for both the IMF's food financing facility and the structural adjustment loans is that, to the extent they are used to finance grain imports, they may also encourage a greater rather than a reduced dependency on such imports in the future, as the food aid programs of the past were accused of doing.

As background for consideration of these policy initiatives and conflicts, this study will review the recent patterns of grain production and trade (Chapter II), the major sources of demand for financing of grain trade (Chapter III), and also the many types of

financing that have been or are available in connection with world grain trade (Chapter IV). (Some quantitative analyses that seek to determine whether the availability of financing or food aid has had a significant impact on the magnitude of grain imports in three sample countries is presented in an appendix at the end of the study.

Having reviewed the past, we will next present some estimates of the future growth of international grain trade (Chapter V) and its financing, incorporating or rejecting the predictions of others as we deem appropriate. Finally, we shall set forth the implications of our analysis for some of the major policy issues currently under discussion (Chapter VI).

In all of this, our focus will be mainly on the longer run trends of production and trade in both importing and exporting, developing and developed countries. The food security issue, which mainly concerns shorter run fluctuations in production, prices, and imports in the poorer developing countries, has already received much attention from others whose work we will draw upon as appropriate.

Chapter II

Recent Patterns of Grain Production and Trade

World production of grain, or cereals--we shall use the terms interchangeably--has more than doubled in the three decades from 1950 to 1980. World population has less than doubled over the same period so that world grain production per capita has risen by roughly one-third, or by about one percent per year. Some people see this as a hopeful sign--that the world is increasingly able to feed its evergrowing population. The Malthusian threat is being overcome. Others read the signs quite differently. While acknowledging that the past is not too bad, they see either the trends changing or growing inequality of distribution resulting in more widespread malnutrition in the face of rising grain production per capita.

Despite the disagreements over the broad trends and prospects for world grain production, it is clear that the share of total production entering into international trade is rising. The growing disparities in per capita production and changing consumption patterns have been major forces driving up the trade ratio. As people's incomes have risen they have tended to consume more grain indirectly as meat, resulting in a rise in total grain consumption and a shift to greater consumption of coarse feed grains such as maize and sorghum. The supply of coarse grain has responded most flexibly in a few countries--especially the United States--so that

the trade flows of maize from the U.S. to the rest of the world have risen dramatically.

Before attempting to consider the future prospects for international grain trade, it is useful to review the past patterns of production and trade in some detail.

A. Production Trends

The broad trends in world cereal production over the past three decades are presented in Table 2:1. Here we see both the magnitudes and the growth rates of cereal production, harvested area and yields per unit of harvested area. We have used the average annual amounts based on three or five year periods around the end of the decades so as to reduce the distortions of particularly good or bad years. For reference purposes the world population estimates and growth rates are also shown.

The growth rate of cereal production for the three decades since 1950 has been consistently above the population growth rate, but it has also been declining, thus narrowing the spread between the two. The optimists emphasize that the spread exists; the pessimists note that it is getting smaller. Growth of production is due to increases in both land and yields, but the growth rates of these two factors have moved in opposite directions from decade to decade. Here again the pessimists focus on the decline in the yield growth rate between the 1960s and the 1970s and suggest that the high growth of 2.5 percent per annum in the 1960s is unlikely

Table 2:1

World Production, Harvested Area and Yields for All Cereals

(Amounts and Compound Annual Growth Rates over 3 Decades)

	1948-49 1952-53		1960-61 1962-63		1969-71		1979-81
Production (million MT)	680		962		1,232		1,593
Growth Rate (per annum)		3.20		2.79		2.60	
Area (million ha.)	595		662		682		727
Growth Rate (per annum)		.98		.33		.65	
Yield (MT per ha.)	1.14		1.45		1.81		2.19
Growth Rate (per annum)		2.21		2.50		1.92	
Population (millions)	2,513		3,027		3,677		4,415
Growth Rate (per annum)		1.88		1.97		1.84	

Source: FAO Production Yearbooks.

a. Production, area and yield values are the annual averages for the periods shown.

b. Growth rates are the compound annual growth rates for the annual averages from mid-point to mid-point of each period shown.

c. Population estimates are for the end of decade years, 1950, 1960, 1970, 1980.

to be achieved again. The optimists suggest that many factors, such as the unprecedented increase in energy and fertilizer prices, and the instability in world grain markets, contributed to depressed grain yields. More favorable conditions and new technological breakthroughs, especially ones that economize on energy inputs, may well bring the yield growth rate back up to the level of the 1960s in future decades. Without trying to resolve which of these interpretations is correct, we can at least record that, over the 30-year span from 1950 to 1980, yields increased at an average annual rate of 2.2 percent resulting in a near doubling of per hectare yields from 1.14 to 2.19 tons per hectare. Also, average annual per capita world grain production increased by 33.3 percent from 271 kgs. to 361 kgs. over the same period.

If we turn from the longer run world trends of cereal production to the disaggregated patterns of different continents and of developed vs. developing countries over the past decade, we encounter a more varied pattern. Whereas world production increased by nearly 30 percent between 1969-71 and 1979-81, the rise in Africa was only 16.4 percent and in the USSR only 3.6 percent. At the other extreme, the United States and China experienced 44 and 46 percent increases in cereal production (see Table 2:2). (For China, the increase reflected in large part a recovery from the disruptions of The Cultural Revolution.) There was also an interesting contrast between the growth rates in the developed and developing countries--25 percent in the former and 34 percent in

Table 2:2

Regional Production of Cereals

(Annual average in million metric tons)

	1969-71	1979-81	Percent Change
World	1,232	1,593	29.4
Africa	61	71	16.4
North America	263	370	40.7
Canada	(34)	(42)	23.5
U.S.	(210)	(302)	43.8
South America	51	67	31.4
Asia	473	640	35.3
China	(196)	(286)	45.9
India	(111)	(139)	25.2
Europe	199	248	24.6
USSR	169	175	3.6
Developed Countries	654	817	24.9
Developing Countries	578	775	34.1

Source: FAO Production Yearbook, Vol. 35, 1981.

the latter, bringing them closer to a 50-50 split of total world cereal production.

While the developing countries had, overall, a higher growth rate of cereal production in the 1970s, they also had a much higher rate of population increase. In Table 2:3 the population growth for the decade is compared with the growth of cereal production. Africa had the greatest disparity with a population growth rate nearly double the growth rate of cereal production. Latin America and India had roughly equal growth rates of population and production. China, Europe and North America all had much higher rates of production growth than population growth.

The consequences of these differential growth rates are manifested in changes in cereal production per capita, shown in Table 2:4. Africa, with by far the lowest level of grain production per capita, experienced a decline of 12 percent in the ratio for the decade of the 1970s. These grim figures exemplify the tragedy of Africa--a land-abundant, population-scarce continent that is failing even to maintain a constant level of per capita food production. As we shall see below, imports do not make up for the growing food deficit.

North America and Europe had large increases in their already high levels of grain production per capita, whereas the USSR experienced a decline. Among the developing countries, China achieved a 26 percent increase in per capita production; India and Latin America were about constant. Again, the large increase in

Table 2:3

Regional Patterns of Growth of Population and Cereal Production

	Population			Cereal Production
	1970	1980	Percent Change	Percent Change 1969-71/1979-81
World	3,677	4,415	20.1	29.4
Africa	354	470	32.8	16.4
North America	319	370	16.0	40.7
South America	190	245	28.9	31.4
Asia	2,091	2,557	22.3	35.3
China	826	957	15.9	45.9
India	551	694	26.0	25.2
Europe	460	484	5.2	24.6
USSR	243	266	9.5	3.6
Developed	1,074	1,164	8.4	24.9
Developing	2,603	3,251	24.9	34.1

Source: FAO Production Yearbook, 1981.

Table 2:4

Cereal Production per Capita

(in kgs.)

	1969-71	1979-81	% Change
World	335	361	7.7
Africa	172	151	-12.2
North America	824	1,000	21.4
South America	268	273	2.0
Asia	226	250	10.7
China	237	299	26.1
India	201	200	-0.4
Europe	433	512	18.3
USSR	695	658	-5.3
Developed	609	702	15.3
Developing	222	238	7.2

Source: FAO Production Yearbook.

China's production was partly a recovery of lost ground that brought per capita production back up to a level that had prevailed in the latter part of the 1950s, before The Great Leap Forward! Whereas Table 2:2 showed a convergence in the total amount of grain produced in the developed and developing countries, the much more significant indication from Table 2:4 is that the disparity in per capita production is large and growing larger. The developed countries produced nearly three times as much grain per capita as the developing countries at the end of the 1970s and the growth rate of production per capita in the developed countries was double that of the developing countries during the 1970s. Continuation of these trends in future decades would have important implications for the patterns of trade and financing between the more and less developed nations.

So far we have been dealing with the broad aggregate of cereals, but this consists of a diverse set of grains which grow under quite different conditions and are used for different purposes in various cultures. These differences help to explain the pattern of international trade in grain.

Table 2:5 records the composition of world grain production at the beginning and end of the 1970s and the growth of output during the decade. As a rough generalization it can be said that by 1979-81 wheat, rice and maize each accounted for one-fourth of total grain production by weight. The other grains--barley, oats, rye, sorghum and millet constitute the remaining fourth. During

Table 2:5

World Production of Major Cereals

(Annual averages in million metric tons)

	1969-71	1979-81	Percent Change
All cereals	1,231	1,593	29.4
Wheat	328	444	35.4
Rice	310	396	27.7
Maize	283	421	48.9
Barley	125	159	27.2
Sorghum	56	64	14.9
Oats	54	44	-19.1
Millet	33	28	-14.1
Rye	31	24	-21.5

Source: FAO Production Yearbook.

the 1970s the shares of maize and wheat rose as their total production increased by 49 and 35 percent respectively. Rice and barley production increased at about the same rate as the average of all grains, whereas sorghum output grew more slowly and the other coarse grains actually declined.

The share of total world grain production entering into international trade rose remarkably in the 1970s from 9 percent at the beginning to 13.7 percent at the end. The amount traded grew by 96 percent (see Table 2:6), or three times faster than total production. Here, too, there are substantial differences in the shares of different grains that are traded and the growth rates of the traded amounts.

Wheat was the most important traded grain by far at the beginning of the 1970s, accounting for half of the total amount traded. Despite a 78 percent increase in the quantity of wheat traded during the decade, bringing the share of total wheat production traded to over 20 percent, there was an even more dramatic increase in maize exports. These rose by 169 percent during the decade and pushed the share of maize production traded from 10 percent to nearly 20 percent. At the other extreme, the share of rice production entering international trade is only about 3 percent and remained constant during the 1970s. By the end of the decade, wheat and maize accounted for 80 percent of the total quantity of traded grain.

Table 2:6

World Imports of Major Cereals

(Annual averages in million metric tons)

	1969-71	1979-81	Percent Change
All cereals	111	218	96.4
Wheat	54	96	77.8
Rice	9	13	44.4
Barley	10	16	60.0
Maize	29	78	169.0
Other	9	15	66.7
Value in U.S.$ billions	8.4	43.0	411.9
Price U.S.$ per MT	75.68	197.59	161.1
World Commodity Price Index (1975=100)	56.2	153.33	172.8
World Import Volume Index (1975=100)	77.4	133.2	72.1

Source: FAO Trade Yearbook and IMF International Financial Statistics.

At the bottom of Table 2:6 are recorded the U.S. dollar value of total grain trade and the average price per ton of the traded grain for the beginning and ending years of the decade. These show that during the 1970s the total value of grain trade rose from $8.4 to $43 billion, or an increase of 412 percent. This increase consisted of a 161 percent increase in the average price of grain and a 96 percent increase in the quantity traded. By way of comparison, the World Commodity Price Index increased by 173 percent and the World Import Volume Index by 72 percent during the same period.

The next four tables (Tables 2:7, 2:8, 2:9, and 2:10) show the regional distribution of production of the four main grain crops: wheat, rice, maize, and barley. We will not discuss them in detail, but merely present the highlights.

Wheat production is distributed most broadly around the world. It was in the past mainly grown in the developed countries, but the rapid increase in Asian production (China and India) along with stagnation of Russian output has significantly increased the share of the developing countries.

Rice, on the other hand, is almost totally a product of the developing countries of Asia, which account for 90 percent of world production and all of the increase in production over the past decade. Barley, in contrast, is mainly a product of the developed countries, particularly in Europe and Russia.

Table 2:7

Regional Production of Wheat

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
World	328	444	35.4
North America	56	89	58.9
(U.S.)	(40)	(66)	(65.0)
(Canada	(14)	(20)	(45.0)
Asia	79	135	70.9
(China)	(30)	(58)	(93.2)
(India)	(21)	(35)	(64.6)
Europe	73	92	25.6
Africa, S. America, & Oceania	27	35	29.6
USSR	93	92	-1.1
Developed	231	288	24.5
Developing	97	156	61.2

Source: FAO Production Yearbook 1981.

Table 2:8

Regional Production of Rice

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
World	312	396	27.7
Asia	286	360	26.8
(China)	(110)	(145)	(31.8)
(India)	(63)	(75)	(19.0)
All others	26	36	38.5
Developed	24	25	4.1
Developing	288	371	28.8

Source: FAO Production Yearbook.

Table 2:9

Regional Production of Barley

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
World	125	159	27.2
North America	20	20	0.0
Asia	15	16	6.7
Europe	48	69	43.8
USSR	35	45	28.6
Other	7	9	28.6
Developed	106	137	29.2
Developing	19	21	10.5

Source: FAO Production Yearbook.

Table 2:10

Regional Production of Maize

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
World	283	421	48.9
Africa	22	28	27.3
North America	136	213	56.4
(U.S.)	(123)	(193)	(56.9)
South America	26	32	24.4
Asia	50	85	69.3
(China)	(32)	(61)	(90.6)
Europe	39	54	39.3
Other	10	9	-10.0
Developed	181	272	50.3
Developing	102	149	45.8

Source: FAO Production Yearbook.

Maize, like wheat, is grown more widely. The United States has been the major producer, but Chinese production nearly doubled in the 1970s, thus increasing the Asia share of total world production. It is interesting to note that maize and wheat production levels in China are nearly the same, and that they both grew by about 90 percent in the 1970s, whereas rice production in China increased only 32 percent. Thus maize and wheat have become much more important components of total cereal production in China, although they still have not achieved equality with rice.

B. Trade Trends

A frequently presented table, attributed to Lester R. Brown, captures dramatically the concentration of grain exporting in the North American and Australian continents in the years since World War II (see Table 2:11). It also shows the rapidly increasing import dependence of all other regions, except Western Europe, during the 1970s. In Western Europe the agricultural policies of the EEC resulted in a substantial reduction of grain imports, but still not an exportable surplus by 1980. A more careful look at the changing trade patterns for the major types of grain over the past decade, highlighting the principal exporting and importing countries or continents of each commodity, helps to illuminate the effects of the changed trade policies in the 1970s.

Wheat, the most important grain in international trade, accounted for $19.5 billion of the $43 billion average value of

Table 2:11

The Changing Pattern of World Grain Trade

(million metric tons)

Region	1934-38	1948-52	1960	1970	1980
North America	+5	+23	+39	+56	+131
Latin America	+9	+1	0	+4	-10
Western Europe	-24	-22	-25	-30	-16
E. Europe and USSR	+5	0	0	0	-46
Africa	+1	0	-2	-5	-15
Asia	+2	-6	-17	-37	-63
Australia and N.Z.	+3	+3	+6	+12	+19

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a. Source: Lester R. Brown, Building a Sustainable Society (New York: W.W. Norton,. 1981), p. 92.

b. Plus sign indicates net exports; minus sign, net imports.

total grain imports in 1979-81. Ninety percent of total wheat exports were supplied by North America, Europe, and Australia. The United States and Canada were the two leading exporting countries and together accounted for over half of world exports. In the 1970s, U.S. and European exports doubled, whereas Canadian and Australian exports grew by only 40-50 percent (see Table 2:12).

Traditionally, wheat has been exported from the climatically temperate countries and imported by the more tropical countries. There were some significant departures from this pattern in the 1970s. Russia and China became substantial wheat importers, whereas India reduced wheat imports sharply. Other tropical countries in Latin America, Africa, and Asia continued to import wheat, and Africa with its growing grain deficits became increasingly dependent on wheat imports. Imports of wheat by European countries grew very slowly (4 percent), indicating that most of the greatly increased exports of European countries went to other continents.

Maize was the second most important grain in international trade in the 1970s, achieving an average annual value of $12.6 billion by 1979-81. The United States was the dominant supplier, accounting for three-fourths of total world exports by the end of the decade, as compared with roughly half of a much smaller export volume at the beginning of the 1970s (see Table 2:13). South Africa nearly tripled maize exports, but from a relatively low base. Other countries' exports were roughly constant.

Table 2:12

Major Exporters and Importers of Wheat

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
Exporters			
Canada	10.8	15.4	42.6
U.S.	16.8	38.9	131.5
Argentina	2.0	4.2	110.0
Europe	10.1	21.7	114.9
Australia	7.4	10.9	47.3
Other	7.6	4.1	-46.1
World	54.7	95.2	74.0
Importers			
Africa	5.1	15.4	202.0
South America	4.5	8.0	77.8
Asia	21.9	35.2	60.7
China	4.5	11.6	157.8
India	2.9	0.7	-75.9
Japan	4.6	5.7	23.9
Other	9.9	17.2	73.7
Europe	18.4	19.1	3.8
USSR	1.8	15.0	733.3
World	53.6	96.4	79.9
Value of World Imports in U.S.$ billion	3.9	19.5	400.0
Price in U.S.$ per metric ton	72.76	202.32	177.3

Source: FAO Trade Yearbook.

Table 2:13

Major Exporters and Importers of Maize

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
Exporters			
U.S.	13.8	59.1	328.3
Argentina	5.1	6.2	21.6
South Africa	1.2	3.3	175.0
France	2.9	2.9	0.0
Other	6.2	6.9	11.3
World	29.2	78.4	168.5
Importers			
Africa	0.7	3.1	342.9
North America	1.1	4.8	336.4
South America	0.4	2.9	625.0
Asia	7.3	23.6	223.3
Japan	5.5	12.6	129.1
China	0.6	4.4	633.3
Korea, Rep.	0.2	2.7	1,250.0
Europe	19.0	30.5	60.5
USSR	0.6	13.0	2,067.7
World	29.0	77.9	168.6
Value of World Imports in U.S.$ billion	2.0	12.6	530.0
Price in U.S.$ per metric ton	68.97	162.30	135.3

Source: FAO Trade Yearbook.

At the beginning of the 1970s, maize was mainly imported by the more prosperous countries of Europe and Japan, but by the end of the decade imports were much more widely dispersed. Russia, China, South Korea, South America, and Africa all increased their maize imports by large amounts, whereas Japanese and European imports grew more slowly. In all areas except Africa and Latin America maize is used mainly as livestock feed, so the import demand is derived from the rapidly rising urban consumer incomes and demands for meat. We shall consider this aspect in greater depth in later sections.

Rice is produced and consumed mainly in Asia, and the limited portion that enters international trade is also predominantly in Asia (see Table 2:14). Thailand had become the biggest exporting country by the end of the 1970s and Indonesia the biggest importer. Pakistan's exports had risen during the 1970s while China's declined. The United States retained its share of roughly 20 percent of world exports.

Among the importers, Indonesia and Africa showed large increases, as did the amalgam of other countries outside Europe and Asia. Most Asian countries except Indonesia reduced their imports.

Finally, barley, like wheat, eminates mainly from North America, Europe, and Australia (see Table 2:15). Europe doubled its exports in the 1970s and by the end of the decade had become a

Table 2:14

Major Exporters and Importers of Rice

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
Exporters			
U.S.	1.7	2.8	64.7
Thailand	1.2	2.9	141.7
China	2.0	1.2	-40.0
Pakistan	0.3	1.1	267.0
Other	3.6	4.8	33.3
World	8.8	12.8	45.5
Importers			
Africa	0.8	2.4	200.0
Asia	6.1	6.6	8.2
(Indonesia)	(0.7)	(1.5)	(114.3)
Europe	1.0	1.7	70.0
Other	0.8	2.2	175.0
World	8.7	12.9	48.3
Value of World Imports in U.S.$ billion	1.4	5.5	292.9
Price in U.S.$ per metric ton	160.92	424.55	163.8

Source: FAO Trade Yearbook.

Table 2:15

Major Exporters and Importers of Barley

(Annual averages in millions of metric tons)

	1969-71	1979-81	Percent Change
Exporters			
Canada	2.6	3.8	46.2
Europe	4.3	8.6	100.0
Australia	0.7	2.1	200.0
Other	1.9	2.0	5.3
World	9.5	16.5	73.7
Importers			
Asia	1.6	4.7	193.8
Europe	7.4	7.8	5.4
USSR	0.0	2.6	
Other	0.5	1.1	120.0
World	9.5	16.2	70.5
Value of World Imports in U.S.$ billion	0.63	3.08	388.9
Price in U.S.$ per metric ton	66.32	190.33	187.0

Source: FAO Trade Yearbook.

small net exporter. Russia and Asia expanded imports of barley greatly in the 1970s, again mainly to use as feed grain.

A recapitulation of the import value, price, and quantity data for each of the major grains, presented in Table 2:16, shows that while maize had the largest increase in quantity and value traded in the 1970s, it also had the smallest price increase. The prices of wheat and barley rose relative to the average for all grains, and the quantities increased by less than the average. This suggests that there is some elasticity of substitution among these grains and that changes in relative prices do make a difference.

Grain price increases are also compared with the world prices for all commodities in Table 2:16. According to the IMF's International Financial Statistics, the Commodity Price Index, which does not include oil, rose by 173 percent from 1969-71 to 1979-81. This was 7 percent higher than the 161 percent increase in the price of world traded grain. Thus, grain prices appear to have risen by less than other non-oil commodities over the decade despite the surge in grain prices in 1972-74.

In summary, the main patterns of grain production and trade that have emerged in the 1970s are:

(1) World grain production growth exceeded population growth by nearly 10 percent.

(2) North America and China achieved the highest rates of growth of grain production, Africa and Russia the lowest.

Table 2:16

Changes in Grain Import Values, Prices, and Quantities

	1969-71	1979-81	Percent Change
Value of World Imports in billion U.S.$			
Wheat	3.9	19.5	400
Maize	2.0	12.6	530
Rice	1.4	5.5	293
Barley	0.6	3.1	417
All grain	8.4	43.1	413
Quantity in million metric tons			
Wheat	53.6	96.4	80
Maize	29.0	77.9	169
Rice	8.7	12.9	48
Barley	9.5	16.2	71
All grain	111.0	218.1	96
Average Price in U.S.$ per metric ton			
Wheat	72.76	202.32	178
Maize	68.97	162.30	135
Rice	160.92	424.55	164
Barley	66.32	190.33	187
All grain	75.68	197.59	161
World Commodity Price Index (1975=100)	56.2	153.3	173

Source: FAO Trade Yearbook and IMF International Financial Statistics.

(3) Maize and wheat output grew at above average rates, rice and barley were about average, while sorghum and other coarse grains were below average or negative.

(4) World grain trade nearly doubled in quantity during the 1970s, led by maize and wheat.

(5) The United States was the major supplier of maize, a significant supplier of wheat, and increased its share of both markets.

(6) Canada's shares of both wheat and barley exports declined, giving ground to the United States and Europe in wheat and mainly to Europe in barley.

(7) Russia and China greatly increased their maize and wheat imports, in the former case because of stagnant domestic grain production, whereas China's was in spite of a significant (25 percent) increase in domestic grain production per capita.

(8) World trade in rice accounted for a small share of total rice production (3 percent) and was mainly carried out between Asian countries.

(9) A decline in the relative world market price of maize may have contributed to the much higher growth of maize exports as compared with wheat and barley exports.

(10) Similarly, the modest decline in the price of grain relative to other world-traded commodities may have added to the high growth in the volume of grain trade.

C. Fluctuations in Production and Trade

The aspect of grain production and trade which has received most attention in recent years has been the year-to-year fluctuations in the production of particular countries or regions and the consequent need for large imports in years following production short-falls. The major reason for this heightened attention was what has been labeled "the food crisis of 1972-74" in the volume on food security by the International Food Policy Research Institute (IFPRI) (Valdes, 1981).

Droughts for two consecutive years in South and East Asia reduced production, generated large import demands, and drove up grain prices to unprecedented levels. Rice, which, as we have seen, is mainly grown and consumed in Asia, was in particularly short supply, and there were limits to which the abundant stocks of wheat in developed countries could be imported and substituted for scarce rice. In part this was a financing problem, but it was also a problem of taste preferences, of speculation, and of sheer logistics and distribution. The Asian grain shortages were reinforced by drought in Africa that gave dramatic evidence of the impact of weather on the means of sustenance.

As a consequence of these tragic experiences of famine and suffering among the poorest segments of the population of the world's least developed countries, many studies were initiated to gain better understanding of the problem and suggest possible remedies. These are reviewed in the next chapter.

The studies in the IFPRI volume suggest that food insecurity, or the inability to maintain food consumption levels within a narrow range of the trend levels for all segments of a population, is due mainly to variations in domestic food production, which in turn results mainly from variable weather conditions. The insecurity problems are most serious in the least developed countries which have limited capacity to finance or to distribute imports to adversely affected areas. Furthermore, some countries, especially in Africa, experience more severe fluctuations in output, presumably due to more erratic weather patterns (p. 32). Introduction of new technologies and high-yielding seed varieties has tended to result in an increase in the absolute variability of production, but the variability relative to a higher level of total output has remained constant or even declined (p. 74).

The main means of stabilizing consumption levels in the face of variable production is through adjustments in stocks or in imports. Information on stocks, especially those held by private households or enterprises, is so limited and unreliable that most attention has focused on imports.

An analysis by Valdes and Konandreas of the relative instability of production and consumption in 24 developing countries suggests that, for many countries, imports did not contribute significantly to stabilizing consumption. Their main findings are presented in Table 2:17. They have measured instability by the coefficients of variation (the standard deviation of a time series

Table 2:17

Variability of Staple Food Production and Consumption in Selected Developing Countries

	Production Instability[a]	Consumption Instability[b]
Asia		
Bangladesh	6.4	7.6
India	6.4	5.3
Indonesia	5.4	6.1
Korea	7.1	6.5
Philippines	5.7	3.3
Sri Lanka	9.3	8.3
North Africa, Middle East		
Algeria	28.9	24.6
Egypt	4.5	12.6
Jordan	65.6	21.2
Libya	28.0	16.2
Morocco	27.2	19.3
Syria	38.8	18.7
Sub-Saharan Africa		
Ghana	5.8	6.1
Nigeria	5.7	5.6
Senegal	18.6	15.7
Tanzania	12.7	14.6
Upper Volta	9.8	9.5
Zaire	4.9	4.1
Latin America		
Brazil	5.2	5.8
Chile	11.1	14.4
Colombia	4.4	4.7
Guatemala	6.5	6.9
Mexico	7.7	5.3
Peru	9.8	3.9

Source: Alberto Valdes and Panos Konandreas, "Assessing Food Insecurity Based on National Aggregates in Developing Countries," in Valdes, ed., Food Security for Developing Countries (Westview, 1981), pp. 30, 34.

a. Production instability is measured by the coefficient of variation, $\frac{Q_t - Q_t}{Q_t} \cdot 100$, of estimated national production for the years 1961-76.

b. Consumption instability is the coefficient of variation for estimated national consumption for the years 1965-76.

as percent of the mean of the series). The consumption estimates reflect domestic production plus net imports plus any recorded changes in stocks. Not only does this miss most of the stock changes, but, because of the use of annual data, there are serious timing problems in matching imports with domestic production.

The data in Table 2:17 indicate that the semi-arid countries of Africa and the Middle East experienced serious instability of production in the period recorded (1961-76). For most of these countries the variability of consumption is less than that of production, indicating that imports did help to stabilize consumption, although in many cases not by much. Most other countries had much less variability of both production and consumption, and the two coefficients are not very different.

About all that this analysis tells us is that some countries are likely to experience more serious instability of production than others, and that, for them, imports are an important means of stabilizing consumption. Much more careful analysis on a country-by-country basis is needed to set more rigorous perameters of consumption stabilization. IFPRI has already made a number of such studies and is still working on others. These will be discussed further in Chapter VI.

Chapter III

Sources of Demand for Grain Trade Financing

The demand for financing international grain trade can emanate either from the side of the importing countries which wish to postpone payment or import larger quantities, or from the exporters who wish to increase exports and/or take away markets from competitors. We shall examine each of these aspects in this chapter.

A related question concerns whether the availability of foreign financing has a significant impact on the amount of grain imports. In an Appendix (pp. 116) we present the results of an econometric investigation of these relationships for three countries (Korea, Brazil and Morocco). The conclusions of this analysis are more tentative than we had hoped, but, as others have suggested (Timmer, Falcon and Pearson, 1983) the forces influencing import demand for grain are manifold and complex, so it is perhaps not surprising that the results are not more robust.

A. Financing Grain Imports

There are three main situations in which countries may seek external financing for grain imports. One is where a country is a chronic grain importer and wishes to use the financing of such imports as a mechanism for obtaining general balance of payments support on relatively favorable terms. A second situation is

where the country has been a chronic grain importer but hopes either to increase domestic grain production and thus reduce import dependence or to increase its industrial or traditional exports rapidly, and thus be able to pay for increased grain imports as well as to repay loans in the future. The third is to finance temporary shortfalls in domestic food supply. This is analagous to the usual division of requirements for finance into needs for chronic dependence, longer run development (structural change), and short-run adjustment.

The existing literature on grain trade financing concentrates mainly on the problems of short-run adjustment. The issue of how to finance chronic import needs is seldom discussed, and the financing of structural change is often dealt with as part of a more general balance of payments problem, where the policy issues are related to broader agriculture, industry and trade strategies.

The literature on food insecurity has two main themes. One is the extent of such insecurity, and whether it is caused by domestic production instability or by world price fluctuations. The other theme is the relative costs of different international solutions to the food insecurity problem, including both financial and other means.

The extent of food insecurity has been measured differently by different authors. Valdes and Konandreas (1981) use the coefficient of variation (CV) of national staple food consumption and

the probability of such consumption falling below 95 percent of trend. Kirkpatrick and Huddleston (1979) used three indicators of food security, namely, the ratio of cereal imports to total imports, the ratio of cereal imports to cereal consumption, and the ratio of cereal imports to export revenue. They define two criteria of food insecurity. The first, dependence, is where the country has each of the ratios over 10 percent. The second, vulnerability, is where the maximum of one of the ratios is at least twice that of the mean. Of 50 countries studied, 36 were judged to be dependent, 10 to be vulnerable, and 23 both dependent and vulnerable.

Green and Kirkpatrick (1981) measured security in terms of having sufficient food imports so that food consumption does not fall below trend. By their definition 28 out of 49 countries studied would require up to 25 percent more imports, 16 would require at least 50 percent more, and 12 would require at least 100 percent more.

Some authors have tried to estimate the contribution of various underlying causes to food insecurity. Siamwalla and Valdes (1980) argued that variations in import costs were largely due to fluctuations in the volume of imports; however, later work by Huddleston et al. (1982) suggested that prices had become more unstable. They attributed the increased variability of prices to the decrease in world stock levels as a proportion of demand.

Several studies have explored the determinants of food import

behavior, including the financial constraints. Morrison (1982) examined the determinants of food imports of 48 countries and found that GNP and food aid were significant variables. Food aid increased both total food imports and commercial imports, which implies that there may be some effect on changing people's tastes. The financial variable (level of foreign exchange reserves), urbanization, and the previous two years' production, were not found significant.

Green and Kirkpatrick (1981) used a model involving covariances among production, food imports, exports, stock changes, foreign exchange reserve changes, and food price changes, to try to form a typology of responses to production shortfalls. They tried to group countries according to whether the source of instability was variation in production (type 1) or in foreign exchange availability (type 2), and according to whether they responded by varying consumption (a), varying stocks (b), varying imports while drawing on foreign exchange reserves (c), or varying nonfood imports and holding foreign exchange reserves constant (d). They did not take account of world price variations as a source of instability.

Another series of studies has examined the relative efficiency or cust of alternative schemes to help stabilize consumption. Konandreas et al. (1978) compared the costs of a purely financial insurance scheme to a similar scheme which combined insurance with buffer stocks of various sizes. In their simulation, grain was

bought and sold from stocks when the world price hit predetermined levels, and countries received insurance payments to bring their consumption up to 95 percent of trend during production shortfalls. The main benefits of such a scheme in their simulation accrued to a few countries, and 20 percent of the benefits accrued to India. Morocco, Mexico, and Turkey were also large recipients. Six or seven countries received over 50 percent of the benefits, and twenty countries received over 80 percent.

Reutlinger (1977) compared the costs of an insurance scheme with the costs of holding stocks under various scenarios. The latter include different amounts of world grain price stability, including a scenario with stocks large enough to prevent any price instability, one with stocks large enough to reduce the standard deviation of grain supply to developing countries by 50 percent, and one with stocks large enough to reduce the standard deviation of world grain prices by 50 percent. He found that costs depend on who participates in the insurance scheme, and how large of a deductible there is in the insurance.

Reutlinger and Knapp (1980) compared the cost of four different trade strategies to stabilize consumption, with the cost of a buffer stock, and found the former much cheaper. The cost of a buffer stock which would be large enough to assure that food consumption did not fall below 125 Kg, with a probability of failure of only 6 percent, was $0.35 per capita. This compares to a per capita cost of $0.02 if trade were free and operated to stabilize intake.

Valdes and Konandreas (1981) also examined the feasibility of self-stabilization of imports by countries. In their sample they found that, for all but 8 or 9 out of the 24 countries examined, shortfalls in export receipts were positively correlated with decreased total import costs. Furthermore, half of the countries could in theory have changed the distribution of their imports intertemporally in such a way as to increase food security, without increasing their total expenditure on imports over time.

Huddleston et al. (1982) examined the relative costs of a facility to finance export receipt shortfalls, a facility to finance food import cost excesses, and an integrated fund to finance both. These approximate respectively to the IMF Compensatory Financial Facility until 1981, and the two proposals for a cereal financial facility, the latter of which has operated since 1981. The authors compared these to a buffer stock. They found that a financial facility was better, particularly for countries which were not highly self-sufficient. Moreover, the facility particularly benefited those countries which had food-security oriented programs.

Finally, there is a growing literature which argues that problems of food security can be dealt with by better use of world markets (Peck, 1981; Yudelman, 1982; Donaldson and Lewis, 1980). Lewis (1983) suggests that importing countries could cut the costs of grain importing by using better trading practices. The World Bank (Yudelman, 1982) has emphasized improving trading expertise

as a component of its food security strategy, in place of holding food reserves. And a paper by Peck (1981) demonstrates that holding stocks in the form of futures contracts which are continuously rolled over if not needed, can be cheaper than holding physical stocks. The maintenance costs of the former (margin monies, interest costs) are less than those of the latter (storage costs, insurance, conditioning or turning over the stock, uneven costs).

The main conclusions of these several investigations and modeling efforts are: that instability of cereal supply is a significant problem for a number of the least developed countries; that the instability is due mainly to unfavorable climatic conditions and increasingly to fluctuations in world grain prices; that many countries have not been very effective in implementing policies to smooth out fluctuations in grain supplies; and that maintenance of buffer stocks, at either the national or international level would be a much more costly way of dealing with supply instability than either insurance or emergency financing schemes or greater use of futures contracts and improved purchasing practices.

The schemes discussed so far only relate to food security at the national level. Very few studies take into account the fact that the production variations which cause food insecurity imply at the same time fluctuations in rural sector incomes and purchasing power. Even if food imports increase, effective demand for food by the poorest segments of the society may be inadequate,

which would require supplementary public food distribution and income maintenance systems.

The literature on grain import financing discussed so far only addresses part of the issue, namely that of short-run fluctuations in requirements. Huddleston (1982), among others, has studied the long-run financing problem from the point of view of food aid. She examines empirically the determinants of the level of import dependence, of trends in import dependence, and of food supply adequacy. She finds that food grain adequacy was highest in countries where staple production increased, or imports increased, or both. Import dependence was related to the levels of GDP, staple crop production, and (for low income countries) food aid. Countries with adequate food per capita tended to be middle and high income countries with a high degree of reliance on the world market. Very few countries with adequate food supply pursued autarkic policies. Low income countries, although their food supply often was inadequate, tended to have low levels of import dependence. Her results suggest that middle income countries with good export earnings can afford to become dependent on imports, but low income countries cannot, even where staple production is decreasing. For such countries, either continuing food aid or longer-term development policies would seem to be the solution, rather than short-term financial measures.

B. Financing Grain Exports

The other perspective on the need for finance of international grain trade is that of the exporting country. There have been three main lines of argument in relation to the financing of grain exports. One is that such financing may be helpful or necessary in disposing of surplus grain stocks and thus supporting prices and farmer incomes in the exporting country. The increased export of one country may be at the expense of reduced exports by another, or increased imports by the recipient country, or both. The benefits and costs of the credit will be distributed among the borrower, the lender, and the competitive supplier in differing ways over time depending upon the prevailing market conditions. Clearly, other instruments than credit can be used to promote exports of surpluses--direct subsidies of the selling price being most obvious.

A second argument for providing financing of grain exports is that of long-term market development; the proposition being that encouraging both the consumption of, and dependence on, an imported grain will change tastes and build up demand for a commodity that is not grown at all or only on a limited scale in the importing country. Wheat in the Republic of Korea is a good example. Over the years since the end of World War II, large imports of wheat into Korea under various aid arrangements helped to develop a sizeable demand for wheat products, in a previously rice-consuming country. The low-cost, imported wheat also discouraged

domestic production. The argument is sometimes made that South Korea is ill-suited for growing wheat, but this seems hardly credible considering how close it is climatically and geographically to the vast wheat-growing areas of North China.

A third argument for financing grain exports is a humanitarian one that is the counterpart of that seen from the side of the importing countries where the cereal is imported to meet either a short-run decline in domestic food availabilities or a longer-run, structural adjustment process that will lead either to increased grain production or to the generation of expanded means to pay for grain imports.

All three of these arguments for financing of grain exports have been advanced at different times in the main grain exporting countries. The forcefulness with which the positions are espoused appears to be correlated with the level of farm prices, surplus stocks, or the cost of carrying those stocks in the exporting countries, as well as the urgency of food shortages in some importing countries.

The broader political economy of international grain trade has also received attention in recent years, mainly as a consequence of the complicated bargainings between the United States and the Soviet Union over grain trade agreements and the controversial role of the multinational grain trading companies in those negotiations. One study by Morgan (1979) ascribes a major role to the five large grain-trading houses which are said to transcend

government controls, or work with and influence national governments to pursue common interests. Financing is seen as a less significant instrument for influencing the pattern of grain exports than price subsidies and direct political pressure. For example, Morgan claims that the United States succeeded in taking away Canada's wheat market in Japan through a combination of post-war food aid that created a demand for bread, U.S. government subsidies of both wheat prices and transport costs to insure that U.S. wheat would be cheaper than comparable Canadian wheat, and direct pressure on the Japanese government to reduce its trade deficit with the United States by buying more American grain. He describes similar packages of politico-economic pressures that were successful in some cases (e.g., Iran, Korea) and failed in others (Russia in 1975) when they ran into overwhelming resistance.

It is difficult to evaluate the influence of personal, corporate, or political interventions on the quantities, prices, or directions of international grain trade. Much of the evidence is anecdotal and is marshalled in a non-neutral way to "make a case." Still, it would be as misleading to ignore such forces as it would be to attribute to them overwhelming consequence.

To sum up: the financing of international grain trade seems to be most important for meeting the short-run needs of low income countries confronted with below normal harvests or above normal world market prices. Poor countries with chronic need for grain

imports require some form of grant or subsidized aid to keep them going and to keep open the possibility of eventually reducing their food import or balance of payments gap. From the grain exporters perspective, subsidized financing may help to maintain or even expand some markets in the poorer countries, but price subsidies, political pressure, and aggressive marketing are likely to be more influential instruments in the major grain markets.

Chapter IV

Past Patterns of Grain Trade Financing

There are many ways to finance grain trade, ranging from outright grants of food aid, to cash payments at the time of purchase. This chapter reviews the major government-supported grant and credit programs of the main food-aid-donor countries and also the new multilateral cereals financing facility of the International Monetary Fund. The main features of these programs are presented in the text and supplementary information on some programs is presented in Appendix A.

This survey considers only financing methods specific to grain trade. Governments can, of course, use other non-specific sources of credit to finance food imports. And to the extent that sources of finance are fungible, even credit tied to some other purpose can be used indirectly to finance grain purchases. This is not discussed here.

Tables 4:1 and 4:2 present some summary figures concerning different kinds of finance. Table 4:1 gives some time series figures on the net flows of food aid, in comparison with other kinds of aid. The table shows that values of food aid have increased in current dollars from $1.3 billion in 1972, to $2.6 billion in 1980; however, in volume terms the levels of the early 1960s have not been reached since (see Table 4:5). Export credits in 1980 were worth $2.1 billion (government direct credits) and

$12.6 billion (private). An unspecified proportion of these was for food.

The table also shows that the composition of food aid has shifted, with a decrease in the proportion going as bilateral aid, a lesser decrease in the proportion of concessional loans, and an increase in the proportion of multilateral aid. However, food aid has been a declining proportion of total resource flows. Official flows, of which food aid is one component, have decreased from 43.4% of the total in 1972, to 35.7% in 1980. Government export credits have not increased. However, private financial flows have become an increased proportion of total flows, and amongst these private export credits increased from 7.8% of total resource flows in 1972, to 16.7% in 1980. Thus, it seems that the terms of finance available for food trade have hardened over time, as have the terms of total financial flows.

Table 4:2 presents the commodity composition of several programs which will be discussed in greater detail below, as well as the annual amount of financing available under the schemes, in current dollars.

The U.S. programs to be discussed cover several agricultural commodities, of which grains form a very large proportion. Out of the different U.S. schemes, food aid programs in particular concentrate heavily on grains, which formed on average about 70 percent of PL-480 aid over the period 1954-80. Commercial programs have a somewhat lower proportion of grains (about 60 percent), and

Table 4:1
Net Flows of Selected Financial Resources
from DAC Members to LDCs

Amount in $ Millions

	1972	1974	1976	1978	1980
Bilateral food aid grants	571.5	604.4	639.9	742.6	798.2
Bilateral food aid loans	516.2	416.3	601.8	652.3	895.8
Multilateral food aid grants	263.0	457.3	342.3	625.4	924.6
Official development assistance	8,538.2	11,315.6	13,656.2	19,881.8	26,775.7
Official export credits	742.2	691.2	1822.7	3497.9	2101.3
Private export credits	1,447.8	2,481.9	5,423.8	9,686.8	12,567.7
Total Financial Resource Flows (BOP Basis)	19,693.0	27,552.9	40,505.4	71,370.6	75,061.3
Amounts as Percentage of Total Food Aid					
Bilateral food aid grants	42.3	39.7	40.4	36.8	30.5
Bilateral food aid loans	38.2	30.3	38.0	32.3	34.2
Multilateral food aid grants	19.5	30.0	21.6	31.0	35.3
Amounts as Percentage of Total Financial Resource Flows					
Official aid	42.3	41.1	33.7	27.9	35.7
--of which food aid	6.9	5.5	3.9	2.8	3.5
Official export credits	3.7	2.5	4.5	4.9	2.8
Private export credits	7.4	9.0	13.4	13.6	16.7

Source: OECD (Various dates, 1975-1981)

Table 4:2

Commodity Composition of Selected Aid and Credit Programs

Long-Term	US GSM-5[a] 1956-80	US PL-480[b] 1954-80	US-Mutual[c] Security 1955-79	Canada[d] Wheat Board Credit 1960/1-1980/1	Canada Export Development 1960/1-1977/8
Grains		Value as percentage of total program			
Wheat	28.7	47.0	17.7	95.2	100.0
Rice	2.0	11.3	2.7	0.0	0.0
Coarse grains	32.7	9.1	17.4	4.7	0.0
Corn-soy-milk & wheat-soy-blend	0.0	2.1	0.0	0.0	0.0
Total, grains	63.4	69.5	37.8	100.0	100.0
Total, nongrains	36.6	30.5	62.2	0.0	0.0
		$m, US, current prices			
Total, absolute figures, annual average	$371.70	$1,116.90	$168.00	$341.70	$40.90

Recent year(s)	US GSM-5[a] 1979-80	US GSM-101[a] 1979-80/6	US GSM-201[a] 1981/1-6	US PL-480[b] 1980	US Mutual[c] Security 1979	Canada[d] Wheat Board 1980-81	Canada[e] CIDA aid 1980-81
Grains			Value as percentage of total program				
Wheat	25.7	25.7	5.8	51.5	0.0	93.3	70.5
Rice	0.9	9.5	17.0	16.2	0.0	0.0	0.0
Coarse grains	32.8	23.9	41.4	10.8	53.9	6.7	6.1
CS Mand WSB	0.0	0.5	0.0	5.1	0.0	0.0	0.0
Total, grains	59.4	59.6	64.2	84.0	53.9	100.0	76.6
Total, nongrains	40.6	40.4	35.8	16.0	46.1	0.0	23.4
Total, absolute figures, annual average	$1,122.7	$352.0	$1,260.6	$1,255.2	$304.0	$854.4	$183.5

a. Source: USDA Quarterly Report of the General Sales Managers, various dates.
b. Source: USAID Food for Peace, various dates.
c. Source: Libbin (1980).
d. Source: Grains Marketing Office (1982), using price data from Wheat Board (1981).
e. Source: CIDA (undated).

feed grains become more important, comprising 20-30 percent of the schemes, as compared to about 5 percent of the value of PL-480 aid. Commercial credits tend to cover more diverse commodities than does the aid program and include more cotton, tobacco, and fats. The differences between aid and commercial credit programs are due in part to the relative income levels of the recipient countries, and hence the different patterns of demand.

The Canadian programs are somewhat smaller in absolute size than those of the U.S., particularly the aid program. (It should be noted that the Canadian food aid is given as grants, whereas a large proportion of that of the U.S. consists of loans.) The figures for export credits are for schemes which cover exclusively grains. Wheat accounts for nearly all of grain aid and credits, with small amounts of barley, oats and corn. This reflects the Canadian pattern of production. For further details see Cohn (1979).

A. Food Aid

Tables 4:3 and 4:4 present different disaggregations of food aid. Canada, the U.S. and the EEC accounted for over 90 percent of food aid in 1975, and over 70 percent in 1980. Aid in cereals, in turn, accounts for about 60 percent of all food aid. Table 4:3 also shows that the U.S. has provided a declining proportion of total food aid, while the proportion of the EEC, Japan, and "others" has increased. Table 4:4 describes the terms of aid by

major donors. The U.S. and Japan favor providing loans, Australia and the EEC provide the majority of their aid as bilateral grants, and Canada provides the majority of its aid via multilateral agencies. The total amount of food aid has declined over the years and is now only about 10 percent of total imports of developing countries (see Table 4:5). Since the 1974 World Food Conference, various international councils have recommended that donors should strive to meet a target of 10 million tons of cereal aid annually, but the total has not exceeded 9 million in any year since 1974.

There is a large literature on food aid and its possible disincentive effects on agriculture in recipient countries (see, for example, the survey by Maxwell and Singer, 1979). In general, distributions of food aid have not been well matched with the needs of countries, although there is a trend towards concentrating aid on poorer countries (Huddleston, 1982). There have been complaints that in disaster situations food aid frequently arrives too late, and that the infrastructure in recipient countries is inadequate to cope with the inflows. However, food aid has been very important in the food imports of some chronic importers, such as Egypt and Bangladesh, both as regards financing their foreign exchange requirements and in providing finance for public sector expenditures.

Huddleston's (1982) results suggest that food aid has been of growing importance in low income countries with declining staple

Table 4:3

Value and Origin of Food Aid from OECD Member Nations

(in millions of U.S. dollars)

	1965		1970		1975		1980	
	Amount	%	Amount	%	Amount	%	Amount	%
Donor								
USA	1,234.4	94.1	888.0	70.3	1,216.0	58.5	1,307.0	49.9
Canada	57.3	4.4	99.2	7.9	263.3	12.8	164.8	6.3
EEC	6.4	0.5	111.2	8.8	413.4	19.9	436.9	16.7
Japan	0.3	0.0	100.0	7.9	15.3	0.7	261.3	10.0
Australia	n.a.	n.a.	20.9	1.6	62.9	3.0	64.0	2.4
Other	12.9	1.0	44.2	3.5	108.5	5.2	84.6	14.7
Total	1,311.3	100.0	1,263.5	100.0	2,079.4	100.0	2,618.6	100.0

Source: OECD (1976), pp. 148-49; and OECD (1981).

Table 4:4

Percentage Composition of Food Aid by Terms, by Donor Country

(1980)

Donor	% Bilateral Grant	% Bilateral Loan	% Multilateral Grant	% Total
USA	36.0	52.6	11.4	100.0
Canada	46.1	1.5	52.3	100.0
EEC	63.1	0.0	36.9	100.0
Japan	4.9	79.0	16.2	100.0
Australia	60.4	0.0	39.5	100.0
All	30.5	34.2	35.3	100.0

Source: OECD (1976), pp. 148-49; and OECD (1981).

Table 4:5

Cereal Food Aid and Commercial Import Volumes by Region

(Annual averages in million metric tons)

	1961-63	1976-78	1979-80
1. Total World Imports	79 (61-2)	188 (78)	211
2. Developing Countries			
a. Cereal imports	30.7	65.0	88.3
b. Food aid imports	11.5	6.9	8.3
c. Food aid as % of total imports	38%	11%	9%
3. Asia			
a. Cereal imports	17.6	28.0	35.4
b. Food aid imports	5.7	3.5	3.7
c. Food aid as % of total imports	32%	12%	10%
4. North Africa/Middle East			
a. Cereal imports	5.9	17.5	24.3
b. Food aid imports	3.9	2.8	2.7
c. Food aid as % of total imports	66%	16%	11%
5. Sub-Saharan Africa			
a. Cereal imports	1.6	4.9	6.9
b. Food aid imports	0.1	0.4	1.2
c. Food aid as % of total imports	8%	16%	17%
6. Latin America			
a. Cereal imports	5.6	14.6	21.7
b. Food aid imports	1.9	0.3	0.6
c. Food aid as % of total imports	33%	2%	3%

Source: Barbara Huddleston, Closing the Cereals Gap with Trade and Food Aid (Draft) (IFPRI, June 1982), p. 21.

production. Such countries usually cannot afford commercial imports, and aid has at least helped to offset the decline in per capita food availability. Huddleston further suggests that if existing aid could be wholly reallocated to those countries with the largest declines in availability, it would be sufficient to offset the worst decreases.

U.S. food aid

The PL-480 program was initiated in 1954 mainly with the intent of reducing U.S. farm surpluses. The original legislation and program application showed greater concern for U.S. interests than for development purposes. Countries had to maintain their usual levels of commercial purchases from the U.S. and third countries (although this has been hard to define and enforce). Also, at least 50 percent of the aid had to be carried in more expensive U.S. ships, although the USDA absorbs the excess costs incurred by this requirement.

Recipients have not always been the most needy countries in terms of income, strategic and political interest have also played a role. The ten largest recipients up to 1980 were (in descending order) India, Egypt, Pakistan, Korea, Bangladesh, Indonesia, South Vietnam, Yugoslavia, Brazil, Israel, and Turkey. In 1974, just after the food crisis of 1972 and 1973, the largest recipients were South Vietnam, Cambodia, Jordan, and Israel. Recent legislation has, however, dictated that 75 percent of the

concessional sales under Title I should be to countries below the World Bank defined poverty level, which was $625 in 1978 prices. Also, all of the Title III concessional sales are directed to the poorest countries. (See Appendix A for elaboration of these laws.)

The main commodities financed under PL480 were wheat (49.1 percent of the value of commodities, 1954-80), and other cereals. Cereals accounted for 71.6 percent of the total. The rest consisted of fats, oils, oilseeds and meal, diary products, small amounts of meat, fruit and vegetables, and some prepared food, such as corn-soy-milk and wheat-soy-blend. There have also been some non-food items, such as tobacco and cotton. The exact mix of commodities has varied depending on the availability of stocks. Libbin (1980) notes that exports of non-foods have decreased over time, and that the proportion of wheat decreased over the period 1965-1974 and has remained relatively lower in the recent past than before 1965. There has been an increase in the amount of rice available, since the earlier shortage of rice proved a major shortcoming of the program. In the past, a relatively large proportion of U.S. farm exports occurred under the PL-480 program. Between 1956 and 1965, over two-thirds of wheat exports were under PL-480, about one-third of feed grains, and 44 percent of rice (Libbon, 1980). By 1980, these figures were 9.9 percent of wheat exports, 1.7 percent of feed grain exports, and 7.3 percent of the U.S. rice exports.

The amounts of PL-480 aid have varied over the years, and a major complaint from recipients has been that aid amounts are tailored to fit with the size of producer surpluses, rather than the the recipients' needs. From 1960-1969, PL-480 amounts ranged from 18-29 percent of the value of total agricultural exports. In 1970-1972, they were 13-16 percent, and then 7 percent in 1973 (a year of hardship for many importers due to high world prices), 4 percent in 1974, and 4-7 percent between 1975-1978. The decreases in U.S. PL480 food aid were a major factor in the decline in total world food grain aid from its average between 1969/70 and 1972/73 of 12 million metric tons, to only 5.9 million metric tons in 1973/74. Thereafter the level of grain food aid rose again and reached an average annual rate of roughly 9 million tons by the end of the decade, of which ___ million was from the PL-480 program. In addition to the PL-480 program, there has been a Mutual Security/Aid program which disbursed $4.2 billion of food aid between 1955 and 1979, as against $28.9 billion under PL-480 (Libbin, 1980). The main commodities under the Mutual Security program were cotton, wheat, feed grain, and soybeans. The program was relatively larger over the period 1955-1961, when it accounted for 20 percent of U.S. food aid. The main country recipients were West Europe, South Korea, and Taiwan.

Canadian food aid

Canada gives food aid differently from the U.S., in that there are no concessional sales, but aid is in the form of grants.

Canada has a core of about 25 recipients eligible for aid, and also gives aid to other countries in specific circumstances. About 40 percent of Candada's aid is given via the World Food Program (WFP), which is a greater proportion than the U.S. The rest is given bilaterally. Refugee aid is a large component, but there are also specific programs which are supported, such as public distribution programs and the Indian oilseeds producer cooperatives program. A large proportion of total food aid is cereals, most of which is wheat. Large recipients of Canadian bilateral aid in 1980-81 were Bangladesh, followed by Senegal, Ethiopia, Somalia, and Tanzania. Large recipients of multilateral donations through the World Food Program were Ethiopia, India, Pakistan, and Morocco (CIDA, undated).

Other food aid programs

Tables 4:3 and 4:4 give some information on other food aid donors. The EEC's food aid contributions have increased substantially over the recent past. Japan is another large donor and is like the U.S. in that a large proportion of its aid is by bilateral loans. Much of the aid of remaining Development Assistance Committee (DAC) member countries occurs through the World Food Program. Non-DAC members also give food aid. The USSR has given food aid loans in three years recently (1973, 1974, and 1975), when it gave amounts of $133 million, $240 million and $10 million, respectively. Food aid and loans given by Eastern bloc

countries tend to go to a few specific recipients. For instance, the USSR pays (in cash) for exports fron Canada to Cuba.

B. Export Credit Programs

There are a series of export financing schemes involving supplier credits of intermediate term (3-10 years), and short term (up to 3 years). These credit schemes may be either directly sponsored by governments, or guaranteed by them, or may be purely private.

Trade credits have been a source of contention among exporting nations because concessional terms under government-supported credit programs could be equivalent to a subsidy on exports. On the other hand, the rapid expansion of trade credit in the 1970s contributed to the shortening and hardening of terms of the foreign debt structure of most developing countries, and in some cases, led to serious repayment problems.

The Berne Union originally set rules to discourage suppliers credits with repayment terms of over five years, suggesting that they should be limited to developing countries and should be part of some development plan. The rules were frequently broken, however, (United Nations, 1966), and the OECD Group on Export Credit has since provided guidelines for credits of over two years (OECD, 1978). They suggested that the maximum period allowed should be 5-10 years, depending on the income level of the country concerned. Countries were divided into groups of the relatively

rich (over $3,000 per capita), intermediate ($1,000 to $3,000), and the relatively poor (below $1,000). They also recommended that interest rates should be between 7.25 and 8 percent, again depending on the particular country's income level. These guidelines have not been effective in standardizing credit terms. There continue to be frequent charges that some countries are offering more favorable terms in order to penetrate the traditional markets of other exporters. The United States' market share of total world grain exports has certainly increased dramatically (see Table 4:6), whereas Europe's has held nearly constant and Canada's has decreased, as has Argentina's and Australia's. But, it is difficult to determine whether the changes in market shares are due to different credit terms, or prices, or delivery times, or simply changing patterns of world demand.

U.S. export credit programs

The U.S. has had a series of export credit programs over the years beginning with government-funded commercial-term credit for food exports in 1956 and shifting increasingly to government guarantees of private commercial credits in 1978 and 1981. The first program (labeled GSM-5) consisted of 100 per cent financing for periods of 6 months to 3 years and the credit was extended by the Commodity Credit Corporation of the U.S. Government. A second program (GSM-101) began in 1978, guaranteed private credit for food exports against non-commercial risks (such as war, expropria-

Table 4:6

Amounts and Shares of Total World Grain Exports of Selected Countries

	Amounts in million M.T.		Percent Shares	
	1969-71	1979-81	1969-71	1979-81
World	111.0	218.1	100.0	100.0
North America	50.7	130.3	45.7	59.7
United States	36.3	109.8	32.7	50.3
Canada	13.7	20.5	12.3	9.4
Europe	21.0	39.0	18.9	17.9
France	11.4	19.6	10.3	9.0
Argentina	9.5	14.3	8.6	6.6
Australia	8.8	14.2	8.0	6.5

Source: FAO Trade Yearbook.

tion and nonconvertability of currencies). This was expanded in 1981 (by GSM-102) to cover all risks and contributed to the shift from direct government credit to commercial credit. (Appendix A contains more detailed information on these programs.)

The three credit programs described above have been fairly similar in their commodity and country coverage. The share of wheat and grains varies from year to year according to current surpluses. Over time, there has been a shift in the recipient countries. A large number of developed countries received funding early on in the program, but have not done so in the more recent past, except for tobacco purchases. Such countries included Australia, Belgium, Denmark, France, Germany, Italy, the Netherlands, Japan, Norway, and the UK. The more recent large recipients have been middle income countries, e.g., Korea, Yugoslavia, Poland, and Greece. Probably the legislation that 75 percent of PL-480 should go to countries below the poverty line, will encourage middle income countries to obtain credit under the above schemes. The program is intended to complement, and not be a substitute for, purchases under PL-480, because of the "usual marketing" requirement of the latter.

East European countries are eligible under the Trade Act of 1974 (which allows Romania and Hungary to receive credit). Poland and Yugoslavia were already eligible, although the latter lost its status. Eligibility also depends on Congressional waiver of a requirement of the law on human rights. Poland has been consistently a major recipient of credit as well as of PL-480 aid.

U.S. - blended credit program

Since October 1982, the U.S. has had a blended credit program. This consists of blending commercial credit from the GSM-102 program, with interest-free credits under a new GSM-5 program in a ratio of 4:1 or more. This is equivalent to a reduction in the interest rate on credit sales of up to 20 percent of the commercial rate. The initial allocation of $100 million in GSM-5 credits (which could yield at least $500 million in blended credit) was used up within a couple of months, and a second allocation was made available of $250 million i.e., at least $1.25 billion in blended credit.

The blended credits can be used for commodities not in short supply, and those covered so far include beans, oil, cotton, rice, and tobacco. However, grains are the main target, and about 70 percent of the first credit allocation was used for wheat. Buyers under this scheme include Yemen, Morocco, and Iraq. The U.S. ostensibly applies the concept of normal marketing requirements to try to ensure that the sales under the program are additional, and in particular that the sales of other sellers not offering such subsidies are not disrupted. The intention is obviously to try to attract customers who might otherwise buy from the EEC without invoking the ire of Canada, Australia, Argentina, and others.

U.S. - other programs

There are various other U.S. credit schemes. The legislation of the 1978 Agricultural Trade Act made allowances for intermediate term (3-10 years) credit at commercial rates, for four categories of use:

1. U.S. breeding animals,
2. to improve infrastructure,
3. to finance reserve stocks, under an agreement, and
4. to meet credit of other exporters.

Such credit is not to be used as balance of payments aid or for debt rescheduling and must be paid in U.S. dollars. The only program currently being used under this legislation is GSM-201, an intermediate export sales program for breeding animals, which has been used only in a small amount (in fiscal 1980, $3 million credit was authorized for Spain).

There is also legislation available but not funded, which allows for a revolving credit scheme to be operated by the CCC. This would have the advantage that once capitalized, it would not have to rely on annual appropriations by Congress. This would allow for more long-run planning of the amounts of loans by country and by commodity (Agriculture Council of America, 1981).

Another program which deserves mention, although it is not a credit program, is the export subsidy program. This was suspended in 1972, but the Agricultural Trade Act of 1981 called upon the CCC to have such a scheme available if need be. The original scheme was set up to:

1. avoid world market disruption,
2. fulfill international obligations,
3. aid domestic price support,
4. decrease CCC stocks, and
5. liquidate CCC stocks.

The second requirement refers to the previous U.S. obligation under the International Wheat Convention to sell wheat to major consumers at world prices (below certain levels) even when U.S. domestic prices are different.

The need for a subsidy was at the discretion of the Secretary of Agriculture, and its level was set by the President of the CCC. Exporters booked levels of subsidy for exports, based on the domestic market price. Over the program's existence, $4.3 billion was paid for the export of 0.5 billion bushels of wheat. The program was suspended after the USSR bought up substantial quantities of (subsidized) wheat in 1972 and caused a tight world supply situation. The program was also criticized (GAO, 1976b) for being weakly controlled and coordinated. Exporters were asked to pay back $2.7 million in payments "improperly made" for transactions in which an exporter claimed a subsidy for sales to its foreign subsidiaries, and where the export sales were delayed to take advantage of market price changes. The subsidy rates were also arbitrarily set, and the program favored large exporters. In 1972, of 409 contracts, 65 percent went to only five exporting firms.

The U.S. has recently been considering and experimenting with several credit and subsidy schemes, such as a revolving credit fund and a revival of wheat price subsidies. Some of these proposals are discussed further in Chapter VII. One (apparently one-time) transaction was made with Egypt whereby one million tons of flour were sold at subsidized prices (January 1983). The CCC supplied free wheat to the millers to combine with wheat valued at market prices, to lower the effective price per ton. It has been said that further deals of this type are not planned, and there is no specific program for these type of sales.

Canadian export credit schemes

The information for this section is drawn mainly from Sabatini (1975), and Wilson (1979). The first Canadian government-sponsored export credit was provided by the Export Credit Insurance Corporation, which was set up in 1945. Flour milling and malting companies were the earliest grain exporters to use the credits, and the first wheat credits began in 1952. East Europe, Israel, and Brazil were major recipients. The terms were for a down payment of 5-25 percent, with up to three years to repay the remainder, at commercial interest rates.

The Canadian Wheat Board instituted short-run credits in 1960, obtaining funds from commercial banks which the government guaranteed. The scheme originated because the government could not offer China and East Germany credit directly, since the coun-

tries were not recognized. As in the U.S., the government guaranteed scheme ultimately became larger than direct credits, since there was thus less restriction on the amount of funds available.

Competition from other exporters led in 1969 to the formation of the Export Development Corporation to replace the Export Credit Insurance Corporation. The new corporation was empowered to offer medium-term, subsidized credit, because it was felt that Canadian interest rates were higher than those of major competitors. Brazil made two purchases under the program (the program aimed to match U.S. terms), and Algeria made one purchase on terms of 10 years for repayment, with a 10 percent initial cash payment, a 2-year grace period, and 4.75 percent interest (Sabatini, 1975). This was considerably more favorable than the previous best terms of 10 percent cash, with the balance to be repaid at 8 percent over 3 years. There have been no further intermediate term loans since. Although the Export Development Corporation still can provide direct short run credit for non-Board grains, in practice it has not done so since 1978, since there has been apparently no difficulty in disposing of them.

There are also some provincial export credit programs, e.g., one in Alberta (Sabatini, 1975).

Government export credits - other countries

There is a range of programs in other countries. The EEC has a major export subsidy program, as well as some export credits.

[See Koester (1982), USDA (1981b), and Valdes and Zietz (1980).] The EEC invites exporters to submit bids to export specific quantities in a weekly tender. The EEC decides on the appropriate level of bid to be accepted and thus sets the amount of subsidy. For wheat exports, the world is divided into different areas. At present there is a separate tender for Latin America, which is a source of friction with the U.S. which has regarded Latin America as one of its traditional markets. Previously there had been a separate tender to East Europe and the Soviet Union. There is a different tender, changed less frequently, to the EEC's traditional markets in Austria, Switzerland, and the Iberian Peninsula. There are accusations that the subsidy to the latter area is lower, because of lower competition. The maximum subsidy per metric ton in 1980/81 was $68 (53 European Currency Units, or ECU), as against $83 in 1979/80 (59 ECU).

The EEC also offers financing, including two-year financing at rates ranging from 7 percent up to the market rate. In 1980, it offered such credits to North Africa and Latin America. The EEC's expenditure on disposal of grain has risen rapidly, and the area has changed from being a net importer to a net exporter through the 1970s. Grain disposal cost the EEC 1.12 billion ECU ($1.14 billion) in 1980. The result of the expenditure has been an increase in market share from 8 percent in the 1970s to 11.5 percent in 1979/80, and 15 percent in 1980/81, as well as considerable distress by the other exporters.

Individual countries within the EEC also have policies affecting grain exports and financing. Most of them have export insurance schemes for exports in general, similar to those of Canada and the U.S. These may be used for grain exports. French producer cooperatives, for example, apparently obtain credit for purchasers. France has also concluded a grain agreement with China in 1980, to supply 0.5 to 0.7 tons of grain annually.

Australia also has some credit policies, such as a current agreement with Egypt for two-year credit at commercial rates, and has in the past had agreements with Pakistan and China. Japan also has concessional credit sales of rice to certain countries.

Private export credits

While there is considerable information on private export credits in general, it is difficult to find how much of this is specifically for grains. Private credits have been increasing as a source of finance to developing countries. Non-concessional lending to non-oil producing LDCs accounted for two-thirds of the total net flow from all sources in 1978, as against less than a half in 1969-71. Low income countries including Indonesia accounted for slightly over 20 percent of the total export credits and private investment flows, as compared to only 4 percent of bank loans in 1977. Omitting Indonesia, however, the low income countries received only 9 percent of all export credits. Middle income countries (including Nigeria) received two-thirds of the

total export credits and bank loans available, and over half of private investment. The lower income countries within this group relied more on export credits (36 percent of total) than did the higher income countries within the group (12 percent of total). The latter, however, got relatively more of the private investments and bank loans.

The major sources of export credits are the U.S., France, Germany, Italy, Japan, and the UK, who accounted for 90 percent of the outstanding $40.5 billion of export credits in 1974. One-third of the total credits had a maturity date of 1-5 years, and two-thirds of over 5 years. Presumably the food/non-food composition of the credits varies by country. One would also expect that very few of the longer term credits are for food, since food imports do not usually increase a country's ability to repay debts (except perhaps in the very long term). There is little information available on the proportion of credits which go uninsured, and hence the extent to which using CCC, Wheat Board, and Export Development Corporation (EDC) figures thereby underestimate the amount of credit which the U.S. and Canada supply for food exports. A case study by Riggins (1975) found that the two U.S. grain exporters he surveyed used CCC insurance. However, non-grain food exports were not always insured because of the cost of such insurance. It seems likely that the CCC, Wheat Board, and EDC figures account for a major proportion of world export credits for grains, with smaller additional amounts for EEC and Australian

credits. Probably there is only a small amount of private credit for grain exports, which is not insured by government schemes. There is also probably some credit which originates in a six-month suppliers credit, not insured by a government scheme.

C. Multilateral Credit Programs

The only multilateral credit scheme specifically for cereals is the new IMF cereals facility, which began in 1981, and is an extension of the existing Compensatory Financing Facility for export earnings. The export facility had been used since the 1960s to finance short run fluctuations in export earnings. Countries can borrow with fairly low conditionality, if their export earnings in the current year fall below a trend based on the past two years and the expected levels of the next two years. The facility has been liberalized progressively to increase the amounts available, and has been heavily used. In 1975-80, it accounted for 31 percent of Fund credit (45 percent, if the UK drawings are excluded) (Goreux, 1980). Its popularity lies partly in the fact that drawings depended only on the condition that the country is willing to cooperate with the Fund in efforts to solve the balance of payments problem (for drawings equal to the first 50 percent of its quota), or has cooperated in such efforts (for further drawings).

The cereals facility was added in 1981 to cover unusually large import payments. These again are calculated as deviations

from a five-year trend centered on the current year, and any "excess" over the trend can be financed, provided that food aid flows are first netted out. Countries can project up to 12 months of data, i.e., they can anticipate future unusual import needs, so the facility could be used to meet expected shortfalls. In practice, countries have so far tended to obtain finance after having made the imports and have probably used commercial 120 day credit first (Morrison, IMF, pers. comm.). It takes usually about six weeks to obtain funds. Loans should be repaid within 3 to 5 years, and the interest rate is 4.375 percent in the first year, rising to 6.375 percent by the fifth year. Countries can borrow an amount up to 125 percent of their quota on the joint exports-cereals facility (or 100 percent on the facilities separately). Countries can choose whether to apply for compensation for export shortfalls alone, or export shortfalls combined with cereal import increases, but if they choose the combined scheme they must then continue to use it for a specified time period. Another criterion for qualifying is that the shortfall in production must be beyond the control of the country. The country must also have "suitable" agricultural policies, although these are not clearly defined.

As of mid-1982, there have been only four users of the facility, namely Malawi, Korea, Morocco, and Kenya, all of whom suffered droughts. Thus, it is not yet possible to assess the scheme. However, there were some projections made before the scheme began as to its use. DeLarosiere (undated) cites an FAO

study which found that consumption decreased absolutely in 4 out of 13 years for a sample of 50 countries, and in these same years import costs were greater than normal (although obviously not great enough to offset the shortfall). He also found that although the cost of cereal imports were on average only 13 percent of the cost of export earnings, the fluctuations in costs were three times as great and were chiefly due to volume changes. Goreux (1981) also calculated what the cost of an additional cereal facility would have been for 46 countries between 1963 and 1975, using the 1978 rules. He found that a cereal facility alone would have disbursed 3.1 billion SDRs (Special Drawing Rights), a joint cereal and export facility would have disbursed 24.8 billion, and the export facility alone would have disbursed 24.9 billion. Thus, according to his study, a joint facility would be cheaper but would provide little additional financing. It might, however, allocate payments more equitably by directing funds away from countries whose export receipt shortfalls are offset by decreased food import costs, and towards those for whom movements in trade flows exacerbate balance of payments problems. At present, countries have the option to use either the export facility alone or the joint scheme and will presumably select the scheme under which a greater amount of financing is available to them. Thus, the costs of the new facility are likely to be slightly larger than those envisaged by Goreux, but still less than the cost of two separate schemes.

Chapter V

Future Prospects for Grain Trade

There are several possible approaches to estimating the future levels of international trade in grains. One, which is sometimes referred to as the naive approach, is simply to assume that past rates of change will continue into the future. This approach can be criticized on the grounds that things are bound to change, and that there is more information which can and should be used to make more sophisticated estimates. Alternatively it is possible to make estimates of the growth of demand, by country and type of grain, using expected changes in incomes, tastes (or factors affecting tastes, such as urbanization), and other variables as elements (or arguments) in the estimating equation. Similarly, one can try to estimate the potential growth of supply, based upon estimated increases in land under cultivation, yields, and possible changes in relative prices. The differences between projected demand and supply at the national level provide the basis for estimates of potential import demand, which may in turn be constrained by the foreign exchange available to pay for the desired imports.

The problem with this more sophisticated approach is that it becomes very complicated, especially if attempted for a large number of countries. Lacking detailed knowledge of the individual countries, most analysts resort to using simplifying assumptions

and standardized models that are severely limited by the kinds of data that are uniformly available for a large number of countries. If the data are not available for a particular country, it is often dropped from the analysis. Such omissions are not serious if the country is small, but the omission of China from estimates of world grain supply and demand for many years was a gross distortion. Fortunately, we now have reasonably good information on grain production and trade for China, but there is still a problem in using the same basic model to estimate future grain production and demand for countries such as China, India, and Nigeria, which have very different economic conditions and systems.

Because of these difficulties with the more sophisticated, disaggregated estimating techniques, the naive approach may at least offer a convenient starting point against which the more sophisticated estimates can be compared.

A. Projections of Total Trade

These projections are based upon the patterns of change in world grain production and trade presented in Chapter II. The focus will remain aggregative, rather than trying to deal with individual countries or continents, and will deal with broad trends which have considerable variance around any point estimate. In essence, we will be estimating what may happen to grain trade in the 1980s if the trends of the 1970s continue. The results are shown in Table 5:1.

Table 5:1

Constant Growth Projections of Future Grain Trade

(Annual averages in million metric tons)

	1969-71	Annual Growth Rate	1979-81	Annual Growth Rate	1990	Total
Grain production	1,232	2.6	1,593	2.4	2,020	
Imports	111	7.0	218	7.0	428	428
Wheat	54	5.9	96	5.9	171	
Maize	29	10.4	78	10.4	210	
Barley	10	4.8	16	4.8	26	451
Rice	9	3.7	13	3.7	19	
Other	9	5.2	15	5.2	25	
Developed	71	5.7	124	5.7	217	
						438
Developing	40	8.9	94	8.9	221	

World grain production has been growing over the past three decades, but at a diminishing rate: 3.2 percent per annum in the 1950s; 2.8 percent in the 1960s; and 2.6 percent in the 1970s. If this pattern continues in the 1980s, the annual growth rate may drop to 2.4 percent. We have used this rate in Table 5:1 and the result is an estimate for world grain production in 1990 of 2 billion metric tons. Such an estimate probably has a standard error of $\pm$ 100 million tons, but it seems very unlikely that the trend level of grain production could be less than 1.9 billion tons or more than 2.1 billion tons, unless there were some basic climatic changes or major technological breakthroughs. Even the latter, if still unknown in 1982, would be unlikely to have much impact by 1990.

The grain trade estimates for 1990 in Table 5:1 are based simply on continuation of the growth rates of imports in the 1970s. We present separate estimates for total imports, for imports of the main types of grain, and for imports of developed and developing countries. Because of the differences in the growth rates of the components, when aggregated they do not add up to the estimate for total imports in 1990. These several totals may suggest a range for our aggregate grain import estimates from 428 to 451 million tons, with a midpoint of 440 million tons. Such a level of imports would amount to 22 percent of total world production as compared with 9 percent in 1970 and 13.7 percent in 1980. For imports to reach that level there would have to be

increasing specialization of production and a willingness to accept greater dependence on foreign sources of supply.

Some support for this high level of imports is found in the growth rates of the imports of different types of grain. If maize imports continue to rise at the rates of the 1970s, which means if the middle to upper income countries continue to exhibit relatively high income elasticities of demand for meat that comes from animals raised mainly on maize, then maize will become the most important grain in traded volume, and probably also in value terms, by 1990. Our simple estimates suggest that maize will account for about half of total grain imports, wheat nearly 40 percent, and the other grains slightly more than 10 percent.

Another interesting aspect of our naive estimates is that they suggest the imports of developing countries will exceed those of the developed countries by 1990. This would reflect in part the growing import needs of many of the very poor countries in Africa whose grain production is not keeping pace with population growth, but the more important part is likely to be the rising imports of feed grain for the more affluent countries in mid-passage from developing to developed status. Thus, the distinction between developing and developed may become misleading and needs to be replaced by a classification that distinguishes between countries that import grain primarily for food or for feed.

Another perspective on the magnitude of grain trade is to relate it to the total value of world trade. This is done in Table 5:2 for 1979-81 and with our naive estimates for 1990, assuming that prices in absolute and relative terms remain as they were in 1979-81. The estimates of total world trade in 1990 are based upon the Leontief study of World Economy Prospects to the year 2000.

As shown in Table 5:2, even if the value of grain trade grows at a relatively high rate of 7.4 percent per year in real terms, for the decade of the 1980s, it will still amount to only slightly more than 2.5 percent of total world trade (which is estimated to grow at 6.25 percent per annum). If grain prices continue to decline relative to the prices of other traded commodities, as they have in the past decade, then the share of grain trade in total world trade might remain roughly constant.

It is a useful reference point to consider that even with a continuation of the fairly high rate of growth of world grain trade that prevailed over the past decade, the share of grain in total world trade is not likely to rise above 2.5 percent by 1990. That is a very small figure compared, for example, to the ratio for oil in 1980 of 24.8 percent.

Table 5:2

Estimated Value of Grain Imports in 1990

(Billions of U.S. dollars in 1979-80 prices)

	1979-80	1990
All grain	40.0	84.3
Wheat	18.1	33.3
Maize	12.0	36.0
Barley	2.8	4.2
Rice	5.0	6.5
Other	2.1	4.3
Total World Imports[a]	1,734	3,277
Grain trade as percent of world trade	2.3%	2.6%

a. Source: IMF International Financial Statistics for 1979-80. Estimate for 1990 assumes 6.25% annual growth rate from Scenario A of the study by Wassily Leontief et al., The Future of the World Economy (New York: Oxford University Press, 1977).

B. Demand for Cereal Imports

Turning from the more aggregative estimates of total grain trade, one can look at the demand prospects from the major importing countries and the supply prospects from the major exporters.

Generally the import demand estimates on an individual country basis add up to much lower figures than those implied by our naive aggregative estimates. One cannot help wondering whether this represents a subtle self-sufficiency bias in the minds of the estimators. Most governments like to beat the drum of food self-sufficiency. And many analysts tend to be optimistic on the potential supply side. The problem is that there has been a tendency to underestimate both income and price elasticity of demand in the longer run, and, on the other hand, to overestimate the potential production-increasing effects of various agricultural programs. We shall see some evidence of this as we review the import demand estimates for some of the major importing countries.

Russia, Japan, and China were the three largest net importers of grain in 1979-81, having average total imports of 75.5 million tons or net imports of 70.5 million tons for those three years. The European countries had average total imports of 62 million tons for those same years, with Italy, Poland, the United Kingdom, Spain, and Belgium being the major importers. France, on the other hand, was the main exporting country accounting for half of Europe's total export. Netting out the total exports and imports of the 27 European countries covered in the FAO statistics, the

continent had average annual net imports of 23.3 million metric tons in 1979-81.

All of the countries of Africa except South Africa and Zimbabwe were net importers of grain in 1979-81. Egypt, Algeria, Morocco, and Nigeria accounted for 13.8 million tons or nearly two-thirds of total African imports of 21.8 million tons, with the remaining 8 million tons split among 48 countries and territories.

Recent IFPRI studies have estimated the prospective grain imports of several of the major importing countries (Russia and China) as well as all of the developing countries. In the following pages, we shall review and comment on these estimates and others for countries not studied by IFPRI.

Russia's future grain imports through 1985 are analyzed by Desai (1981), who also reviewed several other studies (Bond and Levine, 1979, and Green, 1979). She uses three different approaches for estimating imports: one based on an import demand equation, and two on the differences between estimated domestic demand and domestic output. For the latter two, in one case domestic output is based upon past trend, and in the other, on a production function that takes account of varying inputs. She also allows for variation in weather conditions. Her basic conclusion is that annual grain imports will average in the range of 15 to 18 million tons for the years 1981-85. This is much the same as average imports of 16.4 million tons for the years 1971-72 to 1979-80. She also estimates that imports might reach as much as 30 million tons

in bad weather years and that there could be net exports of up to 3 million tons in good weather years. Although her estimates do not go beyond 1985-86, the fact that her five-year import forecasts are very similar to the past levels of imports suggests that not much change could be expected in the latter half of the 1980s. Finally, Desai concludes (p. 40) that "the Soviet Union can afford to import the amount of grain" that she estimates it will require without cutting into other import needs. In essence, she sees no financing problem for Russian grain imports. Her only concern is that large Russian imports after a bad weather year might again create some instability of world grain prices as it did in the past.

Desai's projections of Russian grain imports appear to be quite low on the basis of the first three years after she made her predictions. Total Russian grain imports were 27, 31, and 44 million tons in 1979, 1980, and 1981. Exports averaged 3 million tons annually for the same years, leaving net imports well above her suggested maximum and average. Unless the new regime in Russia is successful in raising grain production or abandons the liberal food consumption policy, it appears that Russian grain imports will continue at much higher levels than Desai predicted. Recent reports that Russia has expanded its port and transport capacity to be able to handle up to 50 million tons of imports per annum gives support to the view that they themselves are expecting imports to rise.

The Russian practice of paying cash for its grain imports has also been modified recently, as there have been reports that some grain purchases have carried six months' deferred payment terms.

Japanese grain import demand has been analyzed by the Japanese Ministry of Agriculture and Forestry (1975) and by Sanderson (1978, 1982) among others. The official Japanese estimates appear to be strongly influenced by the self-sufficiency bias, so we shall refer mainly to Sanderson's more recent estimates. He sees the main driving force of Japanese grain imports coming from a rising demand for meat. As he shows (1982, p. 396ff), Japanese meat consumption through the 1970s was relatively low given Japan's per capita income. Even assuming that the high level of per capita fish consumption currently found in Japan will continue, Sanderson predicts that meat consumption will triple between 1977 and the year 2000. This would result in a 150 percent increase in both the food energy deficit and grain imports by 2000. Assuming a smooth increase over the two decades, 1980 to 2000, this would imply that Japanese grain imports would rise from about 25 million tons in 1980 to 43 million tons in 1990 and 62 million tons in 2000.

Here again, the projected import levels would create no financing problems. Japan has been experiencing large foreign trade surpluses and this is likely to continue. Cereal imports of $4.2 billion in 1980 were only 3.5 percent of total imports and probably would not rise in percentage terms if Japanese exports continue to grow at anything like past rates.

Predicting China's future grain import levels is a much more difficult problem. Recently there have been significant changes in Chinese agricultural and foreign trade policies, but it is still too early to foresee just how effective they will be, much less to anticipate whether and how long they will stay in effect. Over the past 33 years of Communist rule there have been frequent dramatic shifts in policies and these may well occur in the future.

Still, some patterns have emerged in recent years. While China has been a consistent exporter of rice, averaging a little over one million tons per year in the 1960s and 1970s, it has become an increasingly important importer of other grains, especially in recent years. Grain imports consist mainly of wheat and are used mainly to supply the large coastal cities. This has the dual advantage of substituting a less expensive grain--wheat--for a more expensive grain--rice--and also of relieving the burden on the internal transportation system. The volume of grain imports is only about 3 percent of total domestic grain production so that substantial increases in grain production could largely eliminate the need for imports, whereas sizeable increases in consumption or slowing of the growth of production could generate large import demands.

Two recent studies from IFPRI (Tang and Stone, 1980) conclude that Chinese imports of grain are likely to average in the range of 10 to 15 million tons through the 1980s and 1990s. Tang's

estimates of grain demand, production and defecits (or surplus, in parenthesis) by the year 2000 are shown in Table 5:3. It would obviously make a considerable difference for world grain markets if China were exporting 32 million tons or importing 46 million tons. But, as both Tang and Stone imply, China is not likely to move to such an extreme position. Demand and supply will not be allowed to get too far out of balance. If production grows slowly, there will be belt-tightening, whereas, if it grows rapidly, more will be consumed directly and channeled into livestock feed.

Timmer, on the other hand, suggests that a vigorous incentives-led growth strategy in China, including sufficient supplies of meat to satisfy rapidly growing consumer demand, could lead to very large increases in the demand for maize. He concludes that "it is easy to see China adding 20-30 million metric tons in maize import demand to a 1990 world market already likely to be under severe demand pressures and tight supplies." (Timmer, 1981, p.41) Timmer does not envisage substantial increases in maize production within China on the grounds that the country's resources and technology base is already being utilized at close to its maximum potential. It may be, however, that maize is one crop for which these limits are not so constraining.

Table 5:3

Tang's Estimates of China's Grain Production, Demand and Deficit by 2000

(in million metric tons)

	Demand	Production	Deficit
High	831	785	46
Medium	538	524	14
Low	388	420	(32)

Source: Anthony M. Tang, "Food and Agriculture in China: Trends and Projections, 1952-1977 and 2000" in Tang and Stone, Food Production in the Peoples Republic of China, pp. 36-40.

Maize has only been grown on a large scale in China in recent times, replacing sorghum and millet as a summer grain crorp in north and northeast China. Production nearly doubled between 1969-71 and 1979-81. Yields increased by 50 percent over the same period, but at 3 tons per hectare they were still less than half the average yields in the U.S. China has not yet developed high quality hybrid seed or high productivity technologies for maize as it has done for rice and wheat. Thus it is possible that China could increase maize production substantially from its recent level of 60 million tons and thus meet much of the increased demand for feedgrain that Timmer foresees. Another 50 percent increase in yields in the 1980s would satisfy Timmer's estimated import demand without any increase in land committed to maize.

Ulrich Koester, in a recent IFPRI study, has made estimates of the potential production, consumption, and tradeable surplus or deficit of the major grains for the ten EEC countries (including Greece) for 1985 and 1990, assuming that there are no basic changes in current EEC price support policies. These are presented in Table 5:4. According to his projections, EEC wheat production and tradeable surplus will not increase very much during the 1980s. But he expects that maize production will grow very rapidly (by 84 percent) while barley and oats production will increase substantially (33 percent). This would move the EEC countries from a 9 million ton feedgrain deficit in 1980 to an 8

Table 5:4

Grain Production, Consumption, and Net Trade of the European Economic Community for 1980 with Projections for 1985 and 1990

	1980	1985	1990
Wheat			
Production	54.8	55.3	61.8
Consumption	42.3	43.4	44.5
Surplus or deficit	12.5	11.9	17.3
Maize			
Production	17.9	25.2	32.9
Consumption	31.4	35.9	41.2
Surplus or deficit	-13.5	-10.7	-8.3
Barley and Oats			
Production	48.2	56.0	64.5
Consumption	43.4	45.7	48.2
Surplus or deficit	4.8	10.3	16.3

Source: Ulrich Koester, Policy Options for the Grain Economy of the European Community: Implications for Developing Countries (Washington, D.C.: International Food Policy Research Institute, November 1982), p. 23.

million ton surplus by 1990, and an overall grain surplus of some 25 million tons.

Koester suggests that if the EEC were to eliminate its protective grain policies and open its markets up to world competition, EEC grain production would decline by roughly 40 percent. This would move the EEC from a large net exporter to a significant net importer. Other grain exporting countries would expand production to fill the gap, world grain prices would rise, and other grain importing countries would be affected adversely. Koester does not expect such liberalization of EEC markets to occur, and therefore the perspectives of Table 5:4 are his best estimates of what EEC grain trade patterns will be by 1990.

It seems likely, on the other hand, that East European grain deficits will persist and that this will be a potential market for EEC surpluses, provided the East European countries can pay for their imports. This is a market in which financing will have an important role.

The International Food Policy Research Institute (IFPRI) has prepared a number of estimates of future food import needs of the developing countries (IFPRI, December 1977; Huddleston, 1982). The earlier IFPRI study covers only the "Developing Market Economies" (DMEs) which excludes such communist countries as China and Cuba that are important grain importers. Huddleston's more recent study includes these latter countries in some of her estimates, and we will mainly draw on her work.

Huddleston uses four different approaches to estimating the demand for cereal imports for 1990. The first is based on the income elasticity of demand, the second on a minimal nutrition requirement, the third on the difference between past trend consumption and trend production, and the fourth on a projection of past import trends. She concludes that the last of these gave unrealistic estimates on a country by country basis and therefore she did not use it in her subsequent analysis of food aid requirements. On the other hand, it is the only approach that covers all of her 113 developing countries and is thus most directly comparable to our naive estimates for all developing countries presented in Table 5:1. Her import trend is based upon the years 1961-63 and 1976-78 so it gives a somewhat different result than ours based on the decade of the 1970s. The total level of projected imports for 1990 for 113 developing countries based on her past import trend data is 186 million tons, or 84 percent of our trend estimate of 221 million tons. This indicates that the import trend rose during the 1970s. It also highlights the question of whether that trend will continue to rise in the 1980s or turn downward.

Huddleston's other estimates of 1990 grain imports for developing countries would suggest that the trend will be downward. Dealing with a somewhat smaller group of countries because of data limitations, she suggests growth of total grain imports at annual percentage rates ranging from 4.3 to 5.5 percent based on her

other three scenarios. These are well below the 8.7 percent annual growth rate implicit in her continuation of past import trend scenario and our 8.9 percent rate based on the 1970s import trend for all developing countries.

Her lower trend scenarios would imply grain imports for 1990 of roughly 120 million tons starting from the 1976-78 base that she uses, or 150 million tons starting from the considerably higher 1979-81 base of 94 million tons that we show in Table 5:1.

Thus we are faced with a very wide range of estimates for grain imports of all developing countries for 1990 ranging from 120 million to 220 million tons. The lower end of the range would be consistent with very slow growth of income in all developing countries, suppression of feed grain imports in the middle income countries, and a general shift toward autarkic, food self-sufficiency oriented trade and development policies in some of the major importing countries. On the other hand, the high grain import levels would imply not only the opposite set of policies in the developing countries, but also compatible import policies in the developed countries, and sufficient financing of grain exports to permit the developing countries to feel secure in such interdependent strategies. We shall discuss these financing implications further in the next chapter.

C. Supply of Cereal Exports

Aggregate world supply of exportable cereals is not likely to be a serious problem in the coming decade, even if international

grain trade continues to grow at the high rates of the past decade. The main grain exporting countries in North America are currently confronted with surpluses and are considering policies to curtail production and stimulate exports. These countries have unutilized land that could be brought into production or land that could be switched from other crops if the price incentives so imply. Argentina also apparently has the potential for much larger surpluses, given appropriate agricultural and management policies. And the EEC has the potential for expanding grain production if it wishes to push it.

Given the prospect of adequate total supplies of grain to meet world demand for imports, the main questions concern which countries will be supplying which kinds of grain to meet those import demands. We have already indicated that the most rapid growth in demand has been for maize and that the United States has captured the lion's share of this export market. The demand for feedgrain imports will undoubtedly continue to be the fastest growing component of international grain trade in the future, although possibly at a somewhat lower rate than in the past. Will the United States continue to dominate this market or will other countries be able to achieve more of a position in it? The answer to this question is likely to depend on whether the U.S. and others will continue to expand maize production at falling real prices, or whether prices will eventually turn upwards (at least relative to other cereals) to encourage further supply increases.

Here again, EEC agricultural policy contributes to uncertainty. Continuation of large subsidies to EEC feedgrain exports will tend to depress world prices, discourage other producers, and probably shift the EEC from a net importer to a net exporter of feedgrains. Reduced subsidies would mitigate these effects and leave more room for increased supplies from other sources.

Canada has some possibilities for expanding feedgrain production. At current relative prices, yields on soft (feed) wheats are not sufficiently high to encourage major shifts in production patterns. Nor are corn yields sufficiently high to shift all the land theoretically suitable for corn into this crop at present prices. In recent years, U.S. corn prices have been low enough to cause a substantial financial loss when wheat and barley have been diverted from exports to the domestic market at corn-competitive prices. (Since 1974 the Canadian Wheat Board has followed a policy of supplying feedgrain to eastern Canada at prices competitive with U.S. corn, at considerable cost.) Barley and feed wheat have specific uses for which they are demanded abroad even at prices higher than corn, one such use being in the USSR, to enable diversification of its supply of feed. However, unless corn prices rise relatively or current policies are changed, feed wheat and barley production will be restricted or its use distorted.

If feedgrain prices were to increase relative to those of foodgrain, Canadian production could profitably shift. First, the amount of feed wheat could increase at the expense of food varie-

ties. Grading standards could also assist in this shift. Canada has in the past maintained high quality standards and protein requirements for wheat. Changed baking techniques have reduced the need for such high protein wheat, but Canadian wheat grades have not been adjusted correspondingly. Similarly, the existence of separate export and domestic quality standards for wheat and the setting of relative prices based on different wheat grades may inject excessive rigidity into the grain markets, which could be ameliorated by relying more on the signals in export markets to determine the incentives for production of different wheat grades. The Canadian Grains Council has suggested that programs to develop higher yielding wheat varieties should be greatly expanded, but surpluses of production in recent years have probably been a disincentive to such research. If yields can be improved, feed wheats might become increasingly profitable.

Finally, Canada has some potential to increase its corn output. At present most corn in Canada is grown in southern Ontario, and area of production is largely determined by climate. Nowland, et al.'s (1982) soil model suggests that there is considerable potential for increase. At present 0.8 million hectares are used, as against a potential 1.7 million hectares designated as suitable. A further 6.7 million hectares are designated moderately or marginally suitable, mostly in Ontario, but also in Quebec and the Atlantic provinces. Use of the latter land might depend on considerably higher corn prices, or technology for much higher yields

in cooler climates. Use of at least some of the additional land for corn would entail switches out of other crops and hence changed relative prices. Gellner and Hedley (1982) expect that corn production will rise from 5.2 million tons in 1980-1 to 8.1 million tons in 1990-1, a rapid increase, although less rapid than that between 1970 and 1980 when varieties improved, as did soil drainage.

To encourage feedgrain production in Canada would require not new or continued subsidies as in the EEC, but removal of some of the existing disincentives. These include the segmentation of western and eastern markets and the obligation by the Wheat Board to supply the eastern market with feedgrain at corn-competitive prices. This has resulted in low prices for Prairie feedgrains and also the diversion of those grains out of higher valued export uses into domestic use. These feedgrain policies, along with very low rail transport rates, may have also caused distortion in the location of the domestic livestock industry. The industry in the East is artificially protected both by cheap grain prices and low transport costs.

Despite the possibility of a doubling of world grain imports in the 1980s, the grain exporting capacity of North America is sufficient to meet these potential demands from the rest of the world. The major uncertainty is whether the EEC will continue to

nibble away at that market and depress world grain prices through its export subsidizing policies. A shift in EEC policies could turn the trend from declining to rising net imports for all of Europe, a gap that the North American exporters could easily fill. Even a continuation of existing policies may in time have a diminished effect on world markets if the production response to higher producer prices within the EEC has already run its course. A leveling off of EEC grain production would mean that North America could supply most of the growing world market demand for wheat, and this, together with the expected high growth of feed grain exports, could support a continuing expansion of North American grain production. But, as we have suggested previously, the broader dimensions of this expansion will depend on whether world trade policies maintain an open, interdependent orientation or turn inward.

Chapter VI

Policy Issues of the 1980s

The picture that emerges from our review of world grain production and trade trends and prospects is that aggregate supply will probably be sufficient to meet both the effective market demand and minimal nutritional needs of the poor import-dependent countries at least through the 1980s. The questions that remain, then, are whether markets are likely to function efficiently to give appropriate signals to producers and consumers without extreme fluctuations in prices and profits, and whether the means will be available to transfer grain supplies to needy countries or peoples who can't pay for them on a current basis. Both of these questions involve governmental policies and actions. In connection with market efficiency, the issue is more likely to be one of government intervention that causes distortion rather than reducing it. In the case of transfers to the needy, positive government action to finance the transfers is called for.

A. Financing Grain Imports

The big grain importers--Russia, Japan, China, Korea--are not dependent on external financing for their imports. They may avail themselves of short-term commercial financing, or even, in the case of Korea, concessional financing, if it is available, but

such financing is not critical to their import decision. For such countries, price, terms and timing of delivery are likely to be the more critical factors in deciding from whom to import.

On the other hand, the IFPRI studies, as well as those of the IMF, have demonstrated that a number of developing countries experience serious short-run increases in grain import payments when they have domestic crop failures or when world grain prices rise sharply. The countries that are relatively self-sufficient in grain are often least prepared for the crop failures and therefore most severely affected. Also, some of these countries have more erratic climatic patterns than others, which impart an added instability to domestic production. Countries which are chronic importers may be better prepared to cope with the fluctuations in domestic production but, on the other hand, are harder hit by increases in international grain prices or declines in the prices of their main exports.

Developing countries that experience significant fluctuations in their food import bills may need financing for one or more years to tide them over these difficult periods. Instability of production means that there are good years as well as bad, and in the good years it should be possible to reduce imports or raise exports and thus pay off the debts of the bad years. As we have noted, however, when a country experiences several poor harvests in a row, it needs more than short-term financing. Depletion of domestic stocks in the first bad year can often force very large

imports in the second or third bad years and preclude any repayment. Thus, any system for financing of such grain imports needs to be flexible, extendable and expandable to cope with the sequential bad harvest problem. This is analagous to the flexibility required of an effective farm credit program.

At the other extreme from the short-run fluctuation case is that of the poor chronic grain importing country. Some might conclude that such countries should not try to rely on long-term financing for such imports, but instead should employ exchange rate and other policies to achieve a trade structure that would be compatible with continuing grain imports, or adjust agricultural policies to increase domestic grain production. Others argue that the poorer countries should be assisted in meeting these needs through some form of food aid.

Huddleston (1982) has estimated, for the year 1990, the amounts of grain imports that might be needed to bring average per capita grain consumption up to a level that meets basic nutritional needs for all countries with per capita incomes of less than $900. She then assumes that the importing countries will pay for a part of their food imports and that food aid would cover the rest. Her criterion for a country's self-financed portion of imports is a percentage of their projected export earnings. Here she assumes two levels: 2 percent and 5 percent.

The estimated demand for food aid, in the case of 5 percent self-financing is 33 million tons for 1990. In the case of only 2

percent self-financing, it rises to 43 million tons.[2] India and Bangladesh account for roughly one-half of the required food aid in either case, with most of the remainder going to African countries. China is omitted from the estimates. These levels of food aid would be equivalent to 30-40 percent of the total grain imports that Huddleston has estimated will be needed by all developing countries in 1990. They would also be four to five times the recent levels of food aid.

Huddleston presents alternative estimates of food aid requirements based on a continuation of past trends of food demand related to income and consumption levels rather than nutritional needs. These alternatives, which she indicates are more realistic than the nutrition-based demand estimates, result in lower grain imports and food aid levels of 12 to 26 million tons as opposed to the 33-43 million tons derived from the nutrition-based estimates.

Many objections can be raised especially about the nutrition-based estimates. They are mechanistic and make many assumptions and projections based on past trends that ignore the influence of market forces and government policies. A more fundamental question is whether it is developmentally sound to provide a continuing flow of food aid to countries at low levels of development that are sizeable grain importers. Does this tend to keep them dependent on such aid? Is it better to think of medium-term assistance programs that will either reduce the food import ratio or generate increased foreign exchange earnings to pay for the continuing food imports?

A third type of demand for the financing of food imports is as part of a structural change in the production and trading pattern of a country. This might run for a period of five or ten years and be one component of a broader development program. It would probably entail considerably less food aid than that which Huddleston suggests for the chronic, low income food importers. The amounts would depend on the number of countries that were interested in implementing such restructuring programs and the extent to which food imports might play a role in such programs.

Many developing countries may strongly prefer general financial assistance rather than food aid, which must consist of food imports and is often tied to particular countries and types of food. Only if these food imports fit the current developmental needs of the country are they likely to be fully effective. This fit is most difficult in countries that are trying to expand domestic production of the same food items that are being imported, because the imports almost inevitably depress internal prices for those foods, thus providing a disincentive for domestic producers. The fit is easiest where a country is trying to expand other exports to pay for continuing food imports. In this case, the early increase in food imports can be used to hold down food prices and, indirectly, the production costs of the prospective exports. The success of such programs depends in large part, on the eventual competitiveness of the exports. If they are not successful, like the failed infant industry that never grows up, the

countries may simply have increased their dependence on food imports and eventually have to cut back other imports if food aid is curtailed.

In sum, there are three main types of demand from the poorer developing countries that may call for special or concessional financing of grain imports: short-run, year-to-year fluctuations in grain import costs due to crop failures or unstable world market prices; medium term needs for grain imports as part of broader programs to bring about basic structural change; and chronic imports of poor, food-deficit countries. The potential magnitudes of such financing that might be demanded are very difficult to estimate. Some attempts have been made for the chronic grain importers, but they are very mechanistic and seem to be unrealistically large.

We have already discussed in considerable detail the various types of financing available under both bilateral and multilateral programs of the major exporting countries and the IMF (see Chapter IV). Although the amount of traditional, concessional food aid has been declining, there has been an increase in other types of financing, including regular commercial credits, various government guaranteed loans, and some directly subsidized loans. These trends seem likely to continue in the future so that the supply of financing per se will not be a constraint on food imports; rather the cost of that financing may vary over time in response to both world grain market and world monetary conditions. Also, some

countries may encounter limited supplies of new financing if their existing indebtedness has become excessive.

The new IMF Food Financing Facility is specifically designed to meet the short-run needs of such countries. Although it has gotten off to a rather slow start, we anticipate that it will expand operations as procedures become more clearly established and better understood by potential users, and that it will come to play a major role in meeting the problems of short-run grain import instability for poorer countries.

Calls for increased flows of concessional food aid to meet the basic nutritional needs of the very poor chronic grain importing countries have been sounded, and there is some evidence that food aid flows are increasing, but they seem unlikely to reach the levels that Huddleston suggests will be needed. We suspect that many of the people of Africa will continue to be underfed until they can work out ways to increase the productivity of their traditional farming.

Structural adjustment lending from the World Bank and major bilateral aid donors is likely to flow mainly to countries that are farther along in their development process and more concerned with industrial than agricultural restructuring. Such assistance may ultimately help to finance more food imports through increased industrial exports, but it is not likely to provide a source of current financing for such imports.

B. Manipulating Grain Markets

The volume of grain traded on international markets doubled in the 1970s and is likely to double again in the 1980s. Lewis (1983), among others, has stressed the improved efficiency of these markets. He claims that there is more competition, better information, more integration, and that the greater use of future contracts has helped to stabilize prices. In his view, the food crisis of the early 1970s was an example of market failure and is unlikely to happen again.

On the other hand, governments do intervene in these markets in many ways to benefit particular interests or prevent developments that conflict with other national objectives. There are presently many examples of such interventions and new ones are constantly being proposed. Most interventions are zero-sum propositions--any gain by one party is at some other party's expense, and there is no net gain for society as a whole. They redistribute the pie without increasing it and, in fact, often reduce it.

The major issues that overhang the world grain markets in the 1980s have to do with possible changes in patterns of government intervention, which in turn would have substantial effects on national levels of grain supply and demand. Two prime examples are found in Russia and China. The failure of Russian agricultural policies together with a government commitment to improve consumption levels, especially of meat, led to the large increases

in grain imports in the 1970s. Either a turnaround in agricultural performance or a decision to cut back on food rations could have a major impact on Russian grain imports. While it seems unlikely that either change will occur mainly for political reasons, the possibility does exist, and it adds an element of uncertainty to the world grain markets above and beyond the year to year fluctuations in Russian imports due to erratic climatic conditions.

China, too, has permitted more generous food allowances to give incentives for urban workers. It has also permitted farmers more self-control over their land, labor, and product which has contributed to the recent high growth of farm output. Continuation of these policies will undoubtedly increase the demand for higher quality foods, expecially meat. It may also contribute to rapid increases in the production of livestock and related feed grains. The balance of these two forces will be reflected in the growth of China's grain imports. And the combined outcomes in both Russia and China will largely determine whether demand for feed grains continues to dominate the world grain markets.

In these two controlled economies, the governments are deeply involved in setting prices and managing trade flows. Because the economies are so large, minor changes in policy can have major impact on net imports. Both of these factors contribute to uncertainty about prospects for future grain imports.

There are also important elements of market interference and uncertainty among the major grain exporting countries. We have already alluded to the effects of EEC subsidies on grain exports in reducing world grain prices and taking over market shares. This policy, which is designed to raise the incomes of farmers within the EEC countries, imposes a burden on taxpayers within the Community and upon farmers in competing countries, while giving some benefit in the form of lower world grain prices to importing countries.

The United States, as the largest grain exporting country, has attempted to dissuade the EEC from continuing its subsidy policies and thereby depressing world prices. So far, the EEC has shown no sign of yielding to these U.S. pressures and is continuing to sell grain at whatever terms are required to move the surplus.

Consequently, the U.S. has taken several measures to preserve its share of the world market. The most dramatic action was the announcement on January 18, 1983, of the sale of one million tons of wheat flour to Egypt at subsidized prices. This was a direct challenge to the EEC in what they considered their traditional market, and it precipitated strong protests from the French government. In addition, the U.S. began a blended credit program in 1982 which supplied $500 million of subsidized credit in the fourth quarter of 1982 and had an additional $2.5 billion available for 1983. Finally, legislation has been approved for a

revolving credit scheme and for intermediate-term financing under the GSM-201 program.

Other proposals were made in the last session of the U.S. Congress, but not passed. One proposal would have given the Commodity Credit Corporation (CCC) $175-190 million per year for three fiscal years (1983-85) to increase exports under existing authorities. There was also a proposal to subsidize interest rates up to 4 percentage points on grain export credits and to allow the CCC to give 100 percent guarantees on such credits (the GSM programs now have ceilings on the guarantees that are less than 100 percent). The maximum time period for the interest subsidies and guarantees could be for as long as 10 years.

While challenging the EEC with selective subsidies in contested markets, the U.S. government has at the same time been attempting to bring about a reduction in domestic grain production and stockpiles. This is being done by giving U.S. farmers grain from government stocks in exchange for taking a comparable portion of their land out of production. The intention of this program is to raise U.S. farm prices and incomes and to reduce the costs of carrying large stocks. It is not intended to reduce U.S. exports and make room for expansion of EEC exports. In fact the U.S. objective of raising farm prices could be frustrated by continued subsidies of EEC exports. The extent of integration of the world grain markets results in such subsidies having an impact on domestic U.S. grain prices. On the other hand, for the U.S. to

offer its farmers comparable subsidies would be impossibly costly. Thus the U.S. reliance on unregulated markets makes its farmers' incomes vulnerable to the depressing effects of foreign subsidies, and explains the combination of diplomatic pressures and selective price and credit subsidies that are now being tried.

The other major grain exporting countries--Canada, Argentina and Australia--face two kinds of dilemmas as a result of uncertainty over food policies in Russia and China on the one hand and the conflict over subsidies between the U.S. and the EEC on the other. The first issue concerns the potential growth of world demand for feed grains and whether it is advisable to encourage a shift of research focus and other resources from food to feed grains. There are serious questions as to the potential returns from such a shift. These need to be studied carefully. There also undoubtedly are policies in each country that are biased in favor of the traditional food grain exports. These too need to be reviewed. We are in no position to say what the potentials are in these countries, but we do suggest that feed grains are likely to lead the grain trade through the remainder of the decade and that the potentials should be explored.

How to protect national interests of such countries as Canada, Australia, and Argentina in the face of competitive price and credit subsidies by the EEC and the U.S. that depress world prices, is a more intractable problem. One option is simply to accept the lower world prices and let them be reflected in lower

domestic prices and reduced farm incomes. This also means reduced value of exports and deterioration of the terms of trade, but it may prevent a decline in the share of the world grain market. The other main option is to provide comparable subsidies on grain exports and maintain a dual price system with higher domestic prices for both farmers and consumers as compared with world market prices. This also has adverse terms of trade effects but tends to preserve the world market share.

The first option is likely to engender strong political opposition which is more threatening the larger and more powerful the farming sector. The second option can become very costly, especially if grain exports are a sizeable portion of total exports and total agricultural production. This helps to explain why the EEC has resorted to subsidizing its grain exports--French farmers have considerable political power, and grain exports are a very small portion of total EEC exports (1.3 percent in 1981). By way of contrast, grain accounted for 6 percent of total Canadian exports, 11 percent of Australian exports and 30 percent of Argentine exports in 1981. In the case of Argentina, the proportion is so high that there is no way of avoiding the terms of trade impact on national incomes. But for Australia and Canada the possibility exists for distorting markets to moderate the effects on producer incomes. It is sobering to remember that this is, in relative terms, a much less costly undertaking for the EEC. The U.S. is probably in the strongest position to try to press for

some moderation of EEC subsidies, an undertaking that other grain exporting countries could reasonably support.

Appendix A

Econometric Analysis of the Relationships between Financing and Imports

This appendix develops and estimates a simple model to examine the relationship between grain import demand and the availability of finance. Similar studies have been made for all imports (see, for example, Hemphill, 1974). However, the financial variable often used, foreign exchange reserves, is frequently not found significant, perhaps because it is a poor indicator of availability of finance for trade. Chapter III surveyed some cross-country studies of the relationship between grain imports and financial variables. Huddleston (1982) found that the ratio of export earnings to GNP was positively associated with the degree of cereal import dependence, and interpreted this as a measure of foreign exchange availability. She also considered, but did not use, foreign exchange reserves, on the grounds that "the reserve level is very much affected from one year to another by lumpy capital flows, and the country coverage of data is poor" (p. 32). Morrison (1982) did try such an analysis, and found the signs to be insignificant and negative, the opposite of what was expected. He concluded that "food imports in many cases may be relatively more protected than other imports in times of foreign exchange shortage, and in times of upward fluctuations in foreign exchange, food imports may not increase significantly over normal

levels unless there is an unusual need, such as a drought-induced production shortfall. It appears, therefore, that financing, unless it is commodity-specific such as food aid, is not a significant determinant of cereal imports in the short run" (pp. 25-6).

We use a simple model based on the adjustment principle from Green and Kirkpatrick (1981). The latter examine variations in grain production, consumption, imports, stock levels, and foreign reserve levels, and try to categorize countries by their type of response to a food production shortfall. They examine correlation coefficients between the series. For instance, a country which uses imports to compensate for production shortfalls will tend to have a variance in grain consumption which is less than that in production, and grain imports and production should be negatively correlated, as should foreign exchange reserves and imports. The present model uses this concept of adjustment, but instead of correlation coefficients, attempts to estimate a behavioral model using time series data.

It is assumed that domestic grain consumption would, if unconstrained, depend on income, price, population size, and taste variables. This is referred to here as "fitted consumption," $\hat{C}$. However, in any given year domestic production (S_d) differs from fitted consusmption. The excess of fitted consumption, or demand, over production, C^*, can be responded to in various ways. The government can run down food stocks, decrease food exports (if

there are any), increase imports, or finally allow a portion of excess demand to go unsatisfied. (The latter would typically drive up prices, or require some type of rationing.) Governments may use any or all of these methods in combination. One might expect that the availability of foreign financing would allow a government to resort more to importing rather than other methods of dealing with the deficit.

Model

The model is thus as follows:

$$\hat{C} = f(Y, N, Z_1 \ldots Z_n, P) \qquad (A.1)$$

$$C^* = \hat{C} - S_d \qquad (A.2)$$

$$M = g(C^*, P, C^*_{-1}, X_1 \ldots X_n) \qquad (A.3)$$

where $\hat{C}$ = fitted consumption

S_d = domestic supply (production)

C^* = excess demand, unstatisfied from domestic production

M = imports

Y = national income

N = population

P = grain price relative (relative to other consumer prices for food grain, relative to meat prices for feed grain)

C^*_{-1} = lagged value of C^*

$Z_1 \ldots Z^n$ = factors affecting demand such as urbanization, income distribution

$X_1 \ldots X_n$ = financial variables, e.g., debt service ratio, amount of food aid, foreign exchange earnings, level of foreign exchange reserves

Equation A.1 is a conventional consumption equation where food demand depends on prices, incomes and the distribution of incomes, and pouplation. The form of the equation (linear, quadratic, log, or semilog) would depend on the type of demand elasticity postulated. When estimating this equation here we use actual, not fitted, consumption as the dependent variable, since the former is observable and the latter is not. This should not cause a bias in the estimation as long as production fluctuations are independently and identically distributed and not correlated with the independent variables. This condition is, however, rather likely not to hold.

Equation A.2 is an identity defining excess demand for grain over domestic availability. It is thought preferable to use fitted rather than actual consumption in this equation (an ex ante rather than ex post measure) since actual demand incorporates adjustments to domestic production shortage or excess. The response to excess supply may differ from that for excess demand. However, for the countries with which we are concerned here, there is usually an excess demand.

Equation A.3 is an import demand equation. It is assumed that imports are a positive function of excess demand, but with a coefficient of less than 1. The coefficient is likely to be

smaller, the more there are constraints on imports, or the greater the possibility of adjusting stock, export, or consumption levels. Import volumes are also assumed to be a negative function of grain prices and a positive function of finance availability. Hence, they are expected to be positively related to foreign exchange reserves, export earnings, and food aid, and negatively related to debt service payments. The coefficient on food aid is likely to be less than unity, and to be smaller the greater the extent to which food aid displaces commercial imports or is fungible to other uses. Lagged C^* values are included to allow for lagged effects. The perseverance of bad harvests in two or more seasons or years is likely to have more severe effects on food availability, since short-run adjustment possibilities, such as those of farm-held stocks, may be exhausted. Ideally one would also want to be able to experiment with various lengths of lag of imports behind production (in months) to allow for lags in response. However, this is not possible with annual data.

The model can be estimated in either volume or value terms. The advantage of using values is that one can aggregate across different grains more easily, when price trends differ between grains. However, the disadvantage is that prices are on both sides of the equations, and the sign of the price term can no longer be predicted since it depends on the elasticity of demand. In the present case, the estimation uses volumes.

In our model food and feed grain equations are estimated separately. This is based partly on empirical grounds (Chow tests) and partly on theoretical grounds. For example, it is usually assumed that food grain demand has a lower elasticity than that for feed grains, since meat is more of a luxury item than grains. Food grains here comprise rice and wheat, and feedgrains comprise millet, barley, oats, rye, corn, sorghum, and mixed grains. The distinction is not perfect since, for instance, barley has been used for food in Korea, as has corn in Brazil. The equations estimated do not include either oilseeds or starchy staples. Both of these are substitutes for grains either as food or feed. However, the substitution elasticities are lower than those among grains. Lack of data was a major factor in excluding these items. The particular United States Department of Agriculture (USDA) data tape used did not include oilseeds, and data on starchy staples is usually not included. Since the latter are produced largely by subsistence farmers and not heavily traded, figures are not very reliable.

Finally, we should note some limitations of the model. It is rather simplified. Obviously, there is simultaneity in the determination of prices, consumption, and imports, particularly for large countries; however, we have here assumed prices are exogenous. The faster prices adjust, the poorer the assumption. However, food prices are often fairly carefully monitored and even controlled by governments, so the response to economic conditions

is delayed and incomplete. The equations do not estimate other adjustment mechanisms, such as those of stocks or exports. Further equations could be added to show the adjustment path in greater detail, for instance, the adjustment of non-food imports, or the effect of increased imports on exchange reserves. We have not treated stock adjustment here, since stock data is usually very unreliable. Nor have we estimated adjustments in non-food imports, since this would have required modelling the non-food sector. This would, however, be a possible extension.

Data

Table A:1 lists the sources of data. The model was tested for each of Korea, Brazil, and Morocco for the years 1960-80 (actual years included depended on data availability). The choice of countries was motivated mainly by the fact that each is a significant importer of grain. The countries used have fairly large populations and are middle income developing countries. It is assumed that such countries are of the most interest when studying financing. Most low income developing countries have fairly small import demands (even if they have large populations) and are not likely to be major users of financing in the near future. They are not likely to be offered much financing on concessional terms, nor to be willing to accept finance on commercial terms if they have any chance of receiving concessional credits.

Table A:1

Data Sources

Variable	Country	Source
income	Korea (K)	Bank of Korea, national income statistics yearbook (BOK)
	Morocco (M), Brazil (B)	IMF International Financial Statistics (IFS)
population	K	Economic Planning Board (EPB), Government of Korea
	M, B	IFS
grain price index	K	government selling price of rice (EPB)
	M	cereal price index (wholesale, Casablanca) to 1976, thereafter chained to price of 10 kg wheat, Casablanca. Annuaire statistique do Maroc (ASM)
	B	wholesale price of agricultural products to 1969, thereafter chained to wholesale price of cereals. Conjuntura Economics (CE)
general price index	K	wholesale price index (BOK)
	M	general index of wholesale prices of 69 goods, Casablanca (ASM)
	B	general wholesale price index (CE)
meat price	M	wholesale price of meat in Casablanca to 1976, thereafter price of 1 kg beef, Casablanca. (ASM)
	B	wholesale price of agricultural products to 1965, thereafter average of beef, hog and chicken price received by farmers to 1969, thereafter wholesale price for animal and derived products. (CE)
imports	K	BOK Balance of Payments Yearbook
	B, M	IFS
real exports, export volume	B, M	IFS
debt service	K, B, M	World Bank World Debt Tables
food aid	K, B, M	Huddleston (1982)
all grain variables	K, B, M	USDA tape "Foreign production, supply, and distribution of agricultural commodities" for 1980 and 1982

The three countries chosen have some diversity aside from being in different continents. The main grain staple varies from rice in Korea, to rice and corn in Brazil, to wheat in Morocco. Korea and Morocco have been large recipients of PL-480 food aid, which Morocco has used in food for work projects, and Korea to import mainly wheat for urban consumers. Brazil is an important agricultural exporter and in particular is the world's second largest exporter of soybeans, which compete with grains in livestock feed. Brazil and Korea have both been among the largest borrowers of non-oil developing countries.

Estimates

The results are presented in Tables A:3 to A:6. Table A:3 presents estimates of the consumption equation for each of the three countries, for food and feed separately. Table A:4 presents import demand equations for food, and A:5 for feed. Table A:6 presents alternative log form equations for Korea only (the log specification was not used for Brazil and Morocco due to zeros in some of the data series). The variables are defined in Table A:2, and A:7 gives means.

Several different specifications were tested. For Brazil and Morocco, the shortness of the series on debt service payments meant that the equations were estimated both with and without a debt service variable, to increase the sample. Alternative versions of financial resources were tried. These included the value

Table A:2

Variable Names and Definitions

L	Log value
PCC	Per capita consumption of grain in metric tons
PCY	Per capita real income in 1975 U.S. $
PCYSQ	Per capita real income squared
LSQPCY	Log^2 of per capita real income
RPIG	Ratio of wholesale price index of grain to wholesale price index, 1975 = 1.000
MPIG	Ratio of wholesale price index of meat to wholesale price index, 1975 = 1.000
DUM	Dummy variable (Korea only) = 1 in 1977 and after, 0 otherwise
MGN	Per capita imports of grain in metric tons, per year
CSB	Difference between predicted (fitted) consumption and domestic production (Morocco and Brazil); difference between predicted consumption and domestic production plus stocks less exports (Korea); in each case per capita metric tons per year
FAM	Food aid in 1000 metric tons (Korea)
PCFAM	Food aid per capita in metric tons
RSERC	Ratio of debt service to imports (Korea); ratio of debt service to exports (Brazil and Morocco)
T	Time trend (Morocco)

Table A:3

Per Capita Annual Grain Consumption

(metric tons)

Independent Variable	Dependent Variable: Food			Feed		
	Korea	Brazil	Morocco	Korea	Brazil	Morocco
constant	0.112 (6.196)[b]	0.112 (5.641)[b]	-0.358 (0.664)	-0.021 (2.791)[b]	0.127 (2.331)[a]	-1.142 (1.606)
PCY	0.000451 (1.797)[a]	-0.0676 (2.566)[a]	0.528 (0.961)	0.000102 (4.286)[b]	0.00566 (0.0947)	1.353 (1.849)[a]
PCYSQ		0.0000476 (3.121)[b]	-0.000147 (1.072)		0.0000303 (0.873)	-0.000282 (1.491)
RPIG	0.0558 (1.996)[a]	-0.00480 (0.234)	-0.0186 (0.535)	0.00411 (0.257)	0.0526 (1.117)	-0.0662 (1.423)
MPIG					-0.0724 (1.448)	-0.250 (2.536)[b]
DUM	0.0106 (0.974)			0.0166 (2.552)[a]		
T			0.00576 (3.550)[b]			
adjusted R^2	0.65	0.77	0.62	0.90	0.61	0.51
F statistic	12.94[b]	23.86[b]	8.36[b]	58.73[b]	8.68[b]	3.69[a]
Dubin-Watson	0.97	2.31	1.81	1.11	2.35	2.66
o of freedom	3,16	3,17	4,14	3,16	4,16	4,14

a. Denotes significant at 5% level.

b. Denotes significant at 1% level.

c. t statistics are in brackets: 1 tail test used coefficients given to 3 significant figures for decimals, otherwise 3 decimal places.

Table A:4

Per Capita Annual Food Grain Imports

(metric tons)

Independent Variable	Country Korea	Brazil	Brazil	Morocco	Morocco
constant	-0.000442 (0.0135	0.0307 (1.730)	0.00400 (0.121)	-0.0438 (1.956)[a]	-0.0750 (2.142)[a]
CSB	0.613 (2.023)[a]	0.571 (2.807)[b]	0.523 (1.633)	0.492 (2.953)[b]	0.457 (2.385)[a]
RPIG	0.00683 (0.203)	-0.0177 (1.241)	-0.000380 (0.0150)	-0.0571 (2.125)[a]	0.0540 (1.512)
PCFAM		0.150 (0.791)	-0.182 (0.256)	0.473 (1.283)	0.917 (1.676)
FAM	0.00000827 (1.465)				
RSERC	0.205 (2.703)[b]		0.525 (0.959)		0.151 (0.173)
T				0.00141 (1.919)[a]	0.00324 (1.500)
adjusted R^2	0.71	0.42	0.44	0.69	0.70
F statistic	12.11[b]	5.09[a]	3.19	10.41[b]	6.19[a]
Durbin-Watson	1.66	1.93	1.68	1.72	1.40
o of freedom	4,14	3,14	4,7	4,13	5,6

Table A:5

Per Capita Annual Feed Grain Imports

(metric tons)

Independent Variable	Country Korea	Brazil	Brazil	Morocco	Morocco
constant	-0.0298 (1.984)[a]	0.0392 (2.583)[a]	0.0458 (2.320)[a]	0.0104 (0.687)	-0.0154 (1.583)
CSB	0.716 (2.768)[b]	0.183 (4.250)[b]	0.220 (5.064)[b]	0.0876 (1.969)[a]	0.0189 (0.733)
RPIG	0.0459 (2.135)[a]	-0.0235 (3.541)[b]	-0.0183 (2.070)[a]	0.00428 (0.391)	0.00506 (0.817)
MPIG		0.0172 (1.566)	0.00497 (0.366)	-0.00978 (0.842)	0.0129 (1.401)
PCFAM		-0.175 (1.189)	-0.217 (0.572)	-0.0841 (0.602)	0.103 (1.047)
FAM	-0.000000700 (0.169)				
RSERC	-0.106 (2.018)[a]		0.270 (1.475)		0.0226 (0.144)
Adjusted R^2	0.92	0.78	0.89	0.06	0.01
F statistic	49.93[b]	15.83[b]	18.46[b]	1.29	1.03
Durbin-Watson	1.36	1.98	2.17	1.64	2.42
^{o} of freedom	4,14	4,13	5,6	4,13	5,6

Table A:6

Alternative Log Specifications, Korea only, Annual Food and Feed Consumption, and Imports (metric tons)

Independent Variable	Dependent Variable: Food - LPCC	Feed - LPCC	Food - LMGN	Feed - LMGN
constant	-10.094 (2.606)[b]	2.533 (0.178)	3.697 (5.527)[b]	-7.625 (1.896)[a]
LPCY	2.701 (2.092)[a]	-4.152 (0.874)		
LSQPCY	0.216 (2.003)[a]	0.503 (1.270)		
LCSB			1.981 (1.848)[a]	1.813 (2.184)[a]
LRPIG	0.232 (1.674)	0.644 (1.262)	0.813 (1.185)	-0.610 (0.227)
LFAM			0.106 (1.227)	0.281 (0.644)
DUM	0.094 (1.661)	0.176 (0.840)		
LRSERC			0.0958 (1.851)[a]	0.296 (1.911)[a]
adjusted R^2	0.73	0.95	0.74	0.80
F statistic	13.83[b]	89.27[b]	49.93[b]	19.42[b]
Durbin-Watson	1.27	1.62	1.89	1.69
o of freedom	4,15	4,15	4,14	4,14

Table A:7

Variable Means

	Korea	Brazil	Morocco
food MGN	0.0493	0.0279	0.0484
feed MGN	0.0185	0.00227	0.00381
food PCC	0.1804	0.0891	0.1547
feed PCC	0.0210	0.1461	0.1308
PCY	487.6	883.8	1,901.3
PCYSQ	290,411.4	869,531.7	3,650,213.1
RPIG	0.979	1.058	0.806
MPIG	--	0.914	0.863
PCFAM	--	0.00584	0.0179
FAM	796.94	--	--
RSERC	0.117	0.193[a]	0.148[a]

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a. All figures are for 1961-78, except those noted (a), which are for 1967-78. Given to 3 significant figures. Note, Korea's average population was 31,633.4 thousand (this is necessary when comparing coefficient of FAM with that for PCFAM for the other countries).

of exports per capita, deflated by an index of import prices, and the export volume index deflated by population growth. These performed poorly and had generally insignificant coefficients, and are not reported here. A second experiment was to include lagged as well as current values of C^* in the import demand equation, to allow for the persistence of excess demand effects and the possibility of lags in response. The additional variable did not increase explanatory power. The lagged C^* variable was sometimes significant, but at the expense of decreased significance on other coefficients and a decrease in their size. A third experiment was to use an estimation procedure based on a method by Beach and McKinnon to deal with serial correlation. This was tried because in some equations the Durbin-Watson statistic was below the upper critical value (D_u). However, in only one case was the Durbin-Watson statistic below the critical value (D_L), and then only at the 5 percent level. Thus, there is no conclusive evidence of serial correlation. The results using the correction for serial correlation are not reported here. In the case of Morocco, there was found to be a strong time trend in the food equations, which dealt with the serial correlation problem.

In the case of Korea, a dummy was used to indicate a change in food policy. The dummy is zero in all years before 1977, and unity thereafter. This reflects the fact that until 1977, a government regulation required barley to be mixed with rice for human consumption in a 1:4 ratio. The aim of this was to stretch domes-

tic rice supplies. While this regulation was observed more in public eating places than in private homes, it did create an artificial demand for barley for human consumption. Since the abolition of the regulation, it has freed more barley for use as a feed grain and possibly increased demand for rice and wheat as preferred foods.

Table A:3 presents the results for the consumption equations. For Korea and Morocco the income elasticities for food and feed are as expected, positive but declining with income, with the income elasticity for feed higher than that for food (the elasticities can be calculated using the means given in Table A:7). This reflects the usual pattern that diets shift toward higher calorie cost items as incomes increase, and that food in general is a normal and not a luxury good. For Brazil the coefficient of per capita income has an unexpected negative sign in the food equation, which is only partly outweighed by the positive one on per capita income squared. The elasticity of demand for feed is, however, positive but increasing with income. Possibly both of these effects are related to a worsening of income distribution as incomes rose. It may also reflect the fact that corn (classified as feed) has in fact a major food use in Brazil.

The grain price variable generally has a negative but insignificant effect on consumption demand. The exception is for Korea, where the government allowed controlled rice prices to increase over time as incomes and grain consumption rose. Hence,

there may be a multicollinearity problem here. The meat price has a negative effect on demand for feedgrain, as might be expected. Since demand for feed is a derived demand, high meat prices decrease meat and, hence, feed consumption.

The food import equations are presented in Table A:4. The coefficient on the excess demand variable is usually significant and positive, with a narrow range (0.46 in Morocco to 0.61 in Korea). This suggests that about half of the adjustment to excess consumption demand is through imports, leaving the remaining half to be dealt with by other means. Morocco, which has the lowest coefficient, has the highest per capita income, and the opposite is true for Korea. This could suggest that countries with lower per capita income are less able to compress domestic demand, a proposition also set forth by Mellor (1978).

The relative grain price variable is generally insignificant, perhaps because the indicator used (domestic grain price index relative to domestic wholesale price index) is not a good indicator of world grain price levels. Food aid has a positive coefficient although not quite significant, and the size of the coefficient is in all cases less than one (the coefficient of 0.827×10^{-5} on total food aid for Korea translates into a coefficient of 0.259 on per capita food aid). This suggests that there is indeed a large amount of fungibility between food aid and other imports, and that "additionality" requirements on food aid recipients are not being met.

Finally, the coefficient on the debt service variable has the opposite sign from what would be expected. Food imports increase with the debt service ratio. Nor did alternative measures of financial resources (per capita export volume and per capita real export earnings) perform well. This may reflect positive correlation between increased indebtedness and increased food imports due to policy. The three countries each borrowed increasingly over time to finance industrial expansion, and part of the strategy entailed increased food imports to assure adequate food supplies at reasonable prices for the growing urban industrial labor force. At a minimum the results of these regressions suggest that finance was not a constraint on food imports for these three countries.

The feed equations are presented in Table A:5 and have coefficients different in size and sometimes sign from the food equations. In general the equations perform quite well, except for Morocco where, however, feed imports are very small and fluctuate greatly over time. The coefficient on excess demand is smaller than in the case for food for Brazil and Morocco (ranging from 0.09 to 0.22). As expected, excess demand for feed can be more easily absorbed by reducing consumption, since the livestock herd size can be adjusted. In Korea the coefficient on the excess demand variable is even higher than for food (0.72). Perhaps feed demand is less compressible than for the other two countries, because per capita income is lower and there is less meat consumption on average. However, even so the coefficient is surprisingly high.

The relative price of grain has a significant negative effect on feed import demand in Brazil, as might be expected. The positive coefficient for Korea is again probably related to the government policy of allowing grain prices to increase over time as incomes rose. The meat price coefficients are insignificant (it was difficult to obtain long series for the price variables for both meat and grain, and the method used, of linking available series, was not ideal).

Food aid also has an insignificant effect, usually with a negative sign, i.e., feed imports are not affected by food aid since aid is usually not in feedgrains. Finally, debt service ratios have a positive but not significant relation with feed imports in Brazil and Morocco, whereas it is both negative and significant for Korea. Again, the hypothesis that financing can loosen constraints on imports is only weakly supported in the case of Korea.

Conclusions

The model's results should be taken with some skepticism. Probably the weakest assumption is that prices are exogenous, since grain prices are likely to adjust to shortages, although governments tend to intervene more with these prices than with many others. As with other time series studies, there is also the problem of serial correlation and the fact that there are other things going on. Specifically, domestic policy shifts and foreign

market changes could obscure the true relationships. There are also relatively few observations with complete data, relative to the number of fitted parameters.

The results are similar over the three countries and fit quite well with expectations. The main conclusion as regards financing is that it does not seem to be an important determinant of import demand and is apparently not a constraint for these countries. Debt service ratios are, if anything, positively related to food and feed imports, except for feed imports in Korea. Other indicators of financial resources (export volumes and values) also did not perform well, and earlier studies have found that foreign exchange reserves also were a poor measure. Nor is it likely that the cost of credit would have the expected negative relation with imports, either. As import demand in the three countries increased over time, so did the nominal cost of credit as measured by the LIBOR and London Treasury Bill rate (proxies for the cost of international borrowing). Thus, the country studies suggest that structural and economic variables in the importing countries have more marked effects on volumes of imports than do financial variables.

Appendix B

Elaboration of United States Government Program for Financing Grain Exports

The PL-480 program

The PL-480 program began in 1954 as a method of disposing of surpluses. There are presently three titles: Title I consists of sales on favorable terms, Title II consists of donations, and Title III of sales that are converted to donations for countries that meet certain self-help conditions. The information below comes from Food for Peace (undated), and USDA Food for Peace Annual Reports (1975-1980).

Under Title I, a country could purchase food either in U.S. dollars, to be repaid in up to 20 years, with a grace period of up to 2 years, or in local currency, to be repaid in up to 40 years, with a grace period of up to 10 years. Since 1971, all new loans have been for dollars. Interest rates have been below commercial ones. The value of the loan is reduced slightly by the requirement of an "initial payment" of up to 5 percent (dollar sales, or 5-20 percent (under the previous local currency sales). The U.S. used the local currency receipts for military expenses abroad, for embassy expenses, for research purposes, e.g., the National Science Foundation, for purchase of books for the Library of

Congress, to fund conferences, for export market development, etc. Residual amounts have sometimes been given back to the country.

Under Title II, the U.S. gives donations to voluntary agencies, to the WFP (World Food Program), to foreign governments, and for disaster relief.

Title III donations have been given since 1977. Only countries classified as least developed, i.e., below the IDA limit on per capita income, are eligible. This limit was $170 in 1978 prices. Such countries can be forgiven loans, provided that the counterpart funds are used for development purposes, or provided that the proceeds from recipient government sales of commodities are adjudged to be used directly for development purposes, e.g., the Bangladesh open market sales. Up to 1981, six such loans had been granted, to Bangladesh, Bolivia, Egypt, Honduras, Senegal, and Sudan.

GSM-5 export credit sales program

This section and the following ones on U.S. schemes draw on Foreign Agriculture (1980), on Henke (1928a), and on USDA Quarterly Report of the GSM (1980-1981). The GSM-5 program dates from 1956, and was largely replaced by 1980 by the programs GSM-101 and GSM-102. Over some 24 years, commodities valued at $9.3 billion were exported, i.e., about $400 million per annum. This is somewhat less than under PL-480, which exported commodities worth on average $1,200 million annually, between 1955

and 1978. However, there has been a trend toward aid being replaced by credit sales, and the PL-480 sales have recently decreased relative to sales on credit.

The GSM-5 program allows credits of between 6 and 3 years, which is intermediate between the duration of commercial supplier credits, and the PL-480 program. The program was originally intended to reduce the Commodity Credit Corporation (CCC) stocks. Credit is available on commercial terms, for 100 percent of the f.o.b. value of eligible commodities. Countries must be deemed credit-worthy in order to participate. Repayments are in equal sums spread over the period. The program was "directed toward increasing grain exports in order to meet intensified foreign competition," and in the 1970s received extra emphasis to seek additional markets for those commodities involved in the Soviet grain embargo.

The type of commodities financed are very similar to those in the PL-480 program. Wheat represented 20-30 percent of the value of commodities 1976-1980, and all grains 33-65 percent, with the rest consisting of oilseed, fats, tobacco, and a small amount of fruits and vegetables. The top ten recipients over the program's history were (in descending order) Korea, Poland, Portugal, Pakistan, Romania, Greece, Peru, Brazil, the Philippines, and Egypt. These are rather similar to the top PL-480 recipients: four of the ten are the same in each case (Korea, Pakistan, Brazil, and Egypt), and the other six figure prominently in the list of PL-480 recipients. (The reverse is also true.)

GSM-101 noncommercial risk assurance program

This is a credit-guarantee program and dates from the fiscal year 1978. It covers political risks such as war, expropriation, and nonconversion of currencies. It is an export guarantee program rather than a direct government credit program. The government guarantees the risks, but the loan is from a private bank. The program accounted for about half of government credit in 1980 (the GSM-5 program shrank correspondingly), but has since been superceded by the GSM-102 program. Large recipients under the program included Poland and Korea, and smaller amounts went to Peru, the Dominican Republic, Sudan, Thailand, and Yugoslavia. The main commodities financed over fiscal 1979-80 were wheat (20 percent of the total) and all other grains (36 percent).

U.S. GSM-102 export credit guarantee program

This program was introduced in fiscal 1981 to cover all risks, not just the noncommercial ones covered by GSM-101. The program's listed aims are:

1. to facilitate exportation,
2. to forestall or limit declines in exports,
3. to permit exporters to meet competition, and
4. to increase commercial exports of U.S. agricultural commodities.

The program is similar to GSM-101 and guarantees credit for 6 months to 3 years at commercial rates. The main recipients in the first half of fiscal 1981 were Poland, Korea, and El Salvador. Grains accounted for 64 percent of the total value, wheat being only 6 percent of the total.

GSM-301 is an intermediate term program for agricultural products, which provides finance for 85 percent of the value of U.S. commodities being used to set up marketing facilities abroad. Under this scheme there were a couple of shipments of grain to Israel to set up a handling facility worth $17-18 million (Godsey, USDA, pers. comm.). The program is not, however, presently funded.

The Export-Import Bank also has authority to provide short run credit for agricultural exports, although it has largely been replaced by the CCC which apparently has more favorable terms. The Export-Import Bank was set up in 1934. In its early years it concentrated on short-run loans for cotton, wheat, and other agricultural commodities, as well as loans for defense, for capital goods, and for strengthening the dollar position of foreign countries (Piquet, 1970). It has various activities including providing export insurance, direct lending, discounting of loans by other lenders, guaranteeing medium-term loans in conjunction with the Foreign Credit Insurance Association (FCIA), and lending directly for risky exports. Agricultural commodities were once an important part of its business and accounted for 14.0 percent of

authorizations between 1950-58 (Hald, 1959). However, agricultural commodities are now only a small part of its activities, and only 3.2 percent of direct loan appropriations between 1969 and 1973 were for commodities, including agricultural ones (Export-Import Bank, 1976).

One final program which used to exist under PL-480 legislation, but now has independent authority, is the bartering of surplus agricultural commodities for needed stockpiles of other commodities, to be delivered to the Defense Department.

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