SOURCES OF GROWTH IN INTERNATIONAL GRAIN IMPORTS, 1950-1980.

INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

University
Microfilms
International
300 N. Zeeb Road
Ann Arbor, MI 48106

Younis, Sadoon Jumah

SOURCES OF GROWTH IN INTERNATIONAL GRAIN IMPORTS, 1950-1980

The University of Arizona M.S. 1986

SOURCES OF GROWTH IN INTERNATIONAL GRAIN IMPORTS, 1950-1980

by

Sadoon Younis

A Thesis Submitted to the Faculty of the

DEPARTMENT OF AGRICULTURAL ECONOMICS

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

1 9 8 6

STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this essay are allowable without special permission, provided that accurate acknowledgement of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED: Sadeen Yousif

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Eric Monke — April 14, 1986

ERIC MONKE — Date

Associate Professor of Agricultural Economics

To my parents

and

to my wife Ahlam, my son Husam, and my daughter Wisam for their unselfish support, patience, and love, which has made my efforts fruitful and totally satisfying.

ACKNOWLEDGEMENTS

First, I wish to thank Dr. Eric Monke for his help and guidance in selecting the topic of the thesis and also for introducing and stimulating my interest in this field of research. His patience, encouragement and interest, throughout the course of this research, have been invaluable to me.

I wish to express my sincere gratitude to Dr. Roger Fox for his devotion and interest in my career as a foreign student and his forbearance with my ineptitudes caused by my unfamiliarity with the environment of an American university. Our relationship dates from the moment of my arrival as a graduate student and has been completely satisfactory in every detail.

I wish also to thank Dr. David Barkley for reviewing my thesis and giving constructive criticism which contributed greatly to the successful completion of my thesis.

I am indebted to Dr. Jimmye Hillman, Head of the Department of Agricultural Economics, for his encouragement and fatherly advice.

I owe Ed Jorgenson a vote of thanks for his assistance in the computer and statistical analysis area.

My association with a fellow student, Mary Stigers, has led to a close relationship that resembles the family situation that foreign students sacrifice when going to another country. She has assisted me

in understanding the language and has taken a motherly interest in my wife, my children, and me.

I wish to thank Barbara Beard for typing the first draft of my thesis.

Finally, I thank the Government of Iraq for the financial support which has enabled me to attain this degree.

TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF FIGURES

ABSTRACT

World grain trade grew rapidly during the last three decades in developed countries (DCs) as well as in the developing countries (LDCs). To examine the causes of the rapid increase in grain imports, seventy-eight countries have been chosen from among the DCs and LDCs, as net importers of grains in 1980. The results of this study show that, contrary to popular opinion, population growth and the decline of starchy staple production had only a limited effect on grain imports. Improvement in cereal production in most of the country groups had a negative effect on cereal imports, almost balancing the effects of population growth and declining starchy staple production. Income growth is the most significant cause of the rise of cereal importations. In DCs, income growth is most important as a cause of increases in indirect demand for grain. In LDCs, income is a dominant factor in increased direct consumption of grain.

CHAPTER 1

INTRODUCTION

During the last three decades dramatic changes have occurred in world grain trade. One continent after another has become dependent on grain imports, and by the 1970s, North America and Oceania were the only major areas with net grain export capacity. The European Community (EC) was the world's largest feed grain importer during the 1960s and 1970s; its grain imports increased at a steady rate. Asia became a net grain importer in the early 1950s. Africa and Latin America commenced net grain imports in the 1960s. These areas receive most of their grain supplies from the United States, Canada, Australia, and Argentina.[1] For less developed countries (LDCs), dependence on foreign grain markets is a rule, and countries with net grain export capacity are rare exceptions. The transition to import status in most LDCs has coincided either with the collapse of colonialism or with an economy-wide increase in foreign trade.

In most LDCs, the market for staple foods accounts for a substantial fraction of economic activity. As a result, grain markets play an important role politically and LDC governments around the world intervene in food pricing. Thus domestic policies for grain have also played a prominent role in the determination of net trade status.

---

1. Vilho Harlle, ed. The Political Economy of Food. England: Saxonhouse, 1978, p. 3.

Policies have also influenced developed country's (DC) grain trade. In the European Community (EC) high prices and relatively stable domestic demand have resulted in over-production of a number of commodities, including wheat, beef, veal, sugar, and dairy products. While the EC remains a net agricultural importer, it has also become the second largest agricultural exporter after the United States. Japan supports its food production at higher price levels than any other major importing country. For example, direct and indirect agricultural subsidies during the year ending April 1981 totalled an estimated U.S. $11.05 billion. About half of the subsidy expenditure is related to the rice program, under which half of the country's rice crop is purchased at supported prices and then resold to wholesalers at a loss to the government.

Grain trade is the sole responsibility of a government agency in many countries. Importing countries buy their grain through a central buying system, a commercial buying system or a combination of the two. Most Communist countries have state agencies (e.g., Export Khleb of USSR). Such agencies buy either from state sales agencies like Canadian Wheat Board, or from the private trade. Sometimes, governments locate buying missions in exporting countries. Poland, Pakistan and India, for example, are countries who buy through such missions. Most North Africa and Middle Eastern countries (i.e., Algeria, Morocco, Tunisia, Iraq, and Syria) have official government purchasing organizations attached to one of their ministries. Countries in Western Europe, including the United Kingdom, obtain their grain imports through the activity of commercial buyers. The Japanese

buy through combination of government agency buying and private trading.

This study analyzes some of the causes of growth in international grain import during the periods 1948/52-1979/81. Particular attention is given to the role of growth in population, grain production, substitute products (starchy staples) and income. Seventy-eight countries are divided into eleven categories according to their level of economic development. Chapter two provides the groundwork for discussion of the international grain markets growth by examining the pattern of international grain trade during the last three decades. The third chapter quantifies grain trade in terms of sources of growth: grain production growth, population growth, and changes in the production of other starchy staples. The fourth chapter estimates the effects of income growth on direct and indirect grain demand. The conclusion is presented in chapter five.

CHAPTER 2

THE INTERNATIONAL GRAIN MARKET

Total grain trade increased dramatically in the period 1960-1980, from 66.4 million metric tons (mmt) to 221.9 mmt. Developed countries (DCs) dominated export growth. The United States, Australia, Canada, and France accounted for most of the increases, with the U.S. providing nearly 53 percent of total cereal exports. The share of LDCs in cereal exports declined from 34 percent in 1950 to 13 percent by 1980. Imports, particularly of wheat and rice, have become increasingly directed toward LDCs. DCs cereal imports increased from 23 to 118.4 mmt, while LDCs imports increased from 8.4 to 94.0 mmt during the period 1960-1980.

The grain trade is dominated by government monopolies and quantitative controls. The political objective of subsidized consumer prices in many LDCs and central planned economies (CPEs) has increasingly depended on importation of cereals rather than emphasizing incentives to encourage domestic production. Exporting countries have also demonstrated a substantial degree of government interference in trade. In 1980, for example, the United States government suspended grain sales to USSR in excess of the eight million tons guaranteed under the terms of the 1975 bilateral agreement. The purpose of the embargo was to punish the Soviet Union for its invasion of Afganistan in December, 1979.

Policies that control traded quantities mean that world prices have only limited relevance for most consumers and producers. This relationship is particularly significant for the rice and wheat markets, where world prices equal domestic market prices for only four and eight percent of world consumption of the two grains, respectively. Thus international market behavior becomes a reflection of the conflicts between the policies and objectives of different country governments rather than a direct consequence of the actions of consumers and producers.[2]

The first section of this chapter examines the size of international grain trade during the period 1960-1980. The second section examines the principal commodities in international grain trade, with an emphasis on wheat, maize, and rice. This section describes the size of imports and exports as well as production for each region. The third section discusses market structure and price policies in various importing countries.

The Size of International Grain Trade

The world grain market has been substantially transformed over the last three decades (1950-1980). Total trade volume increased from 41.2 to 211.6 million metric tons, growing more rapidly than trade in most other categories of agricultural products. Data collected by the Food and Agricultural Organization (FAO), for example, indicates that

---

2. Eric A. Monke. International Grain Trade. Tucson: University of Arizona, 1983, p. 21.

agricultural trade doubled during the 1961-80 period, while grain trade volumes more than tripled.

Trade has been concentrated increasingly in the hand of four exporters: the United States, Australia, Canada and France. Developed market economies accounted for 150 mmt of the 170 mmt increase in exports.[3] By 1980 the USA was providing nearly 53 percent of total cereal exports, with Canada, France, and Australia providing an additional 28 percent. The export share of developing market economies declined from 34 percent to 13 percent between 1950 and 1980. Developed countries also dominated the import side of the market, as imports increased from 23 to 118.4 mmt. Developing country importers have become increasingly important. The established markets are represented by U.S.S.R., Japan, and China. The major importing countries of cereal in 1980 are shown below:

Countries	Million Metric Tons
U.S.S.R.	31.1
Japan	24.5
China	17.1
Poland	7.8
Italy	7.6
Mexico	7.2
Brazil	6.7
Egypt	6.4
Spain	6.1

3. Ibid., p. 21.

Figure 1 and Table 1 show the changes in per capita cereal imports from 1960-80 for the largest DC and LDC importers. In per capita terms, world cereal imports increased from 22.9 kgs in 1959-61 to 49.4 kgs in 1979-81. Developed country imports increased from 38.6 to 141.6 kgs, while even larger increases took place in the developed CPEs where imports increased from 21.5 to 132.6 kgs. Most of this increase represents changes in USSR imports. In the LDCs, imports increased from 10.5 to 31.4 kgs per capita. Developing CPEs imports increased from 0.4 to 18.8 kgs, with most of this increase taking place in mainland China (PRC).

Principal Commodities in International Grain Trade

Wheat is the principal commodity in world grain trade, accounting for 60 percent of the total trade volume. Furthermore, wheat is the dominant food commodity exported by the developed countries to the developing countries. In 1960, the DCs accounted for 91 percent of total wheat exports, and in 1980, 95 percent. Among individual regions, Latin America, the USSR and the USA experienced the largest declines in export shares between 1960 and 1980, while the share of Western Europe increased from 5.4 to 14.2 percent. As shown in Tables 2, 3, and 4, wheat import shares of the LDCs increased from 48 to 57 percent, while the share of the DCs decreased from 52 to 43 percent.

Rice remained a minor grain throughout the period, and the share of rice in total cereal trade declined from 10 to 6 percent.

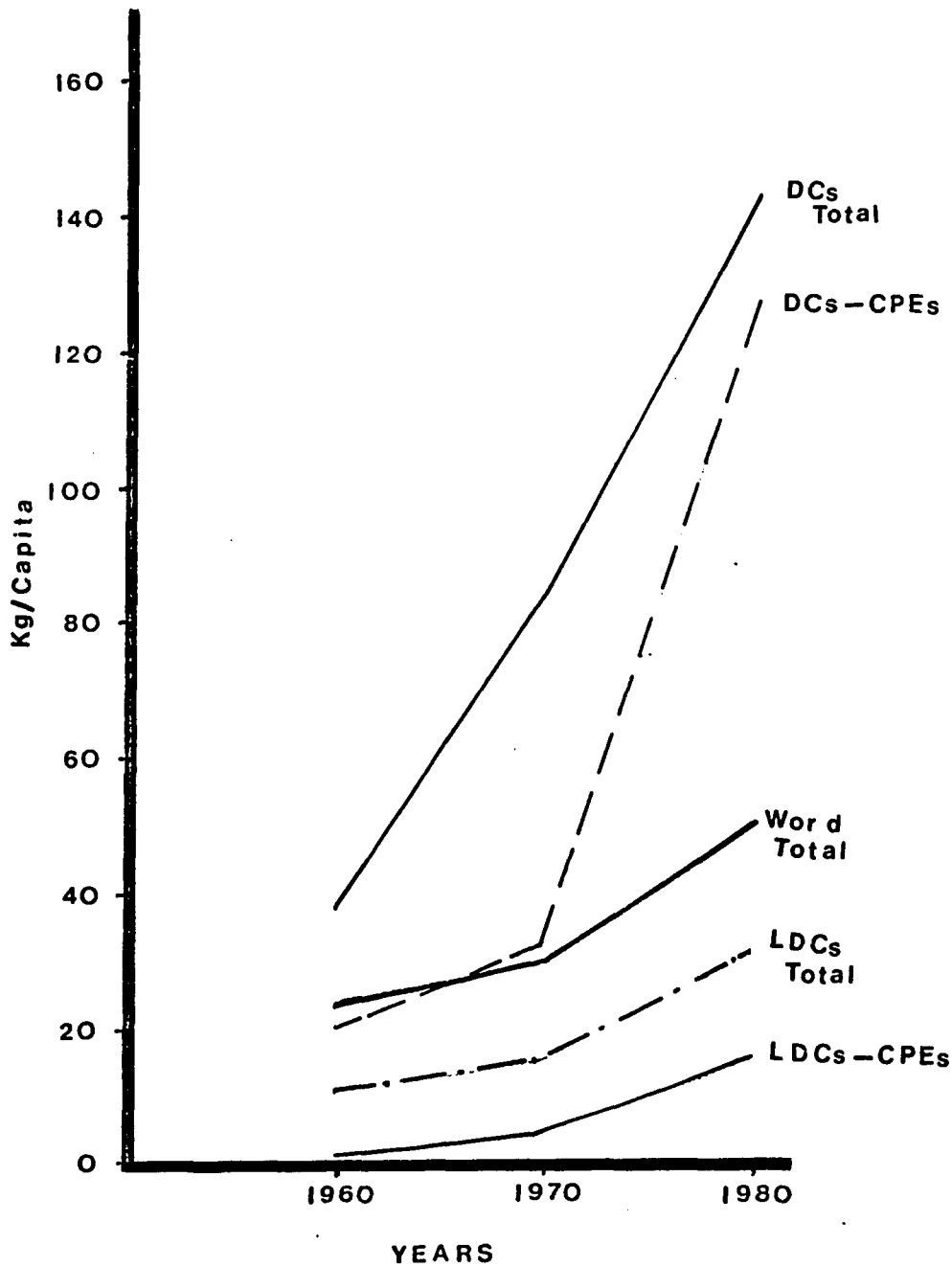

Figure 1. Per Capita Cereal Import by Groups of Countries, 1960, 1970, and 1980

Source: Appendix 6.

TABLE 1

PER CAPITA CEREAL IMPORTS BY GROUPS OF COUNTRIES,

1959-61, 1969-71 AND 1979-81

GROUPS	1959-61	1969-71	1979-81
	(Kgs/capita)[a]		
Developed	38.6	84.8	141.6
CPEs	21.5	30.0	132.6
Market economies	52.8	130.7	149.6
Developing	10.5	15.3	31.4
Low income GNP ($0-699)	6.9	10.8	20.7
CPEs	0.4	7.4	18.8
Market economies	11.9	13.4	22.0
Africa	12.2	17.6	64.1
Asia	11.7	12.1	10.3
Latin America	14.8	18.9	32.8
Middle income GNP ($700-1999	29.5	33.6	79.6
CPEs	71.2	140.2	203.5
Market economies	28.1	30.2	76.2
Africa	28.0	31.8	80.7
Asia	30.8	48.5	108.0
Latin America	27.2	23.8	64.7
High income GNP (> $2000)			
Market economies	99.7	153.8	267.9
Total	18.4	32.3	55.5

Source: See Appendix Table 5.

a. Three year average.

TABLE 2

WHEAT TRADE VOLUMES AND TRADE SHARES, 1960-1980

	Imports				Exports			
	MMT		Shares		MMT		Shares	
	1960	1980	1960	1980	1960	1980	1960	1980
World total	33.2	97.3	--	--	33.2	99.3	--	--
Developed countries	17.2	41.6	52.0	43.0	30.4	93.8	90.0	94.5
Market economies	10.0	20.0	30.0	20.6	24.6	89.6	74.0	90.2
U.S.A.	0.2	0	0	0	13.8	19.8	41.6	19.9
Western Europe	9.8	19.9	29.5	19.5	1.8	14.1	5.4	14.2
U.S.S.R.	0.1	16.0	0	16.5	5.7	2.1	17.2	2.1
Developing countries	16.0	55.6	48.0	57.0	2.8	5.6	10.0	5.5
Market economies	NA	42.4	NA	43.0	NA	5.5	NA	5.5
Near East	2.1	12.2	6.0	12.0	0.05	12.1	0	12.1
Far East	9.0	8.8	27.0	9.0	0	12.3	0	12.3
China	NA	12.0	NA	12.4	NA	0	NA	0
Africa	1.3	9.1	3.0	9.2	0.2	0	0	0
Latin America	3.3	4.6	10.0	4.7	2.5	4.6	7.5	4.6

NA = Not available

Sources: United Nations. FAO, Trade Yearbook, Vols. 17 and 36.

TABLE 3

RICE TRADE VOLUMES AND TRADE SHARES, 1960-1980

	Imports				Exports			
	MMT		Shares		MMT		Shares	
	1960	1980	1960	1980	1960	1980	1960	1980
World trade	6.5	12.8	--	--	5.5	13.0	--	--
Developed countries	1.6	2.6	24.6	11.5	1.2	5.2	21.8	39.2
Market economy	0.6	1.6	9.2	12.3	1.2	5.1	21.8	39.2
U.S.A.	0	0	0	0	0.9	3.1	16.4	23.8
Western Europe	0.6	1.3	9.2	0.1	0.2	0.9	3.6	6.9
U.S.S.R	1.5	0.7	7.7	5.7	NA	0.02	NA	0
Developing countries	4.9	10.2	75.4	78.5	4.3	7.9	78.2	60.8
Market economies	NA	9.6	NA	73.8	4.3	6.2	78.2	47.7
Near East	0.3	1.7	4.6	13.0	0.3	0.3	5.5	2.3
Far East	3.9	4.5	6.0	34.6	3.8	5.3	69.1	40.8
China	NA	0.1	NA	0	NA	1.4	NA	10.8
Africa	0.5	2.2	7.7	16.9	0.04	0.02	0	0
Latin America	0.3	1.1	4.6	8.5	0.1	0.5	1.8	3.8

NA = Not available

Sources: United Nations, FAO, Trade Yearbook, Vols. 17 and 36.

TABLE 4

MAIZE TRADE VOLUMES AND TRADE SHARES, 1960-80

	Imports				Exports			
	MMT		Shares		MMT		Shares	
	1960	1980	1960	1980	1960	1980	1960	1980
World trade	11.9	80.0	--	--	11.4	80.0	--	--
Developed countries	9.5	56.9	79.8	71.6	7.6	74.1	66.7	92.6
Market economy	9.3	38.1	78.2	48.5	6.4	74.0	56.1	92.5
U.S.A.	0	0.02	0	0	5.6	63.2	49.1	79.0
Western Europe	8.9	23.4	74.8	29.3	0.8	5.5	7.0	6.9
U.S.S.R	0.1	10.0	0	12.5	0.1	0.1	8.8	1.3
Developing countries	2.4	22.7	20.2	28.4	3.8	6.2	33.3	7.4
Market economies	NA	18.3	NA	22.9	NA	6.1	NA	7.6
Near East	0.2	3.1	1.7	3.9	0	0.2	0	0
Far East	1.6	3.9	13.4	4.9	0.7	2.3	6.1	2.9
China	NA	4.4	NA	5.5	NA	0.1	NA	0
Africa	0.1	2.4	0	3.0	0.9	0.1	7.9	0
Latin America	0.1	8.9	0	11.1	3.1	3.6	27.2	4.5

NA = Not available

Sources: United Nations, FAO, Trade Yearbook, Vols. 17 and 36.

Although aggregate production is roughly equal among the three grains, only about three percent of rice production enters world trade, while about 20 percent of wheat and maize production is traded.[4] Trade of rice increased from 6.5 to 12.8 mmt between 1960 and 1980. LDCs, as shown in Table 3, dominated the total import of rice; in 1960 import shares were 75.4 percent, while by 1980 the share had increased to 78.5 percent. Asian countries are the dominant importers and account for 10 of the 12 countries which averaged more than 100,000 mt between 1961-1978. Indonesia is the largest importer--by the end of the 1970s, Indonesian imports accounted for 15-20 percent of total trade. In the last decade, Middle Eastern and African importers have become increasingly important, while the participation of India and Vietnam has diminished. Exports in LDCs show a decline by 1980, while the US trade share increased from 21.8 to 39.2 percent.

Maize trade has grown more than seven-fold during the period 1960-80. In the DCs, imports jumped from 9.5 to 56.9 mmt, while exports increased from 7.6 to 74.1 mmt. LDC imports increased from 2.4 to 22.7 mmt and exports nearly doubled. Africa is the only region that shows a decline in maize exports (Table 4); exports declined from 0.9 mmt to 0.1 mmt between 1960 and 1980. LDCs import shares increased from 20.2 to 28.4 percent, while export shares declined from 8.8 to 1.3 percent. Western Europe's shares declined from 74.8 to 29.3 percent and the export share almost the same (7.0 to 6.9 percent). The U.S.A. also increased export shares from 49.1 to 79 percent.

---

4. Ibid., p. 4.

Table 5 shows production and the percentage shares of each region in total production for wheat, rice and maize during 1960 and 1980. The DCs also dominated the world production of wheat and maize. In 1980, the DCs accounted for 66.1 percent of wheat and 62.4 percent of maize production. The developing countries, however, dominate rice production; during 1980 the LDCs accounted for 93.9 percent of world rice production. Latin America increased total production, but not as quickly as other regions. As a result, their percentage shares went down in maize and rice. Africa's percentage also shows a decline in the shares of world production of wheat and maize. Most of the U.S.S.R. is not suited to maize production and attempts to expand maize area have been a disaster. As a result, the U.S.S.R. showed a significant decrease in maize production; between 1960 and 1980 production declined from 18.7 mmt to 9.5 mmt.

Market Structure and Price Policies

Tariffs and Quotas

International food trade has involved political issues as well as economic forces over the years, and trade barriers are an important feature of trade. Perhaps the best known policy change with implications for world markets was the Soviet Union's decision to maintain the program of livestock production started in the mid-1960s. Between 1966-1967 and 1972-73, the Soviet use of wheat for feed increased from 16.2 mmt to 41.2 mmt. In 1972-73, following a major domestic production shortfall, the U.S.S.R. made an unanticipated decision to import grain rather than to increase consumption of stocks. In that year,

TABLE 5

TOTAL PRODUCTION OF WHEAT, RICE AND MAIZE IN 1960 AND 1980

IN MILLION METRIC TONS

	1960			1980		
	Wheat	Rice	Maize	Wheat	Rice	Maize
World total	245.0	239.8	215.9	446.1	399.1	395.1
Developed countries	111.4	4.0	126.0	294.9	24.1	247.6
Market economies	NA	NA	NA	16.7	21.1	216.9
U.S.A.	36.9	2.5	99.3	64.6	6.6	168.6
Western Europe	6.9	1.5	7.6	69.9	1.7	31.2
U.S.S.R.	64.3	0.02	18.7	98.2	2.8	9.5
Developing countries	133.6	235.8	89.9	151.1	375.0	148.4
Market economies	NA	NA	NA	95.3	213.9	82.9
China	31.3	80.0	21.4*	55.2	142.9	62.7
Near East	16.4	2.7	3.6	31.1	4.5	5.6
Far East	16.1	136.6	10.3	44.1	186.9	19.2
Africa	4.1	3.1	11.6	5.3	6.0	12.9
Latin America	7.8	8.1	23.5	14.8	16.4	45.2
	Percent (%) Production					
World total	100.0	100.0	100.0	100.0	100.0	100.0
Developed countries	45.5	1.7	58.4	66.1	6.1	62.4
Market economies	NA	NA	NA	3.7	5.3	54.9
U.S.A.	15.1	1.0	45.9	14.5	1.7	42.7
Western Europe	2.8	0.6	3.5	15.7	0	7.9
U.S.S.R.	26.2	0	8.7	22.0	0	2.4
Developing countries	54.5	98.3	41.6	33.9	93.9	37.6
Market economies	NA	NA	NA	21.4	53.6	20.9
China	12.3	33.5	9.9*	12.4	35.8	15.9
Near East	6.7	1.1	1.7	6.9	1.1	1.4
Far East	6.6	56.9	4.8	9.9	46.8	4.9
Africa	1.7	1.3	5.4	1.2	1.5	3.3
Latin America	3.2	3.4	10.9	3.3	4.1	1.1

SOURCE: UN Production Yearbook, 1963. Vol. 17, p. 35-53
UN Production Yearbook, 1982. Vol. 36, p. 108-115

*For 1957/1958, UN Production Yearbook, 1960. Vol. 14, p. 45

Soviet wheat production was down 12.8 million metric tons from the previous year. When wheat export prices reached their peak in 1973-74, only the Soviets had substantial wheat stocks (72 percent of the world total). As a result, the Soviet wheat stock increased. The Soviet did not export stocks and profit from high prices because it was unwilling to be dependent on the world market in the following year. In 1975-76 the Soviet suffered its worst production shortfall of the observed period and it again turned to world market for compensating imports in spite of the high stock levels in the previous year.

In an effort to solve the political and economic problems of persons other than farmers, food policy in Africa has emphasized peaceful relations between government and their urban constituents and to secure the allegiance of powerful elitists (Bates, 1981). A review of most African countries policies show the tendency to take measures that lead to lower prices for food products. One way to keep food prices low is the maintenance of overvalued exchange rates. For example, Nigerian wheat imports rose dramatically in the late 1970s. One reason, it is noted, was that the price of bread had been fixed since January, 1974--subsequent increases in urban incomes and the strong income elasticity of demand for bread resulted in a steep rise in the demand for wheat. Moreover, at prevailing exchange rates, wheat could be imported much more cheaply than it could be produced locally. Rice policy in Nigeria has followed a similar course, as imports rose by more than 700 percent.

In the Nigerian case, an overvalued exchange rate is consumer-biased. The massive importation of rice and wheat keeps the price of

these and substitute commodities lower than would occur under imports restricted by tariffs or a lower exchange rate. In other LDCs, foreign exchange constraints are a major constraint on grain imports. In many cases, these constraints are only aggravated when a country faces a shortage of foreign exchange, and then shifts land from cash crops into cereal production.

Another policy used to keep domestic food prices low involves banning the export of food crops. In Sudan, for example, in December 1974, the government imposed an export duty of 20 percent on meat and meat products thereby making it unprofitable for domestic producers to sell on the growing Middle East market, and simultaneously lowering the price for domestic consumers.

The particular policy instrument used by the importer is extremely important in determining how a country responds to a shift in world market conditions. With no restrictions on trade, the world price is usually represented by the import price at a country's border, inclusive of international transport costs, while world prices differ from domestic prices when a tariff or quota is in effect. The tariff provides protection for domestic production. As shown in Figure 2A, the world price is lower than the domestic price. With free trade, imports at the world price OPw are shown by the distance Q_1Q_4. Domestic production is OQ_1. Now imagine that tariff equal to PwPt is enacted. In this circumstance the domestic price will rise by the full amount of the tariff. At price OPt, domestic production increases to

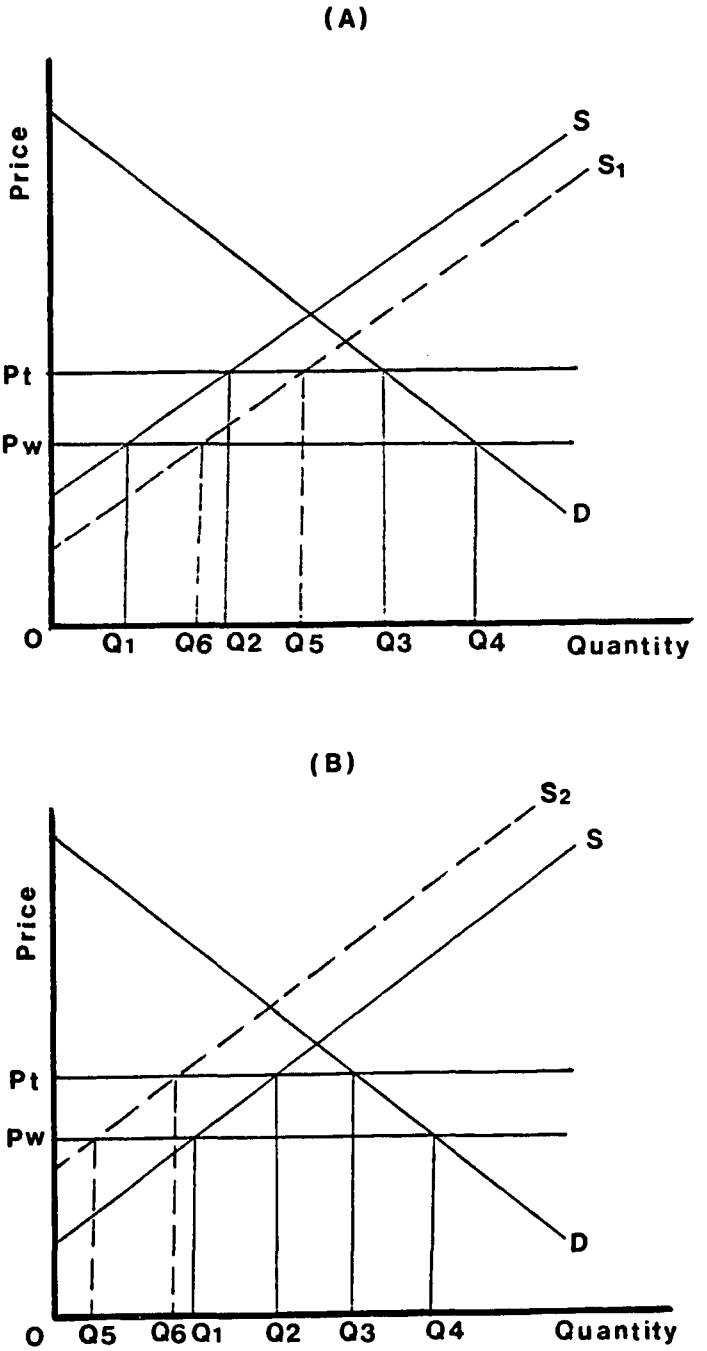

Figure 2. Tariff Policy (Small Country).

OQ_2 and imports decrease to Q_2Q_3. Figure 2A also shows that the higher price after the tariff will lead to reduced consumption, from Q_4 to Q_3.

When the domestic supply increases unexpectedly from S to S_1, as shown in Figure 2A, under the same tariff policy, production increases to OQ_5, but wheat imports are reduced to Q_3Q_5. As a result of this shift of supply the domestic price remains at Pt. The impact of a decrease in domestic supply is as shown in Figure 2B. Under the same tariff policy, domestic production decreases to OQ_6 while the amount of wheat imports increases to Q_3Q_6. The domestic price remains the same, at Pt.

The most prevalent nontariff trade barrier is the import quota, a limit on total quantity of imports allowed in country each year. This quota may be enforced by a government trade monopoly, or by giving out a limited number of licenses to import legally and prohibiting imports without a license. As long as the quantity of imports licensed is less than the quantity that people would want to import without the quota, the quota has the effect not only of cutting the quantity imported but also of driving the domestic price of the good above the world price at which the license holders buy the good abroad.

Figure 3A shows the effect of quota policy on domestic prices when there is an unexpected increase in a country's domestic production. Before the quota, the world price (Pw) encouraged domestic production of OSo, while the country imported a quantity SoDo. With the quota policy, a limit is placed upon the amount of imports of S_1D_1, therefore increasing the domestic price to Pd. Domestic wheat production increases also, to OS_1. This amount of increase in production

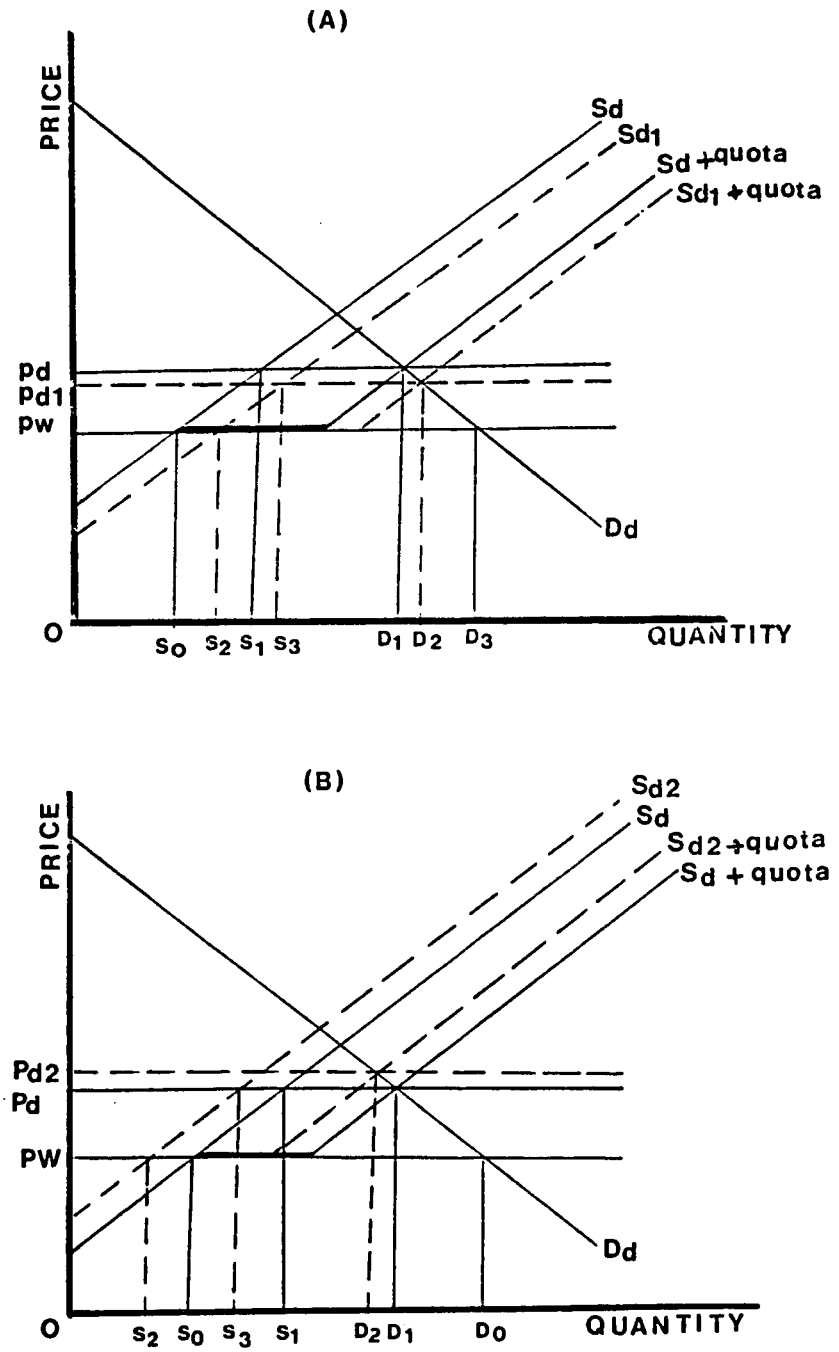

Figure 3. Quota Policy (Small Country).

depends on the elasticity of the supply curve. As the supply curve shows more elasticity, production shows more response to the quota policy.

When wheat supply shows an unexpected increase from Sd to Sd_1, the amount of imports does not change. The quota is indicated in this case by the segment S_3D_2. The domestic price of wheat decreases to Pd_1, production increases to OS_3, while consumption increases from D_1 to D_2. Figure 3B shows the effect of an unexpected short fall in domestic wheat production. The supply curve shifts from (Sd) to (Sd_2). Under the world price, production of wheat decreases to OS_2. Under the effect of the quota (S_3D_1 equals S_1D_1), wheat production declines from OS_1 to OS_3. As a result, the domestic price increases to Pd_2.

This analysis shows that the tariff policy stabilizes the domestic price while the quota policy causes the domestic price to vary as a result of shifts in the domestic supply curve. The effects of domestic production on world markets are larger with the tariff policy than with the quota because the tariff policy does not require that the amount of import be kept constant in the event of variability of domestic production. In addition, the elasticity of demand and the size of the country have a significant impact on the world market effects. In the case of a small country, for example, the impact of production variability on world prices is very small. However, in a large country, when a tariff policy is practiced, the variabilities of production could have significant impact on world price. In the case of the grain trade, large country importers use nontariff policies.

Policies in many high income countries have become increasingly protectionist in recent years; most governments have periodically modified their policies to further insulate the domestic market from major changes in world prices (protection refers to the differential between domestic and foreign prices, and insulation refers to change in the differential caused by changes in the foreign price). This differential can only be changed by compensating changes in trade controls. If a government seeks a target domestic price for grain, then declining world prices would require a higher tariff or export subsidy and increasing world prices would require a lower tariff or a higher export tax. In 1973-74, for example, the U.S. was the only major trading country to refrain from the use of insulating policies. As a result, U.S. domestic grain prices rose much more than they otherwise would have. However, Americans were collectively compensated for accepting greater price instability, since a higher price and a larger volunme of grain exports imply a higher national income.

Conclusion

The international grain market represents one of the fastest growing segments of agricultural trade. Wheat, maize and rice comprise about 85 percent of the total cereal trade and 80 percent of total cereal production for the period 1948-52 through 1979-81. Developed countries dominate the import and export of grain trade, although developing countries showed drastically increased imports during the last decade.

The grain market is the most important agricultural market because there is a close relationship between grain prices and the price of other agricultural products. Grain is important for producing pork, poultry, beef and milk, which makes the market of grain more important to high and low income countries. However, the operation of international grain markets is highly distorted because of the impact of government policies concessional sales, government to government contracts, and export import barriers. Finally, the political decisions in each country and diplomatic relationships between the countries have had a significant impact on grain trade.

CHAPTER 3

SOURCES OF GROWTH IN GRAIN IMPORT

Many factors affect the growth in grain trade. Some of these are related directly to the change in domestic cereal production. Another factor is population growth, which is especially important in less developed countries. The changes in starchy staple production have another effect on grain trade, by substituting for cereal consumption. In addition, there are important variables such as increases in income and changes in consumer preferences. The first section of this chapter estimates the total growth of grain trade in each country and region during the period 1950-1960, 1960-1970, and 1970-1980. Estimates of the impact of population growth, changes in the domestic cereal production, and changes in domestic starchy staple production will be made. The results are analyzed in the chapter's second section. The conclusion is presented in the last section.

Growth in Grain Trade

Methodology

The total growth of the grain trade is estimated from the following equation:

$$TG_{c(t_2-t_1)} = \Sigma\ (M_c^{t2} - M_c^{t1}) \qquad (1)$$

where TG represents the total growth of cereal imports, M_c represents gross imports in $_c$th country and the subscript t refers to the year. This equation is estimated for the periods 1950-60, 1960-70, and 1970-80.

The impact of population growth can be estimated as:

$$TPOP_{c(t_2-t_1)} = \Sigma\ PM_c^{t1}(pop_c^{t2} - pop_c^{t1}) \qquad (2)$$

where $TPOP_{(t_2-t_2)}$ reflects effects of change in population on cereal import demand, PM represents per capita cereal imports, and pop represents population.

Estimates of the effect of domestic production on import demand for cereals are derived from the following equation:

$$TCPROD_{c(t_2-t_1)} = \Sigma\ pop_c^{t1}\ ({}^cQ_c^{st1} - {}^cQ_c^{st2}) \qquad (3)$$

where TCPROD reflects effects of changes in domestic cereal production on import demands; ${}^cQ_c^s$ represents per capita cereal production in the $_c$th country.

Estimates of the impact of changes in the production of non-cereal starchy staples can be calculated in similar fashion:

$$TSSPROD_{c(t_2-t_1)} = \Sigma\ pop_c^{t1}\ ({}^{ss}Q_c^{st1} - {}^{ss}Q_c^{st2}) \qquad (4)$$

where $TSSPROD_{(t_2-t_1)}$ refers to the effects of starchy staple production on import demand during the time period (t_2-t_1) and ${}^{ss}Q^s$ represents adjusted per capita starchy staple production. To estimate the effects of changes in starchy staple production on cereal imports, starchy staples must be converted to a grain equivalent basis. As Table 6

TABLE 6

FOOD COMPOSITION IN TERMS OF THE RETAIL WEIGHT IN 100 GRAMS

	Cereal		Calories/100 Grams
1.	Wheat, medium) whole meal		334
2.	Wheat, hard) or		332
3.	Wheat, soft) flour		333
4.	Rice, husked or brown (only whole removed)		357
5.	Rye, meal or flour		319
6.	Barley, whole seed		332
7.	Oats		385
8.	Maize (corn)		356
9.	Sorghum		343
10.	Total		3091
11.	Average	343.4	
	Starchy Staple		
12.	Potato		70
13.	Sweet potatoes		97
14.	Cassava meal and flour		109
15.	Yautia (Xanthosoma spp)		109
16.	Starchy staple total		385
17.	Starchy staple average	96	

Source: Charlotte Chatfield, Food Composition Tables, FAO, Washington, D.C., U.S.A., 1949, p. 10.

shows, cereals contain about 3.5 times as many calories per unit weight as starchy staples; therefore, starchy staple production is divided by 3.5 to get the cereal production equivalent.

The unexplained residual is the difference between total growth and the sum of the cereal production, population growth, and starchy staple production effects:

$$UN = \Sigma TG - (TCPROD + TPOP + TSSPROD) \qquad (5)$$

where UN represents the unexplained residual of cereal import.

The unexplained residual is the amount of grains left over from the total growth of import after subtraction of the population growth effect, grain production effect, and starchy staple production effect as shown in equation 5.

Total Trade

The data for total cereal trade (Figure 4) demonstrate the rapid growth of cereal imports. Total groups trade increased 3.2 mmt in the 1950-60 period, while increased 105.6 mmt by the 1970-80 period. In addition, trade growth rates were accelerating; in the 1960-70 decade, trade increased more than three times faster than in 1950-60; import growth was more than seven times larger during the period 1970-80. Imports in developed countries grew at a decreasing rate, while those in developing countries grew at an increasing rate. This generalization holds even when the LDCs are subdivided into low income, middle and high income categories. Absolute decreases in total grain imports occurred only in the Asian low income countries and the

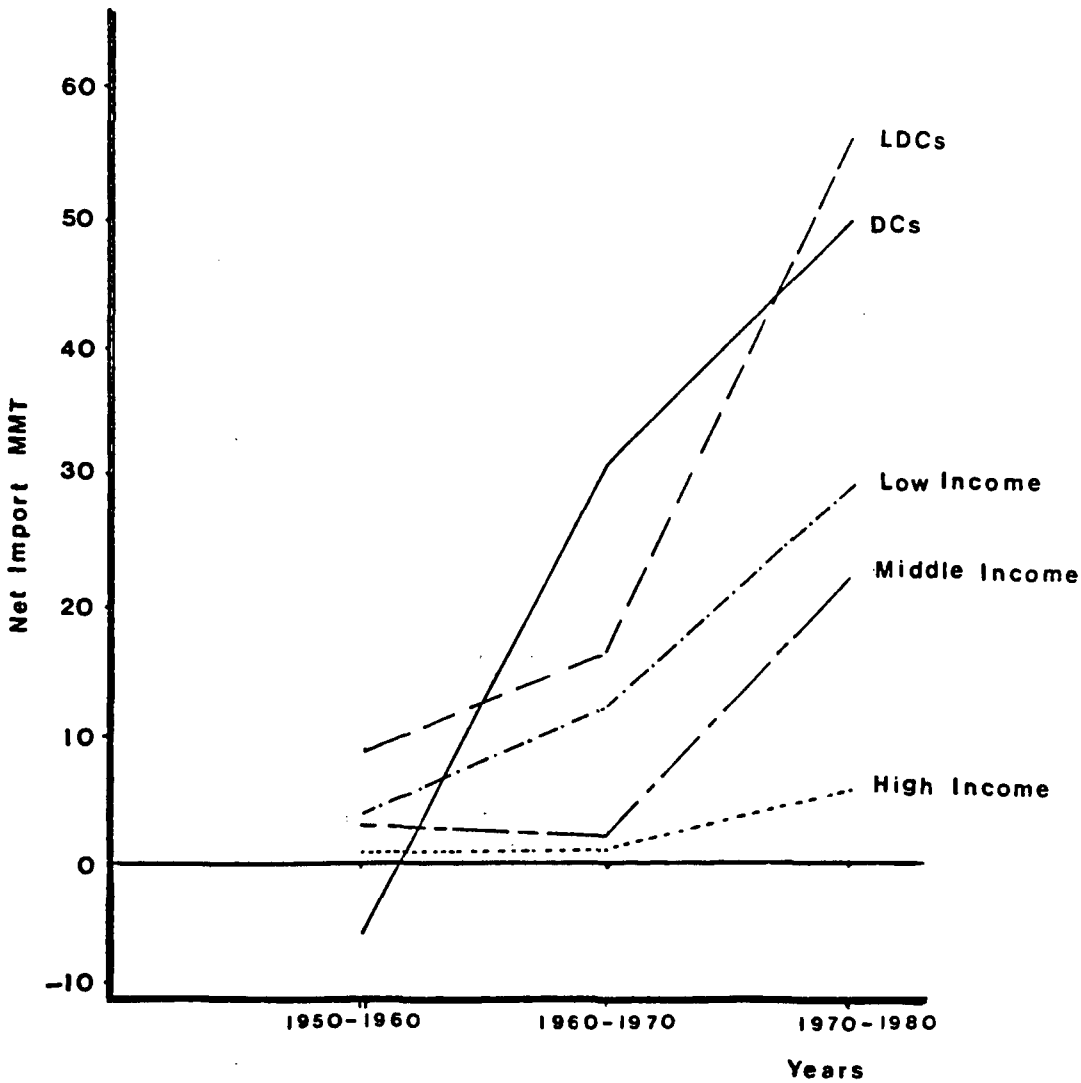

Figure 4. Total Growth of Cereal Imports by Groups of Countries, by Decade, 1950-1980

Source: Appendix 10.

developed market economies. All other country groups showed significant increases.

Population and Grain Imports

Population growth is probably the best understood problem of economic development. According to the demographic transition model, populations are initially stable, characterized by high birth and death rates. As public health measures are introduced, the death rate drops. Birth rates, however, remain at their old level, and a period of population "explosion" begins. Birth rates eventually fall near death rates, and population again approaches a stable but much higher level. This process is illustrated in Figure 5. Most of the DCs have passed through this transition period and appear near the new level of stability--"zero population growth." For these countries, the transition period required between 50 and 100 years. Virtually all LDCs have passed through the stage of declining death rates and are in the interval of still rapid population growth, although birth rates appear to be declining. World population was 4.4 billion in 1980, with a growth rate of approximately 1.8-1.9 percent per year in 1980.

Changes in population have increased cereal imports in both DCs and LDCs, although the effects are more dramatic for the latter group. As shown in Table 8, as a result of population growth, the growth in total grain imports increased more than nine times during the last three decades and more than seven times in LDCs. However, in the market economy of DCs, the rise of imports caused by population growth have almost tripled during the same period. The market economies show

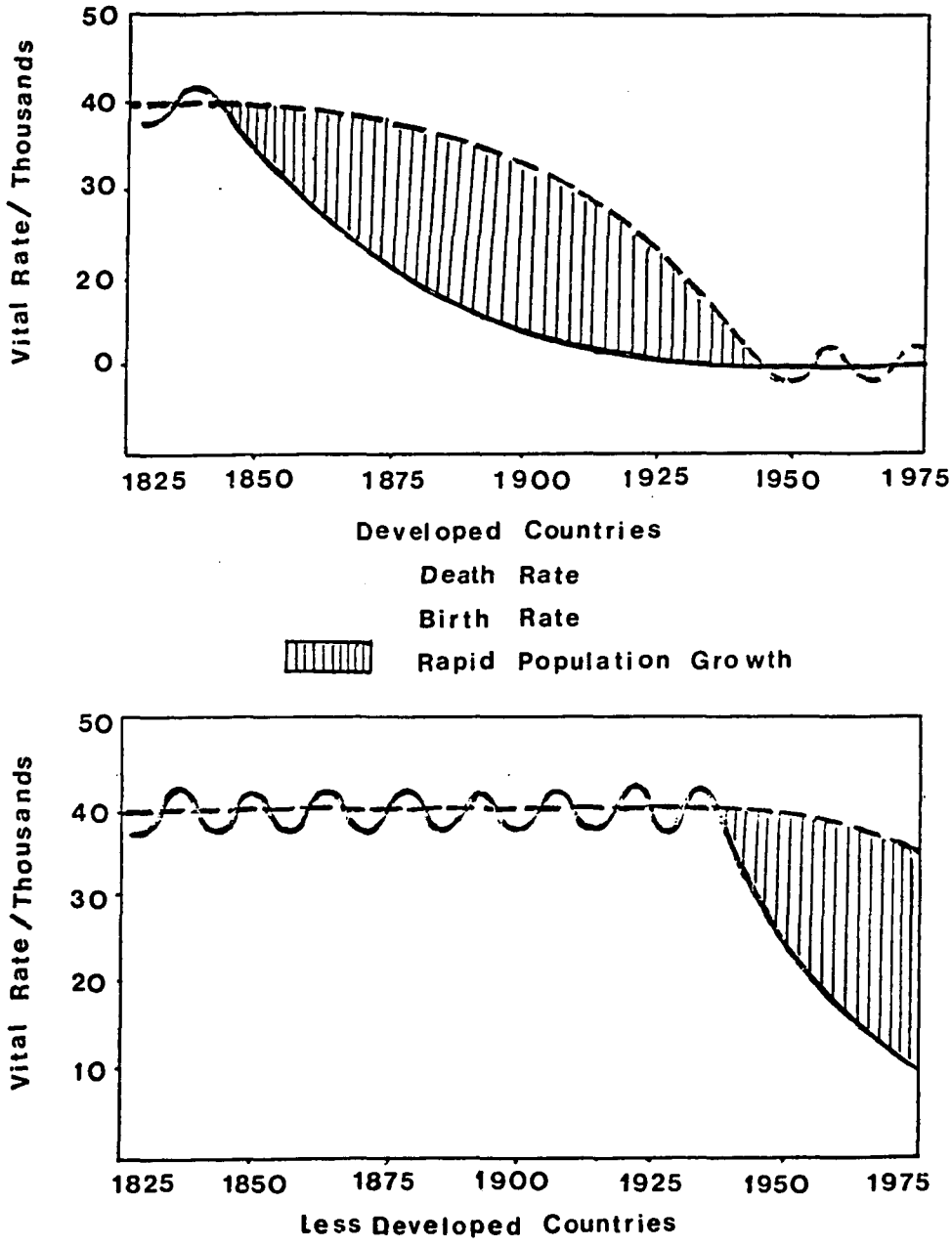

Figure 5. The Demographic Transition Schematized

Note: Rates and years intended to be suggestive.

Source: Thomas T. Poleman, World Food: Myth and Reality World Development, 1977, Great Britain, Vol. 5, pp. 384-394.

TABLE 7

TOTAL GROWTH IN GRAIN IMPORTS BY GROUPS OF COUNTRIES,

BY DECADE, 1950-1980 (IMPORTS-EXPORTS)

Importing Groups	1950-60	1960-70	1970-80
	Million mt by decade		
Developed countries	-5.597	31.266	49.322
CPEs	-0.911	1.921	45.261
Market economy	-4.686	29.345	4.061
Developing countries	8.808	15.634	56.333
Low income	3.811	11.736	28.810
CPEs	-1.784	7.219	12.361
Market economy	5.595	4.517	16.449
Africa	1.080	1.875	16.560
Asia	4.203	2.343	-0.942
Latin America	0.312	0.299	0.831
Middle income	4.368	2.054	22.323
CPEs	0.220	0.715	0.831
Market economy	4.148	1.339	21.492
Africa	0.460	0.715	3.158
Asia	1.480	1.243	5.697
Latin America	2.208	-0.619	12.637
High income			
Market economy	0.629	1.844	5.200
Total groups	3.211	46.900	105.655

Source: Appendix 10.

Note: < 0 means decrease in imports
> 0 means increase in imports

TABLE 8

THE EFFECTS OF CHANGES IN POPULATION

ON CEREAL IMPORTS BY DECADE, 1950-80

Importing Groups	1950-60	1960-70	1970-80
	Million mt by decade		
Developed countries	0.789	3.136	13.373
CPEs	-0.687	-0.608	9.246
Market economy	1.476	3.744	4.127
Developing countries	2.958	8.196	18.985
Low income	1.513	5.674	9.584
CPEs	-0.266	1.288	2.584
Market economy	1.779	4.386	7.000
Africa	0.233	0.715	4.705
Asia	1.482	3.494	1.964
Latin America	0.064	0.177	0.331
Middle income	1.020	1.582	7.159
CPEs	0.091	0.246	0.290
Market economy	0.929	1.336	6.869
Africa	0.060	0.169	1.087
Asia	0.277	0.609	2.056
Latin America	0.592	0.558	3.726
High income			
Market economy	0.425	0.940	2.242
Total groups	3.747	11.332	32.358

Source: Appendix 13.

Note: The numbers represent the increase (+) or decrease (-) in cereal imports due to changes in population. For example, developed countries' imports increased by 789,000 tons during the decade from 1950 to 1960.

a lower population growth effect than the CPEs, in both the developed and developing categories. The gap between the LDCs and the DCs will increase in the future since the LDCs are still in a period of rapid population growth, while the DCs are approaching almost zero population growth.

Domestic Cereal Production and Cereal Imports

Cereal production growth depends on a host of factors, such as availability of uncultivated land, substitution from other crops, expansion of multiple cropping and the availability of yield increasing technology. Expansion of cultivated area was not a dominant factor in increased production growth, since the harvested area of cereals increased by only 25 percent between 1950 and 1980 (595-743 million hectares [ha]). Most of this increase appears due to the substitution of cereals for other crops and an increase in multiple cropping, rather than increased utilization of uncultivated land. FAO data for the 1970-80 period, for example, indicates that the total agricultural cropped area increased by only 28 million hectares, while the harvested area of cereals increased by nearly 70 million hectares.

Yield increases were three times as important as land area expansion in the determination of increased production. Average cereal yields grew from 1.2 to 2.1 mt/ha, with most of the increases occurring since 1960. The principal factors responsible for these increases are well known: increased chemical and fertilizer use (nitrogen fertilizer production, for example, increased from less than five to 60 million

mt), expansion of irrigated areas, and development and dissemination of fertilizer responsive to seed varieties.[5]

However, the global average conceals a substantial diversity in production growth rates, and this diversity among grain importing countries provides a supply-side explanation for the growth in international cereal imports. The results presented in Table 9 show that the decline of per capita production can account for a substantial proportion of the growth in imports in the developed CPEs. This region shows absolute decreases in per capita cereal production of 19.4 kg/capita between 1969-71 and 1979-81. The low income Africa group also shows an absolute decline (31.5 kg/capita) in cereal production during the same period.

China shows substantial fluctuation in per capita production. During recent decades, there were significant increases in cereal imports. In 1950, for example, imports were 0.15 mmt. By 1970, imports had jumped to 5.6 mmt and in 1980 to 17.1 mmt; however, in the 1970-80 period, per capita cereal production increased (see appendix 9). These fluctuations resulted from several factors. The Great Leap years of 1959-61, the Cultural Revolution years of 1967-69, and the Gang of Four years of 1975-77 caused significant economic disruption. In addition to immediate production effects, domestic research capacity may have been badly eroded during the Cultural Revolution, thus causing a significant lag in the development and dissemination of new research

---

5. Ibid., p. 4.

TABLE 9

PER CAPITA CEREAL PRODUCTION BY GROUPS OF COUNTRIES,

1948-52, 1959-61, 1969-71 AND 1979-81

Importing Groups	1948-52	1959-61	1969-71	1979-81
		Kg/capita[a]		
Developed countries	308.8	375.7	454.3	465.8
CPEs	412.1	516.1	619.8	600.5
Market economy	227.8	259.7	314.8	350.1
Developing countries	154.0	209.0	214.0	233.2
Low income	152.1	214.6	215.9	235.4
CPEs	164.0	254.2	241.6	296.7
Market economy	142.8	184.7	196.8	194.1
Africa	143.6	138.2	159.5	128.0
Asia	144.1	199.4	210.1	215.2
Latin America	100.8	99.2	99.4	107.2
Middle income	180.1	182.2	225.1	236.5
CPEs	61.8	83.6	46.4	57.0
Market economy	184.3	185.7	230.7	241.4
Africa	242.7	262.7	276.5	315.1
Asia	196.8	192.8	196.5	205.6
Latin America	164.9	163.9	231.2	236.2
High income				
Market economy	46.0	47.6	54.2	62.2
Total groups	199.7	255.6	273.6	284.1

Source: Appendix 8.

a. Three year average.

results. The effect of these cereal production changes was a fluctuation in imports during the last three decades. In 1950-60, the production effect was -4.4 mmt, in 1960-70, jumped 5.2 mmt, and in 1970-80, -5.0 mmt.

The effect of changes in domestic cereal production on cereal imports were very positive in the developed CPEs in the low income Africa groups, as shown in Table 10. The increases in per capita production were higher in the 1960-70 period than in the 1970-80 period for the DC market economies, Asia CPEs, Africa low income, and Latin America middle income. The Green Revolution effects are most evident for the period 1960-70, reflecting the impacts of new varieties of seeds, chemical fertilizers, machinery and other technological innovations. In total, the cereal production effect was positive but in a decreasing rate; per capita trade effects were 55.9, 18, and 10.5 kg during the periods 1950-60, 1960-70, and 1970-80, respectively.

The Effect of Changes in Domestic Starchy Staple Production on Cereal Imports

Starchy staples (potatoes, cassava, and tubers) are substitutes for direct and indirect cereal consumption. Changes in domestic production of starchy staples can have a significant impact upon cereal imports. A decrease in production of starchy staples and the corresponding increase in the price of starchy staples relative to other grains will shift the demand for cereal outward to the right. Any shortages of cereal grains would be covered by imports. Therefore, it

TABLE 10

THE EFFECT OF CHANGES IN DOMESTIC CEREAL PRODUCTION

ON CEREAL IMPORTS BY DECADE, 1950-80

Importing Groups	1950-60	1960-70	1970-80
	Millions mt by decade		
Developed countries	-32.772	-44.992	-0.242
CPEs	-27.118	-32.211	6.767
Market economy	-5.654	-12.781	-7.009
Developing countries	-68.207	-3.585	-47.080
Low income	-65.350	-0.423	-45.876
CPEs	-53.475	9.105	-49.086
Market economy	-11.875	-9.528	3.210
Africa	0.811	-4.028	7.389
Asia	-12.733	-5.461	-3.887
Latin America	0.047	-0.039	-0.292
Middle income	-2.843	-2.971	-0.948
CPEs	-0.119	0.251	-0.091
Market economy	-2.724	-3.222	-0.857
Africa	0.886	0.045	0.174
Asia	0.140	-0.149	-0.467
Latin America	-3.750	-3.118	-0.564
High income			
Market economy	-0.014	-0.191	-0.256
Total groups	-100.979	-48.577	-47.322

Source: Appendix 11.

Note: The numbers represent the increase (+) or decrease (-) in cereal imports due to change in domestic cereal production. For example, DCs imports decreased by 32.8 mmt during the decade from 1950 to 1960.

is important to consider the production of starchy staples as one of the factors contributing to the growth of grain imports.

The impact of starchy staple production changes on cereal imports is small. Total cultivated areas of roots and tubers in LDCs was only about 35 million hectares in 1980. Total production (measured in cereal equivalents) in LDCs increased from 64.2 to 91.4 million metric tons during the 1960 to 1980 period; in the DCs, production decreased from 75.2 to 51.5 million metric tons (Table 11). In per capita terms, starchy staple production declined in both the DCs and LDCs.

Declines in per capita starchy staple production account for a substantial proportion of the total growth in cereal imports in the DC market economies, the middle income group of Latin America showed 4 mmt, an increase in cereal imports in the 1970-80 period, and the low income Asia countries had 3.4 mmt increase in cereal import in the 1960-70 period. In total, changes in domestic starchy staple production caused an increase in cereal imports from 12.8 mmt at 1960-70 periods to 20.8 mmt by 1970-80 periods (Table 12). Both DCs and LDCs show this tendency (Table 12).

Unexplained Residual of Cereal Imports

The residual is the growth of grain imports that is not explained by the effect of population growth, changes in domestic cereal products, and changes in domestic starchy staple production. Despite an increase in cereal production during the last three decades and decreases in the rate of population growth in the DCs to almost

TABLE 11

STARCHY STAPLE PRODUCTION AND PER CAPITA PRODUCTION EQUIVALENTS IN CEREAL PRODUCTION* BY GROUPS OF COUNTRIES, 1959-61, 1969-71 AND 1979-81

Groups	1959-1961		1969-1971		1979-1981	
	Mmt	Kg/Capita[a]	Mmt	Kg/Capita[a]	Mmt	Kg/Capita[a]
Developed countries	75.2	106.0	61.5	79.0	51.5	61.5
CPEs	44.2	137.7	44.3	124.4	37.5	96.9
Market economy	31.0	79.8	17.2	40.7	14.0	31.1
Developing countries	64.2	35.1	78.2	32.6	91.3	30.5
Low income	55.2	34.4	66.3	31.8	80.7	31.3
CPEs	32.7	47.3	39.8	44.7	44.1	42.5
Market economy	22.5	24.5	26.6	22.1	36.6	23.8
Africa	13.1	73.7	15.7	66.6	18.6	59.3
Asia	8.4	11.8	9.4	10.2	16.1	13.7
Latin America	0.9	35.9	1.4	38.3	1.8	39.9
Middle income	8.8	43.1	11.7	41.5	10.4	27.7
CPEs	0.1	21.9	0.2	18.7	0.3	27.9
Market economy	8.6	43.9	11.5	42.3	10.1	27.7
Africa	0.2	6.4	0.3	6.6	0.4	7.6
Asia	0.3	6.9	0.3	5.9	0.6	7.3
Latin America	8.1	66.0	10.9	62.6	9.0	39.1
High income						
Market economy	0.2	10.1	0.25	7.2	0.3	7.1
Total groups	139.3	54.9	139.8	44.0	142.8	37.3

Source: Appendices 4 and 9.

*Starchy staple production is divided by 3.5.

a. Three year average.

Note: Statistics for the period 1948-52 are not available.

TABLE 12

THE EFFECT OF CHANGES IN DOMESTIC STARCHY STAPLE PRODUCTION ON CEREAL IMPORTS BY DECADE, 1950-1980

Importing Groups	1960-70	1970-80
	Millions mt by decade	
Developed countries	6.085	13.080
CPEs	2.305	9.714
Market economy	3.780	3.366
Developing countries	6.700	7.712
Low income	6.113	3.898
CPEs	1.796	2.331
Market economy	4.317	1.567
Africa	1.004	1.882
Asia	3.394	-0.253
Latin America	-0.081	-0.062
Middle income	0.527	3.802
CPEs	0.023	-0.079
Market economy	0.504	3.881
Africa	0.002	-0.053
Asia	0.035	-0.098
Latin America	0.467	4.032
High income		
Market economy	0.060	0.012
Total groups	12.785	20.792

Source: Appendix 12.

Notes: Statistics for the period 1950-60 were not available.

The numbers represent the increase (+) or decrease (-) in cereal imports due to changes in starchy staple production. For example, Developed Countries imports increased by 6.1 mmt during the decade from 1950 to 1960.

zero, the unexplained residuals remains large. The LDCs also showed a large unexplained residual. During the 1950-60 and 1970-80 periods, these residuals were even higher than in DCs as shown in Figure 6.

Table 13 shows the unexplained residual of countries in this study for the last three decades. Low income market economies show residuals of 15.7 mmt during the 1950-60 period decreasing to 4.7 mmt during 1970-80; CPEs (including China) show a residual of 51.9 mmt in the first period, 4.9 mmt in 1960-70, and an increase in 1970-80 to 56.5 mmt. Most of this fluctuation is due to the cereal production effects in China, Vietnam, and Peoples Republic of Korea (see Appendix 14). Latin America in the middle income groups showed the same level of residuals in the periods 1950-60 and 1970-80, 5.4 mmt, but in the period 1960-70 the residual decreased to 1.5 mmt, because the group in this decade had net exports of grain. The middle and high income groups countries in Asia showed an increase in the residual during these periods. World totals were almost the same in each of the periods.

Conclusion

This analysis shows that the developed countries dominated the per capita growth of grain imports, while the largest rate of increase in imports occurred in the LDCs. Due to the high rate of population growth in LDC, and the low or stable growth in DCs, the effect of population growth on cereal imports were higher in LDCs than in DCs during each of the three decades.

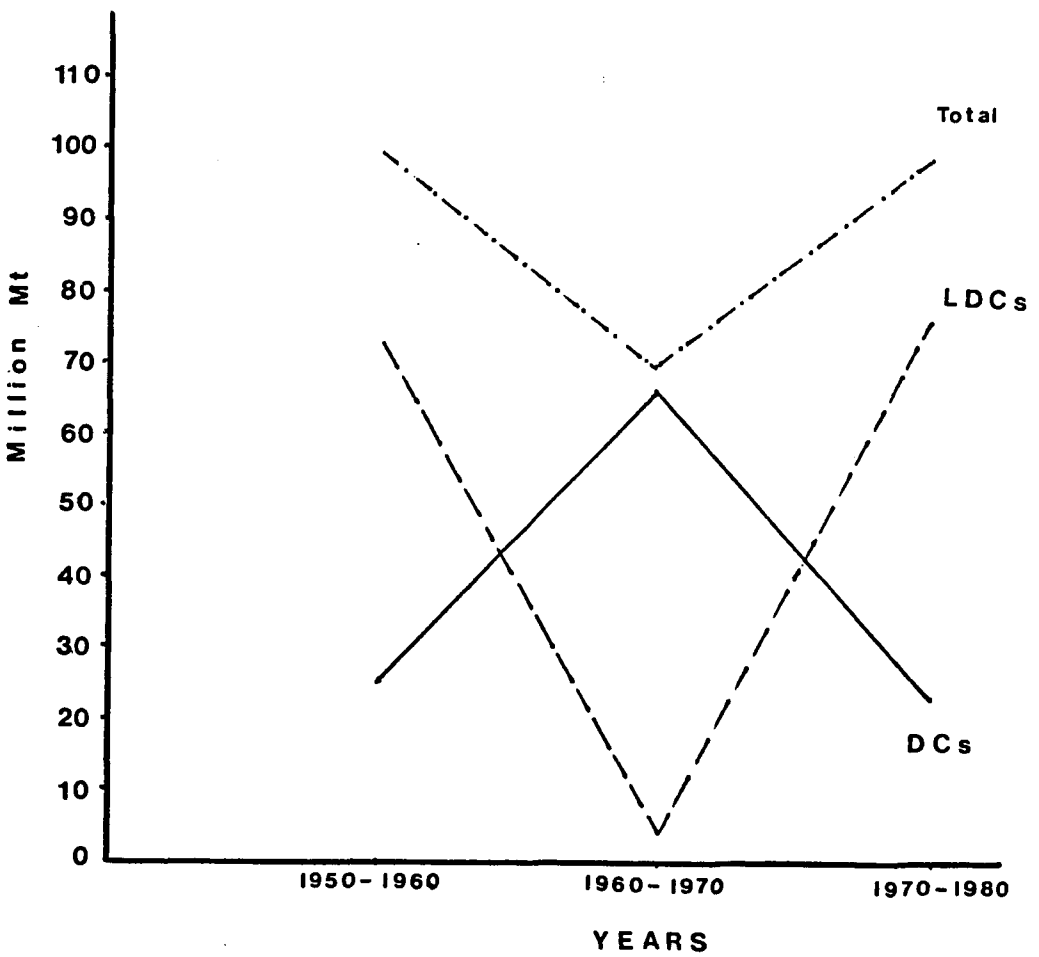

Figure 6. Unexplained Residual of Cereal Imports, by Decade, 1950-1980

Source: Appendix 14.

TABLE 13

THE UNEXPLAINED RESIDUAL OF CEREAL IMPORTS

BY DECADE, 1950-1980

Importing Groups	1950-60	1960-70	1970-80
	(Millions mt by decade)		
Developed countries	26.386	67.037	23.111
CPEs	26.894	32.435	19.534
Market economy	-0.508	34.602	3.577
Developing countries	74.057	4.323	76.716
Low income	67.648	0.372	61.204
CPEs	51.957	-4.970	56.532
Market economy	15.691	5.342	4.672
Africa	0.036	4.184	2.585
Asia	15.454	0.916	1.233
Latin America	0.201	0.242	0.854
Middle income	6.191	2.916	12.310
CPEs	0.248	0.195	0.711
Market economy	5.943	2.721	11.599
Africa	-0.486	0.499	1.950
Asia	1.063	0.748	4.206
Latin America	5.366	1.474	5.443
High income			
Market economy	0.218	1.035	3.202
Total groups	100.443	71.360	99.827

Source: Appendix 14.

Note: Unexplained Residual is the amount of cereal imports which are not explained by population growth, cereal production, and starchy staple production.

The effects of changes in domestic starchy staple production on cereal imports were increasing over time, particularly in the DCs. In the 1970-80 period, for example, the starchy staple effect was 13.4 mmt, while LDCs, induced changes in trade were only 7.7 mmt.

The decline in cereal production had a variable impact on imports, especially in China and the U.S.S.R. during the period 1960-1970. Most of the rest of the DCs and LDCs showed improvement in cereal production which had a significant negative impact on cereal imports during the same period.

As a result, the population growth, cereal production improvement and decline in starchy staple product did not explain very much of the growth in grain imports. The effect of income changes on grain imports during will be discussed in the next chapter.

CHAPTER 4

INCOME GROWTH AND CHANGES IN IMPORT

In global terms, direct human consumption constitutes about half of the demand for all grains. Feed accounts for a third of demand, and industrial uses, seed and waste for the remainder.[6] The relative importance of different uses varies among the individual grains. Only five percent of wheat production is used for feed, while four-fifths is used for human consumption. The proportion of rice production used for feed and industrial purposes is minimal. About a fourth of coarse grain production is used for direct human consumption, three-fifths for feed and the remainder for industrial use, seed and waste.

The relative importance of the direct and indirect uses of each grain also varies greatly from country to country. The developed countries, with about a fifth of the world's population, account for about two-thirds of the grain used for feed. The CPEs, with 35 percent of the world's population, account for about one quarter of grain used for feed. Finally, the LDC's, with 45 percent of the world's population, use only nine percent of their grain supply for animal feed.[7]

---

6. U.S.D.A. "Foreign Agricultural Economic Report," World Prospects for Grain in 1980, No. 75, Washington, D.C., 1971, p. 28.

7. Ibid., p. 28.

These variations can be explained largely by differences in per capita income. At low income levels almost all grain is consumed directly as food. As per capita income increases, diets change to allow higher consumption levels of livestock products. This change in usage translates into a larger proportion of grain fed to livestock (indirect consumption of grain). A study by E. Monke (1983) showed a significant relationship between income level and indirect grain use. Figure 7 shows data for indirect and direct grain consumption. At the lowest income levels, the use of grain feed is zero. "Feed grain use becomes positive at (per capita incomes of) $1,051 and remains fairly small in absolute quantities until per capita income surpasses the $2,000 range. At incomes of about $3,800 indirect demand for grain reaches 185 kgs, roughly equivalent to direct consumption and increases rapidly thereafter. At the highest income level ($9,500), indirect grain consumption is nearly four times as large as direct grain consumption."[8]

This chapter provides further analysis of the impact of income growth on grain imports. Meat and indirect demand for grain is discussed in the next section. Modeling the relationship between income and grain consumption is described in the third section of this chapter. Income elasticities of grain demand (wheat, rice and feed) for each region are estimated from a cross-section, time-series data

---

8. Eric A. Monke. International Grain Trade, Tucson: University of Arizona, 1983, p. 13.

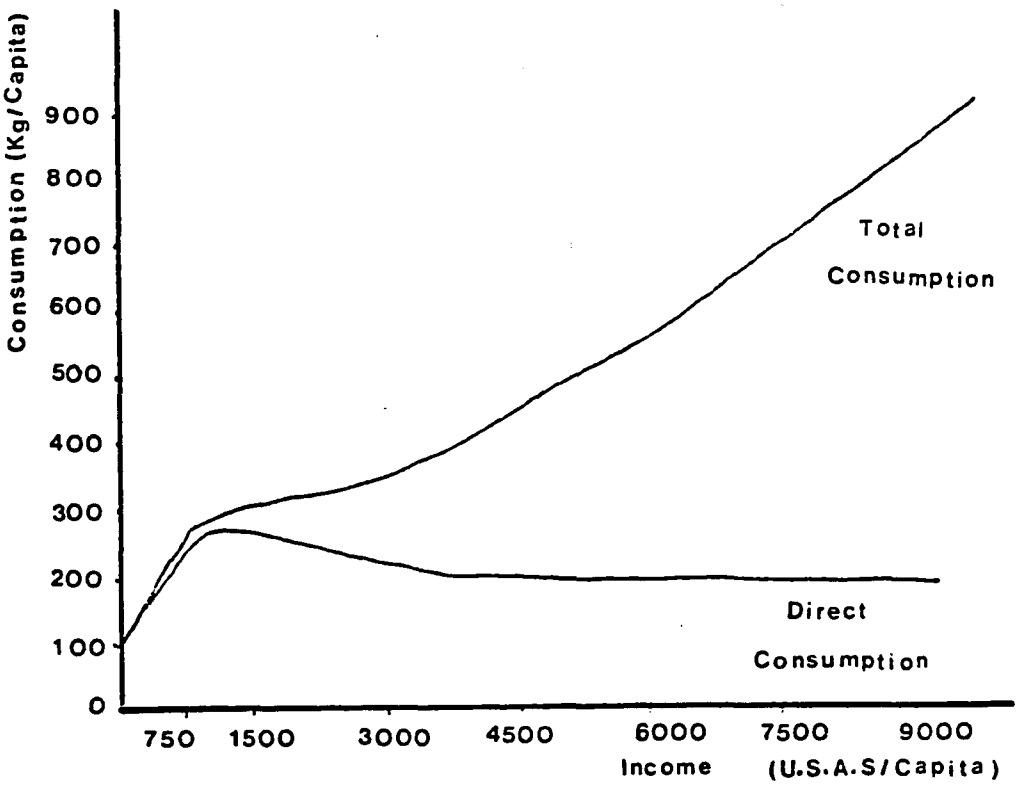

Figure 7. Income and Grain Consumption, 1978

Source: Eric A. Monke, International Grain Trade, 1950-80, The University of Arizona, Tucson, 1983, p. 12.

set. These results are used to estimate the growth in grain consumption caused by income changes during the 1960-1980 period. The fourth section discusses income growth and the demand for grain imports. Conclusions are provided in the last section.

Meat and the Indirect Demand for Grain

By the mid 1970's beef and buffalo meat constituted nearly 50 percent of total meat consumption, pig meat and poultry about 18 percent each. Mutton and goat meat accounted for the remaining 14 percent. Table 14 contains data for per capita meat consumption in 33 countries during 1961, 1970 and 1980. The estimates show that most countries increased consumption of meat and poultry. Per capita meat consumption increased by more than three times in Japan, Greece and Spain. In most CPE countries, per capita meat consumption almost doubled during the same period. In some LDC's, however, per capita consumption of meat declined. This was true in Chile, Peru, and the Philippines from 1970 to 1980.

During the past two decades, growth in aggregate consumption of livestock products was most rapid in eggs, followed by meat and milk. The average annual growth rates were 5.5 percent for eggs, 3.2 percent for meat and 2.6 percent for milk.[9] In the developing countries, demand has been strong but constrained by income levels as well as the availability of livestock products and high prices. In contrast, the

---

9. J. S. Sarma and Patrick Young. Livestock Products in the Third World: Past Trends and Projections to 1990 and 2000, Washington, D.C.: International Food Policy Research Institute, 1985, 49:30.

TABLE 14

PER CAPITA TOTAL MEAT CONSUMPTION IN KILOGRAMS

Countries Groups	Per Capita Total Meat Consumption		
	1961	1970	1980
Developed Countries			
CPE's			
1. Bulgaria	26.7	42.0	64.5
2. Czechoslovakia	45.6	61.2	76.0
3. Germany DR	46.5	59.1	85.6
4. Poland	35.3	45.3	68.6
5. Yugoslavia	22.8	34.9	54.1
6. USSR	28.5	42.5	58.3
Market Economy			
7. Japan	4.7	18.0	31.6
8. Belgium-Luxemburg	48.4	70.6	86.2
9. Denmark	60.3	66.4	79.3
10. France	57.7	74.8	92.0
11. Finland	32.8	43.6	57.8
12. Germany FR	52.0	72.2	85.5
13. Ireland	49.6	70.9	80.2
14. Italy	24.2	51.8	65.9
15. Netherlands	42.8	54.6	69.7
16. Norway	35.0	39.0	51.6
17. Greece	20.8	46.9	63.0
18. Portugal	18.2	30.3	41.4
19. Spain	18.2	46.1	62.0
20. Switzerland	50.6	68.9	84.8
21. UK	64.6	74.1	71.9
Developing Countries			
Latin America			
22. Costa Rica	15.1	16.1	19.8
23. Dominican Rep.	9.5	9.3	10.2
24. Mexico	15.1	18.2	28.8
25. Panama	23.4	27.1	29.3
26. Brazil	24.9	27.8	35.1
27. Chile	25.8	31.9	23.0
29. Colombia	23.8	24.1	27.2
30. Venezuela	21.2	30.9	44.9
31. Peru	15.3	19.0	14.8
Asia			
32. Iran	8.2	9.3	--
33. Philippines	9.8	12.3	11.4
Africa			
34. South Africa	32.0	37.1	38.8

Sources: USDA Foreign Agricultural Service. "Livestock and Meat," Foreign Agricultural Circular, FLM 7-78, Washington, D.C., August 1978, p. 17 and 18. USDA Foreign Agricultural Service. "Livestock and Meat," Foreign Agricultural Circular, FLM 5-81, Washington, D.C., July 1981, p. 8.

growth in demand for animal products in developed countries has slowed down and, on occasion, consumption has even declined. Throughout this period growth in consumption has exceeded that of production in developing countries. The deficit has been met by imports.

Figure 8 shows the growth in consumption of animal products in developed and developing countries during the 1970-80 period. North Africa and the Middle East had the fastest growth rate of meat consumption at 4.1 percent, whereas Latin America's growth rate of 3.4 percent was the highest for milk. The egg utilization in North Africa, Middle East and Latin America rose faster than aggregate consumption for all the 104 study countries. The same study showed per capita consumption of beef and veal had declined during 1961-1979 in most of Central and South America, because of balance of payment problems, high inflation and unstable development policies.

Regier's study indicated that as meat consumption increases with income, the use of grain for feed increases as well. Grain-meat ratios were 4.95 kg of grain to one kg of meat in the developed areas, 3.6 kg in the CPEs and 1.3 kg in the LDCs. The world average ratio was estimated in 1962 at 3.55 kg, and in 1980 at 4.25 kg. The highest ratios were in Bulgaria, Yugoslavia and Hungary (9.75, 8.64, and 7.49 kg, respectively). These countries are relatively large grain producers with relatively inefficient livestock sectors. In Canada, the U.S. and the Western European countries, the ratios in 1980 were 6.94,

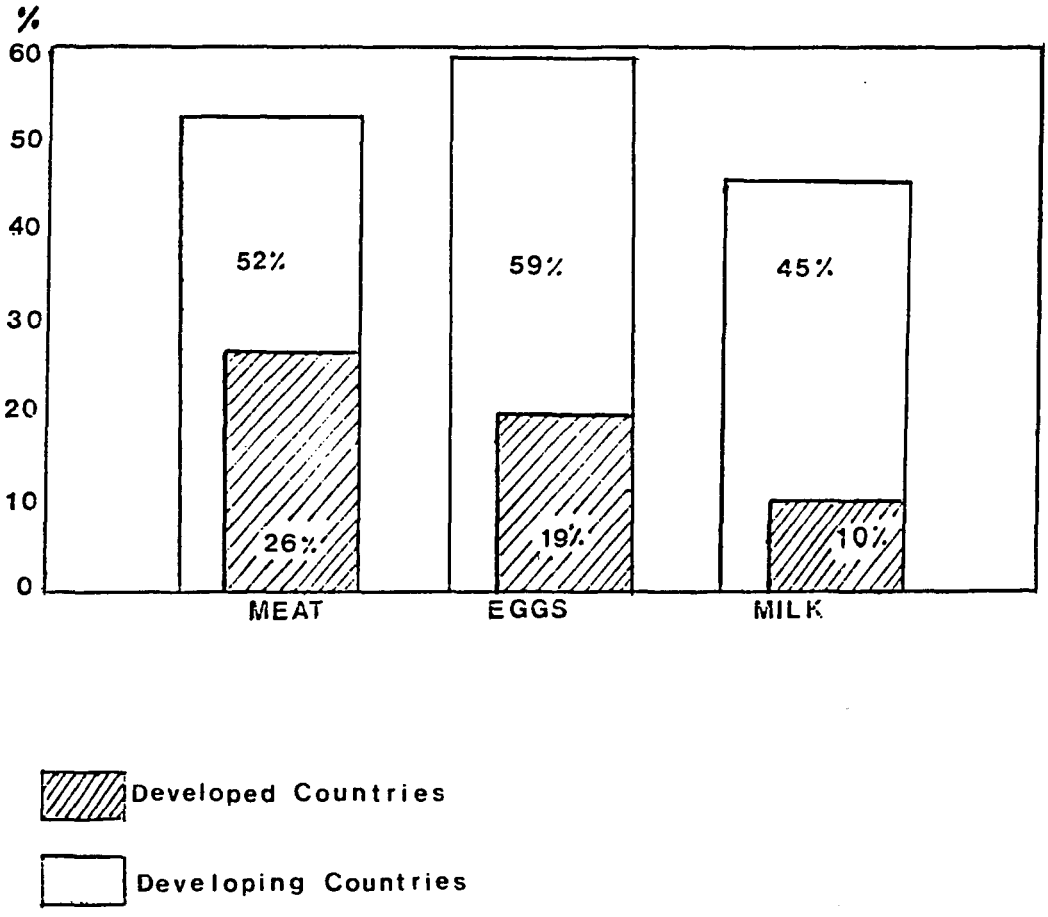

Figure 8. Growth in Consumption of Animal Products, 1970 to 1980

Source: FAO, The State of Food and Agriculture, 1980, p. 93.

5.55, and 4.11 kg, respectively. The smallest ratio was 0.14 kg in West Africa.[10]

The income elasticity of demand is the most important factor influencing the domestic utilization of livestock products. A study by J. S. Sarma and Patrick Young (1985) of 104 countries shows that income elasticities of demand for meats, milk and eggs are higher among LDC consumers than among DC consumers. Their results are summarized in Table 15.

In developing countries, price controls on animal products have promoted growth in consumption, but the principal factor stimulating consumption of poultry meat, eggs, and pig meat has been the decrease in their prices relative to other livestock products, reflecting the technical progress in poultry and pig farming. A recent study of Brazil, Chile and Colombia, for example, showed that in all three countries the prices for poultry meat and eggs fell in real terms during the 1970's whereas prices for beef and cow milk rose.[11]

Modeling the Relationship between Income and Grain Consumption

Demand for grain = Direct demand + Indirect demand

Direct demand is represented by

$$Q^{D}_{grain} = f_1 (P_{grain}, P_{substitutes}, Y) \qquad (6)$$

---

10. U.S.D.A. "Foreign Agricultural Economic Report," Growth in World Demand for Feed Grains No. 63, Washington, D.C., 1970, p. 131.

11. FAO. "The State of Food and Agriculture," World Review, Livestock Production: A World Prospective, FAO, Rome, 1982, pp. 93-94.

TABLE 15

INCOME ELASTICITIES OF DEMAND FOR LIVESTOCK PRODUCTS, 1975

Country Group/Region	Meat	Milk	Eggs
Developed Countries	0.25	-0.05	0.27
Developing Countries	0.63	0.57	1.00
Africa	0.79	0.68	1.05
Asia and Far East	0.97	0.52	1.07
Near East	0.72	0.53	0.83
Latin America	0.37	0.49	0.60

Source: J. S. Sarma and Patrick Young, Livestock Products in the Third World: Past Trends and Projections to 1990 and 2000, International Food Policy Research Institute, Research Report 49, Washington, D.C., 1985, p. 75.

The evaluation of indirect demand is more complicated because the demand for grain is determined by the demand for meat (and livestock products). To derive the indirect demand for grain, we must begin with the demand and supply of meat:

$$Q^D_{meat} = f_2\ (P_{meat},\ P_{substitutes},\ Y) \tag{7}$$

$$Q^S_{meat} = g_1\ (Q_{feed},\ Q_{non\text{-}feed}) \tag{8}$$

In market equilibrium, demand equals supply

$$Q^D_{meat} = Q^S_{meat} \tag{9}$$

$$\text{or } f_2\ (P_{meat},\ P_{substitutes},\ Y) = g_1\ (Q_{feed},\ Q_{nonfeed}) \tag{10}$$

Rearranging (and assuming that the implicit function rule applies)

$$Q_{feed} = h\ (P_{meat},\ P_{substitutes},\ Q_{nonfeed},\ Y) \tag{11}$$

This latter function represents the indirect demand for grain; it depends on the prices of final product (meat) and substitutes, the relative prices of feed and nonfeed inputs (these determine $Q_{nonfeed}$), and on consumer income.

Equations for wheat and rice demand represent direct consumption only; the indirect grain consumption equation includes corn, wheat used for feed, and other coarse grains. Prices were not available for the analysis of wheat and rice demand. Both producer and consumer prices in CPEs, LDCs and other DCs are under government control, and price information for each country is often limited or poor in quality. World prices for feed grains are less subject to this problem, partly because the principal markets for feeds are in DCs, which interfere with prices to a lesser extent. As a result, the empirical tests are limited to estimation of income-quantity relationships. So long as income is uncorrelated with the missing independent

variables, no bias results in the estimated regression coefficients. The data base for the analysis of equations (6) and (11) is generally the 1960-70 and 1970-80 period.

Various functional forms were tried, including square root, semi-logarithmic, straight linear, double logarithmic and quadratic. Most of these models did not explain the relationship of demand to income and price. High standard errors, low F values, low adjusted R^2 and theoretically incorrect signs to the coefficient are indicators of poor fits. The best estimates were provided by the double logarithmic form.

Income elasticities of demand for wheat, rice and feed were estimated from the following equations:

$$\ln Q_w = \alpha + B_1 (\ln PY) + \sum_{i=2}^{11} Bi [(\ln PY) D_1] \quad (12)$$

$$\ln Qf = \gamma + \emptyset_1 (\ln PY) + \sum_{i=2}^{11} \emptyset_i [(\ln PY) D_1] + \emptyset_{11} \ln Pf \quad (13)$$

$$\ln Qr = R + r_1 (LnPY) + \sum_{i=2}^{11} ri[(\ln PY)D_1] \quad (14)$$

LnQw, lnQf, and lnQr are logarithms of per capita consumption of wheat, feed and rice consumption, respectively. α, γ, R are the intercepts of wheat, feed and rice consumption, respectively. LnPY is a logarithm of per capita income; D is a dummy variable used to capture differences in slope parameters for different countries group relative to developed CPEs, holding intercept fixed.[12] i is a region subscript; Pf is a world feed price.

B_1, $\emptyset_1$, r_1 are the income elasticities of wheat, feed and rice demand of the CPEs developed countries; B_i, $\emptyset_i$, r_i are the differences between the income elasticity of the CPE developed countries and the other groups. The actual income elasticities of demand for regions 2-10 can be estimated as:

$$\eta_w^i = B_1 + B_i \tag{15}$$

$$\eta_f^i = \emptyset_1 + \emptyset_i \tag{16}$$

$$\eta_R^i = R_1 + R_i \tag{17}$$

The value of ^{i} is the income elasticity of demand for each country group.

The equations succeed in explaining a substantial proportion of the variation in grain consumption. The adjusted R^2 for wheat, rice, and feed demand are 0.60, 0.52 and 0.58, respectively. Table 16 contains the estimated coefficients $\hat{\beta}$, $\hat{r}$, $\hat{\emptyset}$, and their corresponding t-statistics for wheat, rice and feed. This t-statistic is used to test the null hypothesis that the individual coefficient is equal to zero, and thus indicates significant differences in the slope parameters between country groups.

For wheat, there is no significant difference in slope coefficient of income between the CPEs and the DC market economies. However, there is a significant difference in the slope parameter between the CPEs and the LDC country groups, with the exception of Africa's middle income group. In the rice market, the slope parameter for LDCs is

---

12. Kementa, Jan. Elements of Econometrics, New York: Macmillan Publishing Co., Inc., 1971.

TABLE 16

THE ESTIMATION RESULTS: COEFFICIENTS, t-STATISTICS, AND $\bar{R}^2$ VALUES

	Wheat		Rice		Feed	
Groups	Coefficient $\hat{\beta}$	t-stat.	Coefficient $\hat{\gamma}$	t-stat.	Coefficient $\hat{\phi}$	t-stat.
Developed Countries						
CPEs	0.304	2.91	-0.112	-0.71	0.607	3.36
Market economy	-0.110	-0.339	0.354	0.99	0.023	0.420
Developing Countries						
Low income						
CPEs	-0.357	-6.62	0.964	2.03	-0.327	-3.84
Market economy						
Africa	-0.167	-2.9	2.437	4.77	-0.269	-2.82
Asia	-0.235	-4.31	1.298	2.50	-0.105	-1.17
Latin America	0.338	4.27	9.037	6.83	[a]	[a]
Middle income						
Market economy						
Africa	-0.049	-1.07	1.853	4.09	-0.102	-1.36
Asia	-0.139	-3.35	1.491	3.60	-0.061	-0.89
Latin America	-0.128	-3.10	1.800	3.94	-0.094	-1.39
High income						
Market economy	a	a	a	a	-0.069	-2.49
Price					-2.033	-2.913
$\bar{R}^2$	0.60		0.52		0.58	

Source: Author's calculations.

a. Was not entered into the stepwise regression due to the low level of significance.

significantly different from the slope of CPEs. However, the high income and market economies show no differences in slope parameter. Feed demand shows the same pattern as rice in the DCs. Middle and high income groups show no differences in the slope parameters. The Asian low income group is significantly different.

Income Growth and the Demand for Grain Imports

The direct and indirect human consumption of grain is related to per capita income; as the per capita income rises from a relatively low level, direct human consumption of grain will increase, but beyond a certain income level it will decline to a lower level and therefore remain relatively stable. However, the demand for indirect consumption rises as income grows.

Table 17 contains the estimated income elasticities of demand for wheat, rice, and feed. The income elasticities of demand for wheat are less than one in all groups. Developed market economies and CPEs have elasticities of 0.194 and 0.304, respectively. The highest income elasticities in all groups is 0.64 for the low income group in Latin America. Low and middle income Asian countries have elasticities of 0.069 and 0.165, respectively.

The income elasticities of direct demand for rice show relatively higher values than for wheat and feed, especially in low income LDCs. In DCs and in the high income groups in LDCs, however, it shows a significantly lower level of elasticities. The only unusual result is for low income Latin American countries (8.9), but rice in these countries is a relatively unimportant staple food. In the low and

TABLE 17

INCOME ELASTICITIES IN THE COUNTRY GROUPS

Groups	Wheat	Rice	Feed
Developed Countries			
CPE's	0.304	-0.112	0.607
Market Economy	0.194	0.242	0.630
Developing Countries			
Low Income			
CPE's	-0.033	0.852	0.280
Market Economy			
Africa	0.137	2.325	0.348
Asia	0.069	1.186	0.502
Latin America	0.642	8.925	0.607
Middle Income			
Market Economy			
Africa	0.255	1.788	0.505
Asia	0.165	1.379	0.546
Latin America	1.176	1.688	0.513
High Income			
Market Economy	0.304	-0.112	0.548

Source: Author's calculations.

middle income groups, income elasticities of rice demand are positive and more than one for all groups. African and Latin American countries show higher elasticities than Asia.

The income elasticities of demand for feed are positive in all groups and less than one, but higher than the values for wheat consumption. The DCs and the high income LDCs have higher income elasticities of demand for feed than for wheat and rice consumption. In most of the LDCs groups, however, feed shows relatively lower elasticities than rice.

In order to calculate the impact of income growth on cereal imports, income elasticities are used to estimate total consumption growth:

$$Z_{cw} = (\% \ \Delta \ PY_c) \cdot (\eta) \tag{4}$$

$$X_{cw} = (TC_{wc}^{1960}) \cdot (Zcw^{1960-70}) \tag{5}$$

Z_{cw} is the percentage change in consumption of wheat caused by income growth in country (C) in the 1960-70 period; PY_c is the per capita income in country (C); X_{cw} is the total increase in consumption of wheat in country (C) caused by income growth in 1960-70 in metric tons. TC_{wc}^{1960} is a total consumption of wheat in country (C) during 1960. Similar calculations are made for the 1970-80 period, and for rice and feed consumption.

Estimates of the total growth in grain consumption are calculated as follows:

$$TIC_{gc}^{(1960-1970)} = X_{cw} + X_{cr} + X_{cf} \tag{6}$$

TIC_{gc} is a total growth in consumption of grain for country (C) caused by income growth between the 1960-70 period in metric tons. Similar calculations are followed for the 1970-80 period.

Table 18 and Appendix 19 show the consumption growth of wheat, rice and feed for each region and country. Developed countries showed similar changes in growth of grain consumption at 1960-70 and 1970-80. In the first period, income growth caused a 52.3 mmt increase in consumption; in the second decade, income growth caused an increase of 49.3 mmt. The USSR, Yugoslavia and Poland showed the largest growth in grain consumption among the CPE's; Japan, Germany, Italy, Spain and United Kingdom showed the greatest growth in grain consumption among the market economies. These results indicate that the income effect on grain consumption has emphasized indirect consumption, especially in the market economies, where feed consumption increased six times more than the direct consumption of wheat and rice.

Developing countries showed a higher growth in consumption in 1970-1980 than in 1960-1970. Bangladesh, India, Indonesia, Korea Rep., and Madagascar had the highest level of growth in consumption. Most of this growth reflected increased direct grain consumption. Asia, in the low income regions, showed higher growth in rice consumption than in wheat and feed in the last two decades. This indicates that the lower income countries are still demanding more grain for direct consumption as incomes increase. The total for all regions shows a greater income-induced increase in grain consumption in 1960-1970 than in 1970-1980.

In order to estimate the residual left over of cereal import it is necessary to subtract the unexplained residual in Chapter 3 from the

TABLE 18

EFFECTS OF INCOME CHANGES ON GRAIN IMPORTS, BY DECADE, 1960-80

Groups	1960-1970				1970-1980			
	Wheat	Rice	Feed	Total	Wheat	Rice	Feed	Total
	(million metric tons by decade)							
Developed Countries	17.907	4.779	29.568	52.254	20.277	1.208	27.766	49.251
CPE's	13.431	-0.046	8.147	21.532	18.179	-0.096	10.443	28.526
Market Economy	4.476	4.825	21.421	30.722	2.098	1.304	17.323	20.725
Developing Countries	3.324	29.608	-1.567	31.365	2.721	53.029	-4.273	51.477
Low Income	-0.334	25.047	0.374	25.800	0.767	45.919	1.104	47.790
CPE's	-0.334	1.275	-0-	0.941	-0.465	1.547	-0-	1.082
Market Economy	0.713	23.772	0.374	24.859	1.232	44.372	1.104	46.708
Africa	0.110	1.335	0.008	1.473	0.468	6.804	0.237	7.509
Asia	0.518	21.980	0.262	22.760	0.586	35.212	0.732	36.530
Latin America	0.085	0.437	0.104	0.626	0.178	2.356	0.135	2.669
Middle Income	2.568	4.657	-1.936	5.289	1.417	7.322	-5.441	3.298
CPE's	--	--	--	--	--	--	--	--
Market Economy	2.568	4.657	-1.936	5.289	1.417	7.322	-5.441	3.298
Africa	1.619	0.060	0.019	1.698	0.425	0.012	0.041	0.478
Asia	0.579	1.712	0.315	2.606	0.402	1.538	0.128	2.068
Latin America	0.370	2.885	-2.270	0.985	0.590	5.772	-5.610	0.752
High Income								
Market Economy	0.377	-0.096	-0.005	0.276	0.537	-0.212	0.0064	0.389
TOTAL GROUPS	21.231	34.387	28.001	83.619	22.998	54.237	23.493	100.728

Source: Appendix 19.

Note: The numbers represent the increase (+) or decrease (-) in grain imports due to changes in income. For example, DCs imports increased by 17.9 mmt during the decade from 1960 to 1970

income effect. Table 19 shows the aggregate total income effect on grain consumption and the resulting unexplained residual left over of cereal import. A positive residual means that imports grew by more than the income effect. Factors additional to those considered in this study must be important to the growth in trade. Prices and changes in tastes appear to be the most likely candidates. When negative, the residuals suggest that imports were not allowed to grow by the full magnitude of the income effect. This circumstance occurs when governments artificially limit imports for reasons such as deficits in the balance of payments or policies that increased prices.

In 1970-1980, the aggregate data shows almost no unexplained residual which might suggest that all the growth of grain net trade is explained by grain production, population, substitution and income and income growth. However, examination of the individual country group data shows that such a conclusion is misleading. In 1960-1970, the DCs have a positive residual of 14.8 mmt, while the LDCs have a residual of -27.0 mmt. Most of this residual was from low income Asian countries (-21.8 mmt). The residuals left over in the other LDC groups were small, between -2 mm and zero. In 1970-80, the developed market economy and CPE groups had negative residuals of -17.1 and -8.9 mmt, respectively. The LDCs, however, had a positive residual of 25.2 mmt. The residual in Asia's low income groups was again negative, -35.3 mmt. Africa, Asia, and Latin America in the middle income groups have small residuals, between one and two mmt.

Among individual countries (see Appendix 10) the USSR, German D. Rep. and Bulgaria had the highest positive residual in the CPE

TABLE 19

AGGREGATE RESULT OF INCOME EFFECT AND RESIDUAL LEFT OVER,

BY DECADE, 1960-1980
(mmt)

Groups	1960-1970		1970-1980	
	Income Effect	Residual Left Over	Income Effect	Residual Left Over
Developed Countries	52.254	14.783	49.251	-26.114
CPEs	21.532	10.903	28.526	-8.992
Market economy	30.722	3.88	20.725	-17.148
Developing Countries	31.365	-27.042	51.477	25.239
Low income	25.800	-25.428	47.790	13.414
CPEs	0.941	-5.911	1.082	55.450
Market economy	24.859	-19.519	46.708	-42.036
Africa	1.473	2.711	7.509	-4.924
Asia	22.760	-21.844	36.530	-35.297
Latin America	0.626	-0.384	2.669	-1.815
Middle income	5.289	-2.373	3.298	9.012
CPEs	--	0.195	--	0.711
Market economy	5.289	-2.568	3.298	8.301
Africa	1.698	-1.199	0.478	1.472
Asia	2.606	-1.859	2.068	2.138
Latin America	0.985	0.759	0.389	2.813
High income				
Market economy	0.276	0.759	0.389	2.813
Total Groups	83.619	-12.259	100.728	-0.901

Source: Appendix 20.

-- Not available.

regions, while Poland and Yugoslavia had the highest negative residuals. Japan and The Netherlands in the 1960-70 period showed the highest negative residual (-7.5 and -2.5 mmt, respectively), but England and German F. Rep. had the highest positive residual (8.5 and 5.6 mmt) in the same period. In 1970-80, England, German F. Rep., Italy and Japan experienced the highest negative residuals (4.5, 4.3, 3.7, and 3.4 mmt, respectively). Only Spain, Greece and Portugal had positive residuals during this period. The term "negative residual" of a country means the variables in the equation have more effect than the actual import; however, the term "positive residual" of a country means the variables in the equation have less effect than the actual import. There are many factors not included in this study which may have a significant effect to explain the residual left over in such as price policies.

Among developing countries, Bangladesh, India and Pakistan, showed the highest negative residuals in 1960-70 (6.3, 5.5, 5.2 mmt), while only Mexico, Morocco and Kenya had substantial positive residuals (2.6, 1.6 and 1.2 mmt, respectively). In 1970-80, the Peoples Republic of China, Mexico and Morocco had the highest positive residuals, while India, Bangladesh and Indonesia showed the largest negative residuals.

From these results we could see very clearly that the income is the most important variable to understanding increases in grain imports by developed countries as well as by the developing countries.

Conclusion

The results of this chapter showed that the high income countries had substantial increases in indirect consumption of grain caused by increases in income. However, the developing countries had substantial increases in demand for direct grain consumption, especially in rice and wheat. In addition, the income effect on grain consumption had a larger effect than the factors considered in previous chapters. Increased income had a significant effect on indirect grain consumption. These trends appeared very clearly in the empirical results. The income elasticities of demand for feed are higher than the elasticities of demand for rice and wheat in the DCs, while the reverse situation prevails in the LDCs.

The presence of an unexplained residual shows that, in the DCs in 1960-70, imports were affected by factors other than those considered in this study. However, in the 1970-80 periods, the negative residual in DCs and many of the LDC groups mean that total imports were lower than the sum of the various effects. The results for this period may indicate that import policies of these countries have limited imports, perhaps through an increase in real price levels.

CHAPTER 5

CONCLUSION

Since the 1950's, international grain trade has grown more rapidly than any other segment of agricultural trade. During the last thirty years, LDCs have become heavily dependent on cereal imports in spite of increasing per capita cereal production. The Green Revolution and new production technologies had significant impacts on increasing cereal production in many developed countries, particularly India, China, Argentina, Pakistan, and Mexico. But most LDCs have been unable to improve production sufficiently to cover their demand because of many constraints such as availability of foreign exchange, lack of new technology, anti-producer policies and weather changes. As a result, import growth has been necessary to cover the high growth in the demand for grain. Among the developed countries, the market economies and the CPEs have also increased their imports of grain, mainly for indirect consumption (livestock feed).

Examination of the data shows that trade expanded primarily in response to growth in income and population. Income growth appears particularly important in developed countries and it was a dominant factor in the developing countries in 1960-70. In the 1970-1980 period, income growth had more of an effect on grain trade in the LDCs than in the DCs. Population growth showed a larger effect on trade in the LDCs than in the DCs during all periods.

Decline in domestic cereal production showed a significant effect on grain import only for China and the USSR. In the rest of the country groups, cereal production has not been an important factor affecting import, at least relative to the other factors considered in this study. Declines in domestic starchy staple products showed higher effects on grain import in DCs than in LDCs during 1970-1980; but the magnitude of the impact was still small.

The unexplained residuals left over from the import growth were small during the periods 1960-1970 and 1970-1980 for most of the country groups. Where values are large, they represent the effect of various factors that have not been considered. Changes in prices may be particularly important in this regard. A positive residual is consistent with an increase in prices, while a negative residual may indicate cases where real price levels have declined.

APPENDIX 1

POPULATION IN MILLIONS

Countries	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	7.25	7.87	8.49	8.86
2. Czechoslovakia	12.39	13.65	14.33	15.28
3. German D. Rep.	18.39	18.32	17.06	16.74
4. Poland	24.82	29.70	32.53	35.58
5. Romania	16.8	18.4	20.25	22.20
6. Yugoslavia	17.0	18.4	20.32	22.34
7. USSR	181.05	214.4	242.77	265.54
Market economies				
8. Japan	82.9	94.1	104.35	116.78
9. Belgium-Lux	8.64	9.15	9.99	10.22
10. Denmark	4.27	4.58	4.93	5.13
11. Finland	4.01	4.45	4.61	4.78
12. German F. Rep.	49.99	57.78	60.71	61.56
13. Greece	7.55	8.33	8.79	9.6
14. Ireland	2.97	2.83	2.95	3.31
15. Italy	46.77	49.36	53.66	57.04
16. Netherlands	10.11	11.48	13.03	14.14
17. Norway	3.27	3.59	3.9	4.08
18. Portugal	8.5	8.83	9.04	9.84
19. Spain	27.87	30.13	33.62	37.20
20. Switzerland	4.69	5.35	6.27	6.37
21. UK	50.62	52.54	55.7	56.21
Developing				
Low income GNP ($0-699)				
CPEs				
22. Kampuchia	4.31	4.95	7.06	8.87
23. Vietnam Soc. Rep.	24.48	29.3	41.86	52.30
24. Yemen People Rep.	0.81	0.99	1.50	1.89
25. China People Rep.	546.82	646.53	825.81	956.85
26. Korea People Rep.	8.97	8.25	13.89	17.91
Market economies				
Africa				
27. Egypt	20.39	25.93	33.33	41.99
28. Ethiopia	17.56	20.0	25.45	32.6
29. Kenya	6.02	7.13	11.27	16.4
30. Madagascar	4.26	5.39	6.8	8.74
31. Mozambique	5.7	6.39	8.14	10.47

APPENDIX 1--Continued

POPULATION IN MILLIONS

Countries	1950	1960	1970	1980
32. Somalia	1.89	2.0	2.79	3.65
33. Sudan	8.62	11.77	14.09	18.37
34. Tanzania	8.01	9.24	13.3	17.93
35. Zaire	11.23	14.59	21.64	28.29
36. Angola	4.09	4.61	5.59	7.08
37. Ghana	5.02	6.7	8.61	11.68
38. Ivory Coast	2.59	3.23	5.31	7.97
39. Morocco	8.95	11.63	15.13	20.30
40. Nigeria	34.33	42.95	56.35	77.08
41. Senegal	2.48	3.14	4.27	5.66
42. Zambia	2.44	3.21	4.15	5.66
Asia				
43. Bangladesh	0	0	68.28	88.71
44. India	355.82	432.57	551.32	693.89
45. Indonesia	76.7	92.6	119.47	151.89
46. Pakistan	80.35	92.73	60.45	82.44
47. Sri Lanka	7.68	9.90	12.51	14.87
48. Yemen Arab Rep.	3.62	4.04	4.84	5.93
49. Jordan	1.27	1.70	2.30	3.20
50. Korea Rep.	20.51	24.66	31.37	37.98
51. Philippines	20.28	27.5	37.9	50.99
Latin America				
52. Haiti	3.38	4.25	4.61	5.82
53. Bolivia	3.01	3.46	4.29	5.57
54. Colombia	11.33	14.13	21.27	26.91
55. Ecuador	3.27	4.32	5.96	8.02
Middle income GNP ($700-1999)				
CPEs				
56. Cuba	5.52	6.80	8.55	9.98
Market economies				
Africa				
57. Algeria	8.75	11.02	13.31	18.59
58. Tunisia	3.56	4.17	5.13	6.36
Asia				
59. Cyprus	0.49	0.56	0.62	0.65
60. Iran	16.28	20.19	28.36	38.08

APPENDIX 1--Continued

POPULATION IN MILLIONS

Countries	1950	1960	1970	1980
61. Iraq	5.27	7.09	9.36	13.08
62. Lebanon	1.43	1.78	2.47	3.16
63. Malaysia	6.3	8.11	10.47	13.64
64. Syria	3.41	4.67	6.26	8.64
Latin America				
65. Brazil	52.09	65.74	95.19	126.38
66. Chile	6.07	7.29	9.37	11.11
67. Dominican Republic	2.13	2.99	4.52	5.95
68. Jamaica	1.40	1.61	1.87	2.19
69. Mexico	25.87	34.63	50.33	69.99
70. Peru	8.07	10.86	13.5	17.77
High income GNP (>$2000) Market economies				
71. Libya	1.03	1.20	1.98	2.98
72. Hong Kong	1.9	2.98	3.94	4.80
73. Kuwait	0.22	0.23	0.74	1.37
74. Saudi Arabia	3.24	4.79	6.20	8.37
75. Singapore	1.02	1.63	2.08	2.39
76. United Arab Emirates	0.08	0.1	0.23	0.80
77. Trinidad Tobago	0.63	0.84	1.03	1.14
78. Venezuela	5.03	7.3	10.7	14.91

Source: Food and Agriculture Organization Production Yearbook, various years.

Note: 1950 is the average of 1948-1952.
1960 is the average of 1959-1961.
1970 is the average of 1969-1971.
1980 is the average of 1979-1981.

APPENDIX 2

NET GRAIN TRADE
(IMPORT-EXPORT)
(1000 mt)

Countries	1950	1960	1970	1980
Developed countries				
CPEs				
1. Bulgaria	-55.7	19.1	-229.62	384.62
2. Czechoslovakia	47.5	1900.23	1791.59	1781.76
3. German D. Rep.	21.2	2042.63	2693.97	3320.43
4. Poland	-43.1	222.45	2378.73	7380.6
5. Romania	-99.8	-316.34	-710.73	1120.37
6. Yugoslavia	-190.6	945.83	416.12	988.07
7. USSR	18.8	-6026.37	-5631.12	30995.7
Market economy				
8. Japan	3402.2	4476.27	14040.6	23677.3
9. Belgium	1323.5	1868.17	2914.89	2821.7
10. Denmark	158.3	1079.97	132.92	-490.07
11. Finland	340.	282.7	-41.56	392.43
12. German F. Rep.	4468.7	-592.78	5506.73	2798.74
13. Greece	422.9	168.3	249.34	219.22
14. Ireland	550.0	353.53	444.84	347.04
15. Italy	1471.9	2744.93	6080.38	5663.17
16. Netherlands	1502.4	3664.73	3154.17	3487.7
17. Norway	527.6	560.0	644.5	683.49
18. Portugal	309.2	355.97	1909.7	3791.0
19. Spain	208.3	647.57	1948.9	4919.1
20. Switzerland	784.8	832.9	1350.95	1211.34
21. UK	6300.2	641.63	8092.79	968.29
Developing countries				
Low income				
CPE's				
22. Kampuchia	0	17.5	0	241.34
23. Vietnam Soc. Rep.	0	-468.8	563.34	1420.67
24. Yemen People Rep.	0	0	130.0	207.92
25. China People Rep.	-34.5	-1249.76	4637.33	1577.2
26. Korea People Rep.	98.2	-19.0	168.67	213.33
Market economy				
Africa				
27. Egypt	492.7	757.46	1123.34	6259.04
28. Ethiopia	-35.6	0	58.0	284.25
29. Kenya	-33.6	38.26	-83.34	314.79

APPENDIX 2--Continued

NET GRAIN TRADE
(IMPORT-EXPORT)
(1000 mt)

Countries	1950	1960	1970	1980
30. Madagascar	-3.1	7.7	18.0	205.1
31. Mozambique	14.7	40.1	107.33	370.55
32. Somalia	0.3	30.1	52.67	315.85
33. Sudan	2.3	-69.6	167.33	47.04
34. Tanzania	-4.1	-29.64	22.34	187.9
35. Zaire	0	0	203.0	407.62
36. Angola	-107.9	-87.23	-64.67	262.0
37. Ghana	3.2	120.56	113.67	217.0
38. Ivory Coast	0	42.1	158.33	472.86
39. Morocco	-323.6	-43.37	292.33	7521.37
40. Nigeria	-3.1	83.07	336.67	2059.36
41. Senegal	0	224.7	290.0	456.06
42. Zambia	21	-10.97	183.7	157.96
Asia				
43. Bangladesh	0	0	1291.67	1584.7
44. India	3455.1	4232.77	3616.67	-159.35
45. Indonesia	66.1	1036.4	1260.0	2754.67
46. Pakistan	-60.0	1128.17	-218.0	-102.8
47. Sri Lanka	426.4	806.07	954.33	859.79
48. Yemen Arab Rep.	0	0	93.33	452.59
49. Jordan	21.4	238.07	163.37	515.51
50. Korea Rep.	-4.6	367.07	2625.0	2894.35
51. Philippines	81.7	380.7	745.66	790.22
Latin America				
52. Haiti	0.3	33.9	53.17	200.36
53. Bolivia	47.4	127.76	168.33	301.7
54. Colombia	36.3	174.17	345.33	716.36
55. Ecuador	-36.6	23.34	91.0	270.02
Middle income CPE's				
56. Cuba	264.6	484.67	1199.33	2030.62
Market economy				
Africa				
57. Algeria	-104.0	433.07	544.33	3216.32
58. Tunisia	-123.1	-199.97	403.67	889.86

APPENDIX 2--Continued

NET GRAIN TRADE
(IMPORT-EXPORT)
(1000 mt)

	Countries	1950	1960	1970	1980
	Asia				
59.	Cyprus	77.4	52.4	119.33	329.9
60.	Iran	49.1	246.13	446.33	2975.28
61.	Iraq	-18.8	312.33	319.5	2408.82
62.	Lebanon	107.5	279.1	538.67	574.21
63.	Malaysia	0	29.29	705.67	1166.37
64.	Syria	-475.37	301.0	333.83	705.42
	Latin America				
65.	Brazil	145.7	1941.03	863.66	6052.5
66.	Chile	-16.3	725.3	629.0	1336.9
67.	Dominican Republic	-7.5	144.37	105.33	346.44
68.	Jamaica	12.6	162.37	262.67	383.65
69.	Mexico	427.7	-386.33	-170.52	5651.61
70.	Peru	217.6	401.2	679.0	1234.90
	High income Market economy				
71.	Libya	1.3	99.97	366.67	793.88
72.	Hong Kong	156.6	487.37	654.67	805.91
73.	Kuwait	0	0	153.33	322.29
74.	Saudi Arabia	35.3	279.56	541.33	3123.80
75.	Singapore	493.9	0	385.67	709.17
76.	United Arab Emirates	0	0	0	196.14
77.	Trinidad Tobago	-0.2	117.5	180.33	271.78
78.	Venezuela	37.2	368.2	914.83	2174.38

Source: Data for the cereal imports and exports are taken from Food and Agriculture Organization Trade Yearbook, various years.

APPENDIX 3

CEREAL PRODUCTION
(1000 mt)

Countries	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	3273.0	4713.66	6648.0	8145.0
2. Czechoslovakia	5015.0	5640.33	8018	9830.0
3. German D. Rep.	5838	3482.33	7040	9210
4. Poland	12136	14684.3	18236	18458.7
5. Romania	5815	1036.0	6211	6369.6
6. Yugoslavia	6132	7031.0	5034	5159.6
7. USSR	76236	128949	169320	174955
Market economy				
8. Japan	16493	19874	17595	14333
9. Belgium	1480	1777.33	1923	2066.67
10. Denmark	4015	4085.0	6678	7315
11. Finland	1412	1810	2875	2992
12. German F. Rep.	10272	12896	19058	22928.3
13. Greece	1575	2425.33	3224	4761
14. Ireland	1110	1340	1452	1771
15. Italy	11094	13294.3	16114	18085.3
16. Netherlands	1463	1599.0	1497	1278.67
17. Norway	348	558.67	777	1117.33
18. Portugal	1417	1479.0	1461	1208.3
19. Spain	7352	7989.67	11821	14459.3
20. Switzerland	446	520.33	683	827.67
21. UK	8076	9380.03	13941	18734.3
Developing countries				
Low income				
CPE's				
22. Kampuchia	1339	1533.33	31472	1092.67
23. Vietnam Soc. Rep.	1570	9810.33	10198	12182.7
24. Yemen People Rep.	22	66	90	111
25. China People Rep.	90947	159000	196474	286018
26. Korea People Rep.	2115	4973	5147	6483.33
Market economy				
Africa				
27. Egypt	4103	5213.67	7385	7994.33
28. Ethiopia	2684	2776.33	4355	4332.33
29. Kenya	227	225.67	2671	2608.33
30. Madagascar	968	1307	2018	2175.33

APPENDIX 3--Continued

CEREAL PRODUCTION
(1000 mt)

Countries	1950	1960	1970	1980
31. Mozambique	445	654	685	478.67
32. Somalia	46	42.33	243	262.67
33. Sudan	811	996.33	2119	3219.33
34. Tanzania	1013	985	1349	1458.67
35. Zaire	535	344	660	802.67
36. Angola	354	520	582	363.33
37. Ghana	358	421	739	706.0
38. Ivory Coast	206	250	640	899.33
39. Morocco	2728	2184	4558	3556.67
40. Nigeria	5300	7612	8054	9618.0
41. Senegal	374	323.33	704	746
42. Zambia	461	752	915	941
Asia				
43. Bangladesh	0	0	16727	20994.7
44. India	57493	82772.3	111146	138775
45. Indonesia	11279	14990.	21711	33557.7
46. Pakistan	17199	20637.3	11668	17138.3
47. Sri Lanka	505	881.33	1495	2063.33
48. Yemen Arab Rep.	755	619.0	1075	797.67
49. Jordan	194	116.67	152	99
50. Korea Rep.	3686	4468.33	7508	8004.67
51. Philippines	3463	5262.	7141	10841.3
Latin America				
52. Haiti	408	455	536.0	394
53. Bolivia	244	212.33	498	565.33
54. Colombia	1156	1444.67	1923	3341
55. Ecuador	309	482.33	633	665
Middle income CPE's				
56. Cuba	341	567	397	569.67
Market economy				
Africa				
57. Algeria	1961	1735.33	1882	2099
58. Tunisia	689	451.67	718	1146

APPENDIX 3--Continued

CEREAL PRODUCTION
(1000 mt)

	Countries	1950	1960	1970	1980
	Asia				
59.	Cyprus	98	73	164	117.33
60.	Iran	3084	4303.67	6092	8234.67
61.	Iraq	1412	1623	2058	2256.33
62.	Lebanon	101	92.67	50.0	45.67
63.	Malaysia	637	1149	1711	2145.67
64.	Syria	1198	934	1229	3084.0
	Latin America				
65.	Brazil	9480	14675.5	22353	30790.3
66.	Chile	1258	1588	1787	1742.33
67.	Dominican Republic	149	220.33	265	481.67
68.	Jamaica	21	8.33	5	7.67
69.	Mexico	4004	7517.67	14552	20670.3
70.	Peru	860	1063	1455	1424.66
	High income Market economy				
71.	Libya	75	112.0	113	217
72.	Hong Kong	37	29.33	15	0
73.	Kuwait	0	0	0	0
74.	Saudi Arabia	106	233.0	429	284.33
75.	Singapore	0	0	0	0
76.	United Arab Emirates	0	0	0	1
77.	Trinidad Tobago	22	13	13	29.66
78.	Venezuela	349	764.67	911	1887.33

Source: Food and Agriculture Organization Trade Yearbook, various years.

APPENDIX 4

ROOTS AND TUBERS PRODUCTION
EQUIVALENT IN CEREALS PRODUCTION
(1000 mt)

Countries	1960	1970	1980
Developed countries			
CPEs			
1. Bulgaria	114.29	108.0	107.8
2. Czechoslovakia	1610.0	1389.71	944.76
3. German D. Rep.	3447.43	2980.57	3043.52
4. Poland	12480	12860.9	11291.7
5. Romania	742.86	88.57	82.48
6. Yugoslavia	774.57	93.71	84.08
7. USSR	23322.3	26782.6	21902.8
Market economy			
8. Japan	3012.57	1941.42	1534.85
9. Belgium	505.43	466.3	412.95
10. Denmark	350.57	241.42	247.23
11. Finland	304.86	258.85	179.81
12. German F. Rep.	6351.43	4515.42	247.23
13. Greece	133.71	234.0	282.19
14. Ireland	537.43	414.28	320.57
15. Italy	1109.14	1045.42	851.71
16. Netherlands	1078.0	1533.42	1808.47
17. Norway	302.57	230.57	139.33
18. Portugal	329.71	369.43	358.8
19. Spain	1312.29	1437.42	1628.76
20. Switzerland	327.14	270.28	264.0
21. UK	2099.71	2102.57	1876.38
Developing countries			
Low income			
CPE's			
22. Kampuchia	13.71	14.0	47.14
23. Vietnam Soc. Rep.	647.43	617.43	1842.86
24. Yemen People Rep.	0.29	0.29	0.29
25. China People Rep.	31730.6	38784.3	41669.3
26. Korea People Rep.	660.57	757.714	472.67
Market economy			
Africa			
27. Egypt	145.43	176.29	367.81
28. Ethiopia	220.86	255.43	403.91
29. Kenya	355.71	270.29	380.48

APPENDIX 4--Continued

ROOTS AND TUBERS PRODUCTION
EQUIVALENT IN CEREALS PRODUCTION
(1000 mt)

Countries	1960	1970	1980
30. Madagascar	434.0	514.29	937.62
31. Mozambique	620.0	752.57	559.24
32. Somalia	5.43	8.0	10.09
33. Sudan	60.0	86.29	87.05
34. Tanzania	948.57	1046.86	1451.05
35. Zaire	1778.57	3072.0	3707.81
36. Angola	422.29	508.0	591.43
37. Ghana	859.43	1048.86	1451.05
38. Ivory Coast	536.57	654.86	911.71
39. Morocco	60.0	80.86	114.95
40. Nigeria	6062.0	7147.14	8113.71
41. Senegal	47.71	49.71	10.76
42. Zambia	44.0	51.14	56.86
Asia			
43. Bangladesh	224.57	477.71	495.81
44. India	1778.57	477.72	495.62
45. Indonesia	4565.71	3352.86	4785.05
46. Pakistan	75.14	181.14	164.38
47. Sri Lanka	107.43	134.57	202.09
48. Yemen Arab Rep.	10.86	10.0	37.71
49. Jordan	3.71	0.29	3.14
50. Korea Rep.	660.57	757.71	472.67
51. Philippines	419.71	365.71	1019.52
Latin America			
52. Haiti	66.57	177.14	193.906
53. Bolivia	212.29	271.14	312.763
54. Colombia	499.14	660.57	1188.86
55. Ecuador	162.57	276.57	153.52
Middle income CPE's			
56. Cuba	149.71	159.43	278.38
Market economy			
Africa			
57. Algeria	64.0	72.29	162.86
58. Tunisia	14.0	19.71	35.14

APPENDIX 4--Continued

ROOTS AND TUBERS PRODUCTION
EQUIVALENT IN CEREALS PRODUCTION
(1000 mt)

Countries	1960	1970	1980
Asia			
59. Cyprus	35.43	54.0	59.33
60. Iran	114.29	119.14	198.38
61. Iraq	2.86	4.57	30.29
62. Lebanon	17.43	28.0	38.76
63. Malaysia	112.86	113.43	161.43
64. Syria	10.86	17.71	76.09
Latin America			
65. Brazil	7032.0	9609.71	7795.91
66. Chile	229.14	206.0	257.24
67. Dominican Republic	80.57	98.57	86.86
68. Jamaica	25.14	43.14	61.52
69. Mexico	145.14	202.86	272.95
70. Peru	615.43	772.86	654.57
High income Market economy			
71. Libya	3.43	4.29	28.19
72. Hong Kong	7.43	1.14	0
73. Kuwait	0	0	0
74. Saudi Arabia	0.29	0.29	1.43
75. Singapore	2.29	5.51	2.00
76. United Arab Emirates	0	0	0.48
77. Trinidad Tobago	3.43	6.0	6.29
78. Venezuela	165.43	160.29	192.57

Source: Data for Roots and Tubers Production are taken from Food and Agriculture Organization Production Yearbook, various years.

Notes: The data are divided by ratio 3.5.

APPENDIX 5

CEREAL IMPORTS
(1000 mt)

Region	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	0	197.10	295.38	872.62
2. Czechoslovakia	78.2	1941.233	1828.597	1821.043
3. German D. Rep.	24.2	2042.63	2705.267	3716.833
4. Poland	181.9	222.45	2524.06	7457.596
5. Romania	0	39.66	136.6	2241.5
6. Yugoslavia	153.3	1620.83	648.45	1205.46
7. USSR	18.8	830.633	2548.88	33,934.98
Market economies				
8. Japan	3417.6	4512.266	14,717.61	24,518.993
9. Belgium-Lux	1379.4	1968.67	3697.887	5736.557
10. Denmark	333.8	1206.967	460.917	410.24
11. Finland	350.8	320.7	78.11	434.727
12. German F. Rep.	4475.5	532.22	7457.06	5094.936
13. Greece	423.0	169.533	325.013	982.537
14. Ireland	550.5	382.533	447.84	539.28
15. Italy	1679.8	3182.933	7082.05	7588.77
16. Netherlands	1564.9	3872.733	4582.17	5316.837
17. Norway	527.6	560.3	656.17	685.36
18. Portugal	331.4	355.966	1921.7	3794.8
19. Spain	249.3	688.567	2573.9	5729.897
20. Switzerland	786.0	832.9	1351.953	1212.16
21. UK	6346.3	930.63	9232.12	3518.917
Developing				
Low income				
CPEs				
22. Kampuchia	0	17.5	0	241.34
23. Vietnam Soc. Rep.	0	91.2	582.67	1420.67
24. Yemen People Rep.	0	0	149.0	207.92
25. China People Rep.	.142	146.24	5593.33	17,062.0
26. Korea People Rep.	98.2	0	270.67	580.0
Market economies				
Africa				
27. Egypt	740.2	1074.46	1771.0	6354.42
28. Ethiopia	0	0	58.0	284.25
29. Kenya	4.6	51.26	32.33	314.79

APPENDIX 5--Continued

CEREAL IMPORTS
(1000 mt)

Region	1950	1960	1970	1980
30. Madagascar	3.3	36.77	73.67	206.81
31. Mozambique	17.6	40.1	107.33	370.55
32. Somalia	0.3	30.1	52.67	315.85
33. Sudan	12.7	111.4	182.33	290.43
34. Tanzania	0	46.36	58.67	247.06
35. Zaire	0	0	203.0	407.62
36. Angola	0.6	29.77	87.33	262.0
37. Ghana	3.3	120.56	113.67	217.0
38. Ivory Coast	0	42.1	158.33	474.3
39. Morocco	84.9	274.63	430.0	7540.11
40. Nigeria	0.6	83.07	336.67	2059.36
41. Senegal	0	224.7	311.0	459.05
42. Zambia	21.0	5.03	191.67	339.57
Asia				
43. Bangladesh	0	0	1291.67	1584.7
44. India	3477.3	4236.77	3646.67	774.22
45. Indonesia	76.8	1036.4	1399.33	2780.13
46. Pakistan	13.7	1197.17	189.0	1051.53
47. Sri Lanka	427.6	806.07	954.33	865.67
48. Yemen Arab Rep.	0	0	93.33	452.59
49. Jordan	27.7	242.07	168.67	556.25
50. Korea Rep.	0	391.07	2629.0	2894.3
51. Philippines	95.7	396.7	745.66	964.81
Latin America				
52. Haiti	0.3	33.9	56.67	200.36
53. Bolivia	47.4	127.76	169.33	301.7
54. Colombia	38.6	174.17	367.33	747.51
55. Ecuador	9.2	50.37	91.0	270.02
Middle income CPEs	264.6	484.67	1199.33	2030.62
56. Cuba				
Market economies				
Africa				
57. Algeria	115.4	572.07	553.3	3216.32
58. Tunisia	66.1	23.03	410.0	891.46

APPENDIX 5--Continued

CEREAL IMPORTS
(1000 mt)

	Region	1950	1960	1970	1980
	Asia				
59.	Cyprus	68.5	52.4	129.0	333.51
60.	Iran	72.6	246.13	450.33	2975.28
61.	Iraq	12.9	312.33	389.0	2408.82
62.	Lebanon	109.7	288.1	550.67	694.19
63.	Malaysia	0	104.29	705.67	1180.39
64.	Syria	30.6	301.0	564.33	749.18
	Latin America				
65.	Brazil	366.5	1951.03	2113.33	6107.76
66.	Chile	72.9	728.3	643.67	1347.51
67.	Dominican Republic	1.7	35.73	105.33	346.44
68.	Jamaica	12.6	162.37	262.67	383.65
69.	Mexico	452.0	72.67	360.48	5673.89
70.	Peru	217.6	401.2	680.0	1244.42
	High income Market				
71.	Libya	16.4	99.97	366.67	793.88
72.	Hong Kong	165.6	552.37	701.0	822.56
73.	Kuwait	0	0	172.0	361.17
74.	Saudi Arabia	35.3	279.56	541.33	3140.09
75.	Singapore	541.6	NA	538.0	1283.97
76.	United Arab Emirate	0	0	0	318.3
77.	Trinidad Tobago	0	117.5	181.33	271.78
78.	Venezuela	37.2	368.2	949.33	2187.47

Sources: Data for the cereal imports are taken from Food and Agriculture Organization Trade Yearbook, various years.

APPENDIX 6

PER CAPITA CEREAL IMPORTS
Kg/Capita

Countries	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	0	25.1	34.8	98.5
2. Czechoslovakia	6.3	142.2	127.6	119.2
3. German D. Rep.	1.3	111.5	158.6	222.1
4. Poland	7.3	7.5	77.6	209.6
5. Romania	0	2.2	6.7	101.0
6. Yugoslavia	9.0	88.1	31.9	53.9
7. USSR	0	3.9	10.5	127.8
Market economy				
8. Japan	41.0	47.9	141.0	209.8
9. Belgium-Lux	159.7	215.0	369.9	561.1
10. Denmark	78.2	263.5	93.5	80.0
11. Finland	87.5	72.1	16.9	90.9
12. German F. Rep.	89.5	9.2	122.8	82.8
13. Greece	55.9	20.4	36.9	102.3
14. Ireland	185.4	134.9	151.6	163.0
15. Italy	35.9	64.5	131.9	133.0
16. Netherlands	154.7	337.3	351.6	375.9
17. Norway	161.6	156.2	174.1	167.7
18. Portugal	38.9	40.3	212.6	385.8
19. Spain	8.9	22.9	76.6	154.0
20. Switzerland	167.4	155.7	215.7	190.4
21. UK	125.4	177.7	165.7	62.6
Developing				
Low income GNP U.S. $(0-699)				
CPEs				
22. Kampuchia	0	3.5	0	27.2
23. Vietnam Soc. Rep.	0	3.1	13.9	27.2
24. Yemen People Rep.	0	0	99.5	110.0
25. China People Rep.	0.3	0.2	6.8	17.8
26. Korea People Rep.	10.9	NA	19.5	32.4
Market economies				
Africa				
27. Egypt	36.3	41.4	53.1	151.3
28. Ethiopia	0	0	2.3	8.7
29. Kenya	0.8	701	2.9	19.2
30. Madagascar	0.8	6.8	10.8	23.7

APPENDIX 6--Continued

PER CAPITAL CEREAL IMPORTS
Kgs/Capita

	Countries	1950	1960	1970	1980
31.	Mozambique	3.1	6.3	13.2	35.4
32.	Somalia	0.2	15.1	18.9	86.7
33.	Sudan	1.5	9.5	12.9	15.8
34.	Tanzania	0	5.0	4.4	13.8
35.	Zaire	0	0	9.4	14.4
36.	Angola	0.1	6.5	15.6	37.0
37.	Ghana	0.7	17.8	13.2	18.6
38.	Ivory Coast	0	13.0	29.8	59.5
39.	Morocco	9.5	23.6	28.4	371.5
40.	Nigeria	0.02	1.9	6.0	26.7
41.	Senegal	0	71.6	72.9	81.1
42.	Zambia	8.6	1.6	46.2	59.9
	Asia				
43.	Bangladesh	0	0	18.9	17.9
44.	India	9.8	9.8	6.6	1.1
45.	Indonesia	1.0	11.2	11.7	18.3
46.	Pakistan	0.2	13.0	3.1	12.8
47.	Sri Lanka	55.7	81.5	76.3	58.2
48.	Yemen Arab Rep.	0	0	19.3	76.4
49.	Jordan	21.8	142.8	73.4	173.9
50.	Korea Rep.	0	15.9	83.8	76.2
51.	Philippines	4.7	14.4	19.7	18.9
	Latin America				
52.	Haiti	0.1	8.0	12.3	34.4
53.	Bolivia	15.7	37.0	40.0	54.1
54.	Colombia	3.4	12.3	17.3	27.8
55.	Ecuador	2.8	11.7	15.3	33.7
Middle income GNP U.S. $(700-1999)					
CPEs					
56.	Cuba	47.9	71.0	140.0	203.5
Market economies					
	Africa				
57.	Algeria	13.2	51.9	41.6	173.0
58.	Tunisia	18.6	535	79.9	140.1

APPENDIX 6--Continued

PER CAPITAL CEREAL IMPORTS
Kgs/Capita

	Countries	1950	1960	1970	1980
	Asia				
59.	Cyprus	138.7	93.1	209.8	512.3
60.	Iran	4.5	12.2	15.9	78.1
61.	Iraq	2.4	44.1	41.6	184.1
62.	Lebanon	76.6	161.6	223.0	219.6
63.	Malaysia	0	12.9	67.4	86.5
64.	Syria	9.0	64.5	90.2	86.7
	Latin America				
65.	Brazil	7.0	29.7	22.2	48.3
66.	Chile	12.0	99.9	68.7	121.3
67.	Dominican Republic	0.8	11.9	23.3	58.3
68.	Jamaica	10.0	100.6	140.5	175.0
69.	Mexico	17.5	2.1	7.2	81.1
70.	Peru	26.9	36.9	50.4	70.0
	High income GNP U.S. $(>2000) Market economies				
71.	Libya	15.9	83.7	184.9	266.7
72.	Hong Kong	87.2	185.3	177.8	171.3
73.	Kuwait	0	0	231.2	263.2
74.	Saudi Arabia	10.9	58.4	87.3	375.3
75.	Singapore	529.9	NA	259.3	537.2
76.	United Arab Emirates	0	0	0	399.9
77.	Trinidad Tobago	0	139.2	176.6	238.6
78.	Venezuela	7.4	50.4	88.7	146.7

APPENDIX 7

PER CAPITA NET GRAIN TRADE
(Kg/Capita)

Countries	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	-7.68	2.43	-27.05	43.40
2. Czechoslovakia	3.83	139.17	124.99	116.6
3. German DR	1.15	111.51	157.93	198.39
4. Poland	-1.73	7.49	73.13	207.45
5. Romania	-5.94	-17.19	-35.09	50.46
6. Yugoslavia	-11.21	51.40	20.48	44.14
7. USSR	0.10	-28.11	-23.20	116.73
Market economy				
8. Japan	41.04	47.57	134.56	202.75
9. Belgium	153.20	204.11	291.64	276.02
10. Denmark	37.06	235.75	26.97	-95.60
11. Finland	84.81	63.54	-9.02	82.13
12. German F.R.	89.40	-10.26	90.70	45.46
13. Greece	55.98	20.21	28.36	22.84
14. Ireland	185.25	124.75	150.59	104.91
15. Italy	31.47	55.61	113.31	99.28
16. Netherlands	148.55	319.23	242.03	246.59
17. Norway	161.59	156.25	166.24	167.28
18. Portugal	36.38	40.31	211.25	385.42
19. Spain	7.47	21.49	57.98	132.24
20. Switzerland	167.19	155.65	215.57	190.28
21. UK	124.47	12.21	145.2	17.23
Developing				
Low income				
CPEs				
22. Kampuchia	0	3.53	0	27.26
23. Vietnam Soc. Rep.	0	-16.0	13.46	27.16
24. Yemen People Rep.	0	0	86.84	110.01
25. China People Rep.	-0.06	-1.93	5.62	16.49
26. Korea People Rep.	10.95	-2.30	12.14	11.91
Market economy				
Africa				
27. Egypt	24.16	29.21	33.70	149.04
28. Ethiopia	-2.03	0	2.28	8.72
29. Kenya	-5.58	5.37	-7.40	19.19
30. Madagascar	-0.73	1.43	2.65	23.46

APPENDIX 7--Continued

PER CAPITA NET GRAIN TRADE
(Kg/Capita)

Countries	1950	1960	1970	1980
31. Mozambique	2.58	6.28	13.19	35.38
32. Somalia	0.16	15.05	18.88	86.64
33. Sudan	0.27	-5.91	11.88	2.56
34. Tanzania	-0.51	-3.21	1.68	10.48
35. Zaire	0	0	9.38	14.41
36. Angola	-26.36	-18.94	-11.57	37.02
37. Ghana	0.64	17.99	13.20	18.58
38. Ivory Coast	0	13.03	29.82	59.31
39. Morocco	-36.14	-3.73	19.33	370.58
40. Nigeria	-0.09	1.93	5.98	26.72
41. Senegal	0	71.56	67.96	80.53
42. Zambia	8.61	-3.42	44.24	27.90
Asia				
43. Bangladesh	0	0	18.92	17.86
44. India	9.71	9.79	6.56	-0.23
45. Indonesia	0.86	11.19	10.55	18.14
46. Pakistan	-0.75	12.17	-3.61	-1.25
47. Sri Lanka	55.54	81.45	76.26	57.82
48. Yemen Arab Rep.	0	0	19.30	76.37
49. Jordan	16.85	140.45	71.06	161.15
50. Korea Rep.	-0.22	14.89	83.69	76.21
51. Philippines	4.03	13.84	19.67	15.50
Latin America				
52. Haiti	0.09	7.98	11.54	34.44
53. Bolivia	15.74	36.90	39.27	54.15
54. Colombia	3.20	12.32	16.24	26.62
55. Ecuador	-11.20	5.41	15.27	33.66
Middle income CPEs				20
56. Cuba	47.93	71.31	140.26	203.51
Market economy				
Africa				
57. Algeria	-11.88	39.30	40.90	172.98
58. Tunisia	-34.58	-47.98	78.73	139.85
Asia				
59. Cyprus	156.68	93.07	194.03	506.76

APPENDIX 7--Continued

PER CAPITA NET GRAIN TRADE
(Kg/Capita)

Countries	1950	1960	1970	1980
60. Iran	3.02	12.19	15.74	78.13
61. Iraq	-3.57	44.08	34.15	184.10
62. Lebanon	75.02	156.53	218.17	181.66
63. Malaysia	0	3.61	67.43	85.51
64. Syria	-139.41	64.45	53.34	81.61
Latin America				
65. Brazil	2.80	29.52	9.07	47.89
66. Chile	-2.68	99.49	67.13	120.37
67. Dominican Republic	-3.52	48.22	23.29	58.26
68. Jamaica	8.98	100.60	140.54	175.02
69. Mexico	16.53	-11.16	-3.39	80.74
70. Peru	26.95	36.95	50.28	69.48
High income Market economy				
71. Libya	1.26	83.66	185.0	266.67
72. Hong Kong	82.42	163.49	166.08	167.86
73. Kuwait	0	0	206.09	234.91
74. Saudi Arabia	10.9	58.36	87.34	373.35
75. Singapore	483.27	0	185.87	296.72
76. United Arab Emirates	0	0	0	246.72
77. Trinidad Tobago	-0.32	139.22	175.59	238.61
78. Venezuela	7.39	50.44	85.50	145.80

APPENDIX 8

PER CAPITA CEREAL PRODUCTION
(Kg/Capita)

Countries	1950	1960	1970	1980
Developed				
CPEs				
1. Bulgaria	451.39	599.17	783.04	919.09
2. Czechoslovakia	404.79	413.09	559.37	643.28
3. German D. Rep.	317.49	190.1	412.71	550.28
4. Poland	488.88	494.37	560.66	518.82
5. Romania	346.13	56.30	306.69	286.91
6. Yugoslavia	360.71	382.12	247.72	230.96
7. USSR	421.08	601.44	697.46	658.87
Market economy				
8. Japan	198.95	211.2	168.62	122.73
9. Belgium	171.32	194.18	192.40	202.16
10. Denmark	940.06	891.73	1354.8	1427.0
11. Finland	352.21	406.83	624.19	626.2
12. German F.R.	205.50	223.19	313.90	372.45
13. Greece	208.50	291.26	366.66	495.94
14. Ireland	373.86	472.83	491.54	535.37
15. Italy	237.21	269.33	300.30	317.05
16. Netherlands	144.65	139.29	114.87	90.40
17. Norway	106.58	155.79	200.41	273.45
18. Portugal	166.71	167.5	161.62	122.84
19. Spain	263.82	265.19	351.60	388.70
20. Switzerland	95.02	97.24	108.98	130.01
21. UK	159.55	178.54	250.29	333.29
Developing				
Low income				
CPEs				
22. Kampuchia	310.67	309.64	445.04	123.16
23. Vietnam Soc. Rep.	64.13	334.82	243.60	232.94
24. Yemen People Rep.	27.16	66.67	60.12	58.73
25. China People Rep.	166.32	245.93	237.92	298.92
26. Korea People Rep.	235.87	602.79	370.50	473.56
Market economy				
Africa				
27. Egypt	201.20	201.08	221.58	190.36
28. Ethiopia	152.85	138.82	171.12	132.89
29. Kenya	37.72	31.65	237.11	159.03
30. Madagascar	227.44	242.35	296.77	248.84

APPENDIX 8--Continued

PER CAPITA CEREAL PRODUCTION
(Kg/Capita)

	Countries	1950	1960	1970	1980
31.	Mozambique	78.07	102.43	84.15	45.70
32.	Somalia	24.39	21.17	87.13	72.06
33.	Sudan	94.14	84.65	150.39	175.24
34.	Tanzania	126.55	106.61	101.43	81.34
35.	Zaire	47.66	23.58	30.50	28.37
36.	Angola	86.49	112.92	104.15	51.33
37.	Ghana	71.36	62.84	85.79	60.45
38.	Ivory Coast	79.69	77.40	120.55	112.80
39.	Morocco	304.70	187.86	301.34	175.24
40.	Nigeria	154.38	177.23	142.94	124.78
41.	Senegal	150.81	102.97	167.99	131.73
42.	Zambia	188.93	234.27	220.38	166.23
	Asia				
43.	Bangladesh	--	--	244.98	236.68
44.	India	161.58	191.35	201.60	200.0
45.	Indonesia	147.05	161.88	181.73	220.93
46.	Pakistan	214.06	222.56	193.02	207.89
47.	Sri Lanka	65.77	89.06	119.47	138.75
48.	Yemen Arab Rep.	208.56	153.22	222.29	134.6
49.	Jordan	152.76	68.83	66.12	30.95
50.	Korea Rep.	179.69	181.20	239.38	210.77
51.	Philippines	170.80	191.35	188.40	212.59
	Latin America				
52.	Haiti	120.71	107.08	116.29	67.73
53.	Bolivia	81.01	61.33	116.19	104.46
54.	Colombia	101.99	102.23	90.43	124.17
55.	Ecuador	94.58	111.73	106.23	82.89
	Middle income CPEs				
56.	Cuba	61.78	83.42	46.43	57.09
	Market economy				
	Africa				
57.	Algeria	224.04	157.47	141.43	112.89
58.	Tunisia	193.54	108.37	140.04	180.1

APPENDIX 8--Continued

PER CAPITA CEREAL PRODUCTION
(Kg/Capita)

	Countries	1950	1960	1970	1980
	Asia				
59.	Cyprus	198.38	129.66	266.67	180.23
60.	Iran	189.48	213.21	214.82	216.24
61.	Iraq	268.14	229.08	219.99	172.45
62.	Lebanon	70.48	51.97	20.25	14.45
63.	Malaysia	101.11	141.68	163.48	157.31
64.	Syria	351.32	200.00	196.39	356.78
	Latin America				
65.	Brazil	181.98	223.23	234.82	243.64
66.	Chile	207.15	217.83	190.72	156.87
67.	Dominican Republic	69.99	73.59	58.59	81.01
68.	Jamaica	14.97	5.16	2.68	3.50
69.	Mexico	154.77	217.09	289.13	295.32
70.	Peru	106.53	97.91	107.75	80.16
	High income Market economy				
71.	Libya	72.67	93.72	57.01	72.89
72.	Hong Kong	19.47	9.84	3.81	0
73.	Kuwait	0	0	0	0
74.	Saudi Arabia	32.74	48.64	69.22	33.98
75.	Singapore	--	--	--	--
76.	United Arab Emirates	0	0	0	1.26
77.	Trinidad Tobago	34.81	15.40	12.66	26.04
78.	Venezuela	69.34	63.65	85.14	126.55

APPENDIX 9

PER CAPITA STARCHY STAPLE PRODUCTION AFTER CONVERTED IN CEREAL
Kg/Capita

Countries	1960	1970	1980
Developed			
CPEs			
1. Bulgaria	14.53	12.72	12.16
2. Czechoslovakia	117.91	96.95	61.83
3. German DR	188.20	174.73	181.84
4. Poland	420.19	395.40	317.38
5. Romania	40.37	4.37	3.72
6. Yugoslavia	42.09	4.61	3.76
7. USSR	108.78	110.32	82.48
Market economy			
8. Japan	32.01	18.61	13.14
9. Belgium	55.22	46.62	40.39
10. Denmark	76.53	48.98	48.23
11. Finland	68.52	56.20	37.63
12. German F.R.	109.92	74.37	40.56
13. Greece	16.06	26.61	29.39
14. Ireland	189.64	140.24	96.91
15. Italy	22.47	19.48	14.93
16. Netherlands	93.90	117.67	127.86
17. Norway	84.37	59.47	34.10
18. Portugal	37.34	40.87	36.48
19. Spain	43.56	42.76	43.79
20. Switzerland	61.14	46.32	41.47
21. UK	39.97	37.75	33.38
Developing			
Low income			
CPEs			
22. Kampuchia	2.77	1.983	5.31
23. Vietnam Soc. Rep.	22.10	14.75	35.24
24. Yemen People Rep.	0.29	0.19	0.15
25. China People Rep.	49.08	46.97	43.55
26. Korea People Rep.	80.07	54.54	26.39
Market economy			
Africa			
27. Egypt	5.61	5.29	8.76
28. Ethiopia	11.04	10.04	12.39
29. Kenya	49.88	23.99	23.20
30. Madagascar	80.47	75.63	107.26

APPENDIX 9--Continued

PER CAPITA STARCHY STAPLE PRODUCTION AFTER CONVERTED IN CEREAL
Kg/Capita

Countries	1960	1970	1980
31. Mozambique	97.10	92.45	53.40
32. Somalia	2.715	2.87	2.77
33. Sudan	5.61	6.12	4.74
34. Tanzania	102.67	78.71	80.91
35. Zaire	121.90	141.97	131.06
36. Angola	91.70	90.91	83.56
37. Ghana	128.27	121.76	78.94
38. Ivory Coast	166.12	123.35	114.35
39. Morocco	5.16	5.35	5.66
40. Nigeria	141.14	126.84	105.29
41. Senegal	15.20	11.65	1.9
42. Zambia	13.71	12.32	10.04
Asia			
43. Bangladesh	--	6.99	5.59
44. India	4.11	0.8	0.71
45. Indonesia	49.31	28.07	31.50
46. Pakistan	0.81	2.99	1.99
47. Sri Lanka	10.86	10.75	13.59
48. Yemen Arab Rep.	2.69	2.07	6.36
49. Jordan	2.19	0.12	0.98
50. Korea Rep.	26.79	24.16	12.45
51. Philippines	15.26	9.65	19.99
Latin America			
52. Haiti	15.67	38.43	33.33
53. Bolivia	61.32	63.26	56.13
54. Colombia	35.32	31.06	44.18
55. Ecuador	37.66	46.41	19.14
Middle income CPEs			
56. Cuba	22.03	18.64	27.90
Market economy			
Africa			
57. Algeria	5.81	5.43	8.76
58. Tunisia	3.36	3.85	5.52

APPENDIX 9--Continued

PER CAPITA STARCHY STAPLE PRODUCTION AFTER CONVERTED IN CEREAL
Kg/Capita

	Countries	1960	1970	1980
	Asia			
59.	Cyprus	62.93	87.80	91.14
60.	Iran	5.66	4.20	5.21
61.	Iraq	0.40	0.49	2.31
62.	Lebanon	9.78	11.34	12.26
63.	Malaysia	13.92	10.84	11.84
64.	Syria	2.32	2.83	8.80
	Latin America			
65.	Brazil	106.96	100.95	61.69
66.	Chile	31.43	21.98	23.16
67.	Dominican Republic	26.91	21.79	14.61
68.	Jamaica	15.58	23.08	28.07
69.	Mexico	4.19	4.03	3.90
70.	Peru	56.69	57.23	36.83
	High income Market economy			
71.	Libya	2.87	2.16	9.47
72.	Hong Kong	2.49	0.290	--
73.	Kuwait	--	--	--
74.	Saudi Arabia	0.06	0.05	0.17
75.	Singapore	1.40	2.62	0.84
76.	United Arab Emirates	--	--	0.60
77.	Trinidad Tobago	4.06	5.84	5.52
78.	Venezuela	22.66	14.98	12.91

APPENDIX 10

TOTAL GROWTH OF GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
Developed			
CPEs			
1. Bulgaria	74.8	-248.72	614.24
2. Czechoslovakia	1852.73	-108.64	-6.83
3. German D. Rep.	2021.43	651.34	626.46
4. Poland	265.55	2156.28	5001.87
5. Romania	-218.54	-394.39	1831.1
6. Yugoslavia	1136.43	-529.71	569.95
7. USSR	-6045.17	395.25	366626.8
Market economy			
8. Japan	1074.07	9564.34	9636.68
9. Belgium	544.67	1048.72	-93.19
10. Denmark	921.67	-947.05	-622.49
11. Finland	-57	-324.26	433.99
12. German F. Rep.	-5061.48	6099.51	-2707.99
13. Greece	-254.6	81.04	-30.12
14. Ireland	-196.47	91.31	-97.8
15. Italy	1273.03	3335.45	-417.21
16. Netherlands	2162.33	-510.56	333.53
17. Norway	32.7	84.2	38.99
18. Portugal	46.77	1553.73	1881.3
19. Spain	439.27	1301.33	2970.2
20. Switzerland	48.1	518.05	-139.61
21. UK	-5658.57	7451.16	-7124.56
Developing			
Low income			
CPEs			
22. Kampuchia	17.5	-17.5	241.34
23. Vietnam Soc. Rep.	-468.8	1032.14	857.33
24. Yemen People Rep.	0	130.	77.92
25. China People Rep.	-1215.26	5887.09	11139.8
26. Korea People Rep.	-117.200	187.67	44.66
Market economy			
Africa			
27. Egypt	264.76	365.88	5135.7
28. Ethiopia	35.6	58.	226.25
29. Kenya	71.86	-121.6	398.13
30. Madagascar	10.8	10.3	187.1

APPENDIX 10--Continued

TOTAL GROWTH OF GRAIN IMPORT
(1000 mt)

	Countries	1950-60	1960-70	1970-80
31.	Mozambique	25.4	67.23	263.22
32.	Somalia	29.8	22.57	263.18
33.	Sudan	-71.9	236.93	-120.29
34.	Tanzania	-25.54	51.98	165.26
35.	Zaire	0	203.	204.62
36.	Angola	20.67	22.56	326.67
37.	Ghana	117.36	-6.89	103.33
38.	Ivory Coast	42.1	116.23	314.53
39.	Morocco	280.23	335.7	7229.04
40.	Nigeria	86.17	253.6	1722.69
41.	Senegal	224.7	65.3	166.06
42.	Zambia	-31.97	194.67	-25.74
	Asia			
43.	Bangladesh	0	1291.67	293.03
44.	India	777.67	-616.1	-3776.02
45.	Indonesia	970.3	223.6	1494.67
46.	Pakistan	1188.17	-1346.17	115.2
47.	Sri Lanka	379.67	148.26	-94.54
48.	Yemen Arab Rep.	0	93.33	359.26
49.	Jordan	216.67	-74.7	352.14
50.	Korea Rep.	371.67	2257.93	269.35
51.	Philippines	299.0	364.96	44.56
	Latin America			
52.	Haiti	33.6	19.27	147.19
53.	Bolivia	80.36	40.57	133.37
54.	Colombia	137.87	171.16	371.03
55.	Ecuador	59.97	67.63	179.02
Middle income CPEs				
56.	Cuba	220.07	714.66	831.29
Market economy				
	Africa			
57.	Algeria	537.07	111.23	2672.02
58.	Tunisia	-76.87	603.64	486.19

APPENDIX 10--Continued

TOTAL GROWTH OF GRAIN IMPORT
(1000 mt.)

	Countries	1950-60	1960-70	1970-80
	Asia			
59.	Cyprus	-25.0	66.93	210.57
60.	Iran	197.03	200.2	2528.95
61.	Iraq	331.13	7.17	2089.32
62.	Lebanon	171.6	259.57	35.54
63.	Malaysia	29.29	676.38	400.7
64.	Syria	776.37	32.83	371.59
	Latin America			
65.	Brazil	1795.33	-1077.37	5188.84
66.	Chile	741.6	-96.3	707.9
67.	Dominican Republic	151.87	-39.04	241.11
68.	Jamaica	149.77	400.3	120.98
69.	Mexico	-814.03	215.81	5822.13
70.	Peru	-183.6	277.8	555.9
	High income Market economy			
71.	Libya	98.67	266.7	427.21
72.	Hong Kong	330.77	167.3	151.24
73.	Kuwait	0	153.33	168.96
74.	Saudi Arabia	244.26	261.77	2582.47
75.	Singapore	-493.9	385.67	323.8
76.	United Arab Emirates	0	0	196.14
77.	Trinidad Tobago	117.7	62.83	91.45
78.	Venezuela	331.	546.63	1259.55

APPENDIX 11

CEREAL PRODUCTION EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
Developed			
CPEs			
1. Bulgaria	-1071.57	-1446.51	-1155.1
2. Czechoslovakia	-102.77	-1997.3	-1202.81
3. German D. Rep.	2342.36	-4077.68	-2346.64
4. Poland	-136.29	-1968.93	1360.78
5. Romania	4869.099	-4607.02	400.58
6. Yugoslavia	-364.03	2472.88	340.70
7. USSR	-32659.9	-20586.8	9369.69
Market economy			
8. Japan	-1015.55	4006.55	4788.43
9. Belgium	-197.52	16.33	-97.57
10. Denmark	206.44	-2121.52	-355.88
11. Finland	-218.99	-967.0	-9.29
12. German F.R.	-884.25	-5241.34	-3554.87
13. Greece	-625.19	-627.81	-1136.78
14. Ireland	-293.83	-53.02	-129.48
15. Italy	-1502.23	-1528.69	-899.66
16. Netherlands	54.26	280.28	318.86
17. Norway	-160.66	-160.01	-283.18
18. Portugal	-6.73	51.94	350.48
19. Spain	-38.34	-2605.1	1245.22
20. Switzerland	-10.44	-62.84	-131.80
21. UK	-961.22	-3769.06	-4623.35
Developing			
Low income			
CPEs			
22. Kampuchia	4.46	-670.52	2272.50
23. Vietnam Soc. Rep.	-6626.48	2672.9	446.09
24. Yemen People Rep.	-32.	6.48	2.08
25. China People Rep.	-43530.3	5180.08	-50374.8
26. Korea People Rep.	-3290.2	1916.37	-1431.68
Market economy			
Africa			7.387
27. Egypt	2.48	-531.65	1040.36
28. Ethiopia	246.28	-646.07	972.96
29. Kenya	36.55	-1465.14	879.58
30. Madagascar	-63.45	-293.45	325.91

APPENDIX 11--Continued

CEREAL PRODUCTION EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
31. Mozambique	-138.84	116.69	312.96
32. Somalia	6.08	-131.93	42.02
33. Sudan	81.74	-773.76	-350.13
34. Tanzania	159.56	47.90	267.24
35. Zaire	270.32	-101.02	46.09
36. Angola	-108.19	40.38	295.16
37. Ghana	242.75	-153.80	218.28
38. Ivory Coast	5.92	-139.38	41.16
39. Morocco	1046.14	-1319.33	1907.32
40. Nigeria	-784.28	1472.8	1023.36
41. Senegal	118.63	-194.73	141.90
42. Zambia	-110.61	44.59	224.83
Asia			
43. Bangladesh	0	0	566.99
44. India	-10593.7	-4432.62	883.31
45. Indonesia	-1137.12	-1838.4	-4682.6
46. Pakistan	-682.59	2738.69	-898.5
47. Sri Lanka	-178.80	-300.91	-241.3
48. Yemen Arab Rep.	200.35	-279.06	424.05
49. Jordan	106.59	4.6	80.85
50. Korea Rep.	-30.90	-1434.66	897.34
51. Philippines	-416.53	81.08	-917.08
Latin America			
52. Haiti	46.06	-39.13	223.82
53. Bolivia	59.27	-189.93	63.15
54. Colombia	-2.64	166.77	-717.57
55. Ecuador	-56.02	23.75	139.08
Middle income CPEs			
56. Cuba	-119.47	251.43	-91.20
Market economy			
Africa			
57. Algeria	582.66	176.78	374.83
58. Tunisia	303.22	-132.03	-205.39

APPENDIX 11--Continued

CEREAL PRODUCTION EFFECT ON GRAIN IMPORT
(1000 mt)

	Countries	1950-60	1960-70	1970-80
	Asia			
59.	Cyprus	33.95	-77.13	53.16
60.	Iran	-386.23	-32.42	-40.21
61.	Iraq	205.69	64.38	444.73
62.	Lebanon	26.52	56.56	14.33
63.	Malaysia	-255.57	-176.84	64.63
64.	Syria	516.0	16.87	-1003.72
	Latin America			
65.	Brazil	-2148.7	-762.44	-839.21
66.	Chile	-64.89	197.69	317.15
67.	Dominican Republic	-7.67	44.91	-101.39
68.	Jamaica	13.76	4.01	-1.54
69.	Mexico	-1612.	-2494.96	-311.24
70.	Peru	69.58	-106.80	372.54
	High income Market economy			
71.	Libya	-21.72	43.87	-31.47
72.	Hong Kong	18.31	17.99	15.00
73.	Kuwait	0	0	0
74.	Saudi Arabia	-51.51	-98.54	218.38
75.	Singapore	0	0	0
76.	United Arab Emirates	0	0	-0.29
77.	Trinidad Tobago	12.27	2.32	-13.75
78.	Venezuela	28.6	-156.86	-443.06

APPENDIX 12

SUBSTITUTION PRODUCE EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1960-70	1970-80
Developed		
CPEs		
1. Bulgaria	14.22	4.73
2. Czechoslovakia	286.22	503.5
3. German DR	246.70	-121.32
4. Poland	736.23	2537.78
5. Romania	662.39	13.33
6. Yugoslavia	689.72	17.23
7. USSR	-330.87	6758.3
Market economy		
8. Japan	1261.77	570.03
9. Belgium	78.69	62.26
10. Denmark	126.20	3.69
11. Finland	54.83	85.51
12. German F. Rep.	2054.14	2052.64
13. Greece	-87.89	-24.47
14. Ireland	139.98	128.02
15. Italy	147.47	244.21
16. Netherlands	-272.80	-132.87
17. Norway	89.31	98.37
18. Portugal	-31.14	39.67
19. Spain	23.98	-34.41
20. Switzerland	79.29	30.39
21. UK	116.58	243.22
Developing		
Low income		
CPEs		
22. Kampuchia	3.89	-23.51
23. Vietnam Soc. Rep.	215.30	-857.73
24. Yemen People Rep.	0.10	1.06
25. China People Rep.	1366.27	2821.38
26. Korea People Rep.	210.59	391.17
Market economy		
Africa		
27. Egypt	8.28	-115.62
28. Ethiopia	20.13	-59.88
29. Kenya	184.62	8.97
30. Madagascar	26.13	-215.05

APPENDIX 12--Continued

SUBSTITUTION PRODUCE EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1960-70	1970-80
31. Mozambique	29.68	317.91
32. Somalia	-0.31	0.28
33. Sudan	-6.08	19.52
34. Tanzania	221.36	-29.25
35. Zaire	-292.81	236.13
36. Angola	3.695	41.07
37. Ghana	43.62	368.89
38. Ivory Coast	138.16	47.77
39. Morocco	-2.15	-4.81
40. Nigeria	614.06	1214.66
41. Senegal	11.13	41.6
42. Zambia	4.46	9.44
Asia		
43. Bangladesh	0	96.08
44. India	1403.76	83.92
45. Indonesia	1966.88	-410.66
46. Pakistan	-202.73	60.61
47. Sri Lanka	1.01	-35.49
48. Yemen Arab Rep.	2.50	-20.78
49. Jordan	3.50	-1.97
50. Korea Rep.	64.84	367.36
51. Philippines	154.38	-392.07
Latin America		
52. Haiti	-96.74	23.50
53. Bolivia	-6.73	30.56
54. Colombia	60.17	-279.04
55. Ecuador	-37.79	162.54
Middle income CPEs		
56. Cuba	22.99	-79.14
Market economy		
Africa		
57. Algeria	4.14	-44.26
58. Tunisia	-2.03	-8.60

APPENDIX 12--Continued

SUBSTITUTION PRODUCE EFFECT ON GRAIN IMPORT
(1000 mt)

	Countries	1960-70	1970-80
	Asia		
59.	Cyprus	14.01	-2.05
60.	Iran	29.48	-28.59
61.	Iraq	-0.6	-17.08
62.	Lebanon	-2.79	-2.28
63.	Malaysia	24.96	-10.44
64.	Syria	-2.36	-37.38
	Latin America		
65.	Brazil	395.12	3737.6
66.	Chile	68.87	-11.01
67.	Dominican Republic	15.32	32.5
68.	Jamaica	-12.11	-9.31
69.	Mexico	5.57	6.59
70.	Peru	5.57	6.59
		-5.94	275.51
	High income Market economy		
71.	Libya	0.84	-14.48
72.	Hong Kong	6.56	1.14
73.	Kuwait	0	0
74.	Saudi Arabia	0.07	-0.8
75.	Singapore	-1.99	3.69
76.	United Arab Emirates	0	-0.14
77.	Trinidad Tobago	-1.50	0.33
78.	Venezuela	56.08	22.13

APPENDIX 13

POPULATION EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
Developed			
CPEs			
1. Bulgaria	1.50	-16.85	16.15
2. Czechoslovakia	176.05	84.99	110.42
3. German D. Rep.	-7.8	-198.99	-63.68
4. Poland	36.54	206.46	6337.73
5. Romania	-27.51	-64.99	98.36
6. Yugoslavia	71.96	39.34	89.12
7. USSR	-937.40	-657.97	2658.34
Market economy			
8. Japan	532.78	1378.56	2521.57
9. Belgium	104.91	245.56	62.93
10. Denmark	73.08	9.38	-18.83
11. Finland	27.96	-1.42	14.13
12. German F. Rep.	-79.97	266.02	38.51
13. Greece	15.62	13.21	18.43
14. Ireland	-16.84	18.07	37.14
15. Italy	144.14	487.13	335.77
16. Netherlands	436.07	375.64	274.20
17. Norway	50.16	48.37	34.96
18. Portugal	13.30	44.36	306.80
19. Spain	48.58	202.17	473.94
20. Switzerland	102.26	197.46	18.84
21. UK	23.45	459.71	8.79
Developing			
Low income			
CPEs			
22. Kampuchia	2.27	0	49.29
23. Vietnam Soc. Rep.	-77.12	169.07	283.46
24. Yemen People Rep.	0	44.03	43.23
25. China People Rep.	-192.75	1006.75	2160.61
26. Korea People Rep.	1.65	68.50	47.9
Market economy			
Africa			
27. Egypt	161.72	249.41	1291.6
28. Ethiopia	0	12.42	62.35
29. Kenya	5.97	-30.58	98.59
30. Madagascar	1.62	3.72	45.56

APPENDIX 13--Continued

POPULATION EFFECT ON GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
31. Mozambique	4.30	23.14	82.54
32. Somalia	1.72	14.9	74.17
33. Sudan	-18.66	27.55	10.96
34. Tanzania	-3.96	6.82	48.55
35. Zaire	0	66.12	95.86
36. Angola	-9.90	-11.38	55.15
37. Ghana	30.28	25.26	56.95
38. Ivory Coast	8.41	62.00	158.0
39. Morocco	-9.97	67.64	1915.92
40. Nigeria	16.67	80.04	553.99
41. Senegal	47.23	76.59	112.42
42. Zambia	-2.63	41.68	42.11
Asia			
43. Bangladesh	0	1291.67	364.93
44. India	750.99	779.04	-32.74
45. Indonesia	177.96	283.36	588.08
46. Pakistan	150.65	116.471	-27.42
47. Sri Lanka	180.67	199.65	136.27
48. Yemen Arab Rep.	0	15.36	83.25
49. Jordan	59.69	42.92	145.03
50. Korea Rep.	61.73	561.16	504.05
51. Philippines	100.02	204.67	202.87
Latin America			
52. Haiti	6.93	4.15	41.61
53. Bolivia	16.61	32.36	69.63
54. Colombia	34.48	115.85	150.18
55. Ecuador	5.68	25.08	69.47
Middle income CPEs			
56. Cuba	91.06	246.01	290.41
Market economy			
Africa			
57. Algeria	89.09	93.55	914.53
58. Tunisia	-29.17	75.51	172.85

APPENDIX 13--Continued

POPULATION EFFECT ON GRAIN IMPORT
(1000 mt)

	Countries	1950-60	1960-70	1970-80
	Asia			
59.	Cyprus	6.42	10.09	18.24
60.	Iran	47.67	128.65	759.64
61.	Iraq	80.19	77.53	686.53
62.	Lebanon	54.79	149.67	125.71
63.	Malaysia	6.54	158.85	271.41
64.	Syria	81.21	84.71	194.72
	Latin America			
65.	Brazil	402.98	267.18	1493.57
66.	Chile	121.08	139.63	209.08
67.	Dominican Republic	41.71	35.61	82.91
68.	Jamaica	21.23	35.81	56.53
69.	Mexico	-97.73	-53.19	1587.75
70.	Peru	102.88	133.10	296.62
	High income Market economy			
71.	Libya	13.64	145.60	144.19
72.	Hong Kong	176.74	159.60	147.52
73.	Kuwait	0	107.37	395.88
74.	Saudi Arabia	90.58	122.97	93.47
75.	Singapore	0	81.97	93.47
76.	United Arab Emirates	0	0	140.21
77.	Trinidad Tobago	29.51	32.13	26.72
78.	Venezuela	114.34	290.69	614.38

APPENDIX 14

UNEXPLAINED RESIDUAL OF GRAIN IMPORT
(1000 mt)

Countries	1950-60	1960-70	1970-80
Developed			
CPEs			
1. Bulgaria	1144.88	1200.42	1748.47
2. Czechoslovakia	1779.45	1517.45	579.06
3. German D. Rep.	-313.13	4681.32	3158.1
4. Poland	365.3	3182.52	-5235.3
5. Romania	-5058.12	3615.23	1318.83
6. Yugoslavia	1428.5	-3731.64	122.9
7. USSR	27547.2	21970.9	17840.5
Market economy			
8. Japan	1556.84	2917.47	1756.65
9. Belgium	637.28	706.15	-120.81
10. Denmark	642.15	1038.89	-251.97
11. Finland	133.74	589.33	343.64
12. German F. Rep.	-4097.0	9020.68	-1244.27
13. Greece	354.96	783.52	1112.70
14. Ireland	114.20	-13.72	-133.47
15. Italy	2631.12	4229.53	-98.13
16. Netherlands	1672.0	-893.67	-126.67
17. Norway	143.20	106.53	188.84
18. Portugal	40.19	1488.57	1184.35
19. Spain	429.03	3680.28	3775.90
20. Switzerland	-43.72	304.15	-57.04
21. UK	-4720.8	10643.9	-2753.15
Developing			
Low income			
CPEs			
22. Kampuchia	10.77	649.13	-2056.93
23. Vietnam Soc. Rep.	6234.8	-2025.13	985.51
24. Yemen People Rep.	32.0	79.39	32.55
25. China People Rep.	42507.8	-1666.02	56532.7
26. Korea People Rep.	3171.35	-2007.79	1037.27
Market economy			
Africa			
27. Egypt	100.56	639.84	2919.35
28. Ethiopia	-210.78	671.52	-749.18
29. Kenya	29.33	1189.5	-589.01

APPENDIX 14--Continued

UNEXPLAINED RESIDUAL OF GRAIN IMPORT
(1000 mt)

	Countries	1950-60	1960-70	1970-80
30.	Madagascar	72.62	273.90	30.67
31.	Mozambique	159.94	-102.28	-450.20
32.	Somalia	22.0	139.90	146.71
33.	Sudan	-134.98	989.22	199.36
34.	Tanzania	-181.14	-224.10	-120.98
35.	Zaire	-270.32	530.71	-173.46
36.	Angola	138.55	-10.09	-64.71
37.	Ghana	44.32	78.03	-540.79
38.	Ivory Coast	27.77	55.45	67.60
39.	Morocco	-755.93	1589.53	3410.61
40.	Nigeria	853.78	-1913.3	-1069.32
41.	Senegal	58.84	172.30	-129.87
42.	Zambia	81.28	103.94	-302.12
	Asia			
43.	Bangladesh	0	0	-734.96
44.	India	10620.4	1633.72	-4710.51
45.	Indonesia	1929.47	-188.24	5999.87
46.	Pakistan	1720.11	-3998.81	980.51
47.	Sri Lanka	377.80	248.51	45.98
48.	Yemen Arab Rep.	-200.35	354.52	-127.26
49.	Jordan	50.39	-125.73	128.23
50.	Korea Rep.	340.85	3066.6	-1499.4
51.	Philippines	615.51	-75.17	1150.84
	Latin America			
52.	Haiti	-19.39	150.99	-141.74
53.	Bolivia	4.48	204.86	-29.97
54.	Colombia	106.02	-171.62	1217.46
55.	Ecuador	110.30	56.59	-192.07
	Middle income CPEs			
56.	Cuba	248.49	194.23	711.22
	Market economy			
	Africa			
57.	Algeria	-134.68	-163.23	1421.93
58.	Tunisia	-350.92	662.19	527.33

APPENDIX 14--Continued

UNEXPLAINED RESIDUAL OF GRAIN IMPORT
(1000 mt)

	Countries	1950-60	1960-70	1970-80
	Asia			
59.	Cyprus	-65.37	147.98	141.22
60.	Iran	535.59	74.49	1838.11
61.	Iraq	45.25	-134.13	975.14
62.	Lebanon	90.29	56.14	-102.22
63.	Malaysia	278.32	669.4	135.1
64.	Syria	179.16	-66.38	1217.97
	Latin America			
65.	Brazil	3541.05	-977.22	796.88
66.	Chile	685.42	-502.49	192.68
67.	Dominican Republic	117.83	-134.88	227.09
68.	Jamaica	114.78	72.56	75.30
69.	Mexico	895.70	2758.4	4539.03
70.	Peru	11.14	257.44	-388.77
	High income Market economy			
71.	Libya	106.76	76.39	207.83
72.	Hong Kong	135.73	-16.85	-9.10
73.	Kuwait	0	45.96	21.44
74.	Saudi Arabia	205.19	237.28	1555.07
75.	Singapore	-493.9	305.69	226.34
76.	United Arab Emirates	0	0	56.36
77.	Trinidad Tobago	75.92	29.88	78.14
78.	Venezuela	188.02	356.72	1066.1

APPENDIX 15

GROSS DOMESTIC PRODUCT
BILLIONS US $ DEFLATED AT 1975

Countries	1960	1970	1980
Developed			
CPEs			
1. Bulgaria	7.18	13.36	24.04
2. Czechoslovakia	23.70	36.84	58.13
3. German D. Rep.	34.30	50.57	78.54
4. Poland	26.95	49.47	90.69
5. Romania	5.40	13.57	33.95
6. Yugoslavia	11.00	20.56	38.26
7. USSR	291.05	487.75	789.78
Market economy			
8. Japan	132.92	385.92	619.41
9. Belgium	30.18	49.43	67.14
10. Denmark	20.03	31.74	40.27
11. Finland	13.16	21.74	30.78
12. German F. Rep.	225.29	356.21	470.39
13. Greece	7.07	14.74	23.31
14. Ireland	4.05	6.18	9.03
15. Italy	94.82	162.78	221.53
16. Netherlands	40.41	66.85	92.81
17. Norway	13.41	21.23	33.62
18. Portugal	6.01	11.06	17.59
19. Spain	37.33	76.96	112.01
20. Switzerland	33.09	53.09	60.56
21. UK	144.39	191.57	228.99
Developing			
Low income			
CPEs			
22. Kampuchia	0.31	0.45	0.58
23. Vietnam Soc. Rep.	2.59	4.20	5.96
24. Yemen People Rep.	0.19	0.35	0.54
25. China People Rep.	50.71	92.84	154.66
26. Korea People Rep.	1.78	4.66	8.55
Market economy			
Africa			
27. Egypt	6.50	9.69	18.69
28. Ethiopia	1.57	2.34	3.49
29. Kenya	0.55	1.39	6.19
30. Madagascar	0.57	1.09	3.08

APPENDIX 15--Continued

GROSS DOMESTIC PRODUCT
BILLIONS US $ DEFLATED AT 1975

	Countries	1960	1970	1980
31.	Mozambique	1.75	1.83	2.47
32.	Somalia	0.21	0.22	0.30
33.	Sudan	1.11	2.19	2.28
34.	Tanzania	0.61	1.65	2.69
35.	Zaire	0.90	3.41	3.46
36.	Angola	1.56	1.65	1.70
37.	Ghana	3.33	4.52	5.71
38.	Ivory Coast	1.45	3.73	7.94
39.	Morocco	4.63	6.52	11.87
40.	Nigeria	16.35	22.05	50.39
41.	Senegal	0.59	0.87	2.90
42.	Zambia	1.06	2.17	2.35
	Asia			
43.	Bangladesh	2.72*	5.55	11.23
44.	India	49.12	71.71	104.31
45.	Indonesia	14.29	20.69	43.73
46.	Pakistan	8.75	9.83	15.26
47.	Sri Lanka	0.96	1.69	2.67
48.	Yemen Arab Rep.	0.23	0.47	1.18
49.	Jordan	0.22	0.49	2.91
50.	Korea Rep.	4.51	13.05	29.63
51.	Philippines	6.70	11.13	20.59
	Latin America			
52.	Haiti	0.54	0.57	0.85
53.	Bolivia	0.99	1.85	2.88
54.	Colombia	5.61	9.32	16.35
55.	Ecuador	1.84	2.52	5.89
	Middle income CPEs			
56.	Cuba	4.46	4.98	5.16
	Market economy			
	Africa			
57.	Algeria	2.68	14.38	34.36
58.	Tunisia	1.51	2.58	5.62

APPENDIX 15--Continued

GROSS DOMESTIC PRODUCT
BILLIONS US $ DEFLATED AT 1975

	Countries	1960	1970	1980
	Asia			
59.	Cyprus	0.42	0.78	1.14
60.	Iran	13.18	31.62	41.64
61.	Iraq	3.58	8.94	22.55
62.	Lebanon	0.89	1.49	3.9
63.	Malaysia	2.60	6.04	13.06
64.	Syria	1.76	2.95	6.76
	Latin America			
65.	Brazil	34.86	70.68	161.81
66.	Chile	7.02	11.43	15.60
67.	Dominican Republic	1.22	1.99	2.48
68.	Jamaica	1.02	1.61	1.50
69.	Mexico	32.52	64.10	121.46
70.	Peru	5.42	9.46	13.20
	High income Market economy			
71.	Libya	1.30	9.53	19.85
72.	Hong Kong	0.66	1.95	13.30
73.	Kuwait	8.97	11.65	14.35
74.	Saudi Arabia	8.56	22.86	61.25
75.	Singapore	1.41	3.41	8.16
76.	United Arab Emirates	0.19	0.77	14.04
77.	Trinidad Tobago	0.35	2.04	3.40
78.	Venezuela	21.79	28.34	58.93

Sources: The World Bank, World Development Report 1982.
United Nations, Year Book of National Accounts Statistic Vol. (III) 1973.
International Financial Statistics, International Monetary Fund, Year Book, 1982.

APPENDIX 16

PER CAPITA REAL GROSS DOMESTIC PRODUCT
DEFLATED AT 1975 US $

Countries	1960	1970	1980
Developed			
CPEs	1095.62	1759.65	2852.94
1. Bulgaria	908.86	1571.76	2701.12
2. Czechoslovakia	1729.93	2576.22	3799.35
3. German D. Rep.	1874.32	2957.31	4702.99
4. Poland	907.41	1522.15	2547.47
5. Romania	293.48	668.47	1529.28
6. Yugoslavia	597.83	1012.81	1715.70
7. USSR	1357.51	2008.86	2974.69
Market eccnomy	2728.13	4188.58	5429.04
8. Japan	1412.54	3700.09	5303.17
9. Belgium	3280.43	5148.96	6582.35
10. Denmark	4354.35	6477.55	7896.08
11. Finland	2990.91	4726.09	6412.50
12. German F. Rep.	3897.75	5868.37	7636.20
13. Greece	851.81	1656.18	2428.13
14. Ireland	1446.43	2060.0	2736.36
15. Italy	1919.43	3031.28	3886.49
16. Netherlands	3513.93	5142.31	6582.27
17. Norway	3725.0	5443.59	8200.0
18. Portugal	682.95	1228.89	1794.89
19. Spain	1240.20	2290.48	3011.02
20. Switzerland	6127.78	8426.98	9462.5
21. UK	2750.29	3439.32	4074.56
Developing			
Low income			
CPEs	126.79	168.92	220.53
22. Kampuchia	63.27	63.38	65.17
23. Vietnam Soc. Rep.	87.80	100.24	113.96
24. Yemen People Rep.	190.0	233.33	284.21
25. China People Rep.	78.44	112.42	161.64
26. Korea People Rep.	214.46	335.25	477.65
Market economy			
Africa	231.63	279.64	368.22
27. Egypt	250.97	290.99	446.06
28. Ethiopia	78.5	91.76	107.06
29. Kenya	77.46	123.01	377.44
30. Madagascar	107.55	160.29	354.02

APPENDIX 16--Continued

PER CAPITA REAL GROSS DOMESTIC PRODUCT
DEFLATED AT 1975 US $

	Countries	1960	1970	1980
31.	Mozambique	273.44	225.93	235.24
32.	Somalia	105.0	78.57	83.33
33.	Sudan	94.07	155.32	123.91
34.	Tanzania	66.30	124.06	150.28
35.	Zaire	61.64	157.87	122.26
36.	Angola	339.13	294.64	239.44
37.	Ghana	497.01	525.58	488.03
38.	Ivory Coast	453.13	703.77	1005.06
39.	Morocco	399.14	431.79	584.73
40.	Nigeria	381.12	391.65	653.57
41.	Senegal	190.32	202.33	508.77
42.	Zambia	331.25	516.67	412.28
	Asia	125.16	189.08	360.27
43.	Bangladesh	53.13	81.26	126.61
44.	India	114.50	133.02	157.19
45.	Indonesia	154.32	173.14	287.89
46.	Pakistan	94.39	162.75	185.19
47.	Sri Lanka	96.97	135.2	179.19
48.	Yemen Arab Rep.	57.5	94.0	210.71
49.	Jordan	129.41	213.04	909.38
50.	Korea Rep.	182.59	415.61	781.79
51.	Philippines	243.64	293.67	404.52
	Latin America	309.30	354.71	501.23
52.	Haiti	128.57	123.91	146.55
53.	Bolivia	282.86	430.23	514.29
54.	Colombia	397.87	437.56	607.81
55.	Ecuador	427.91	427.12	736.25
	Middle income CPEs			
56.	Cuba	655.88	579.07	521.21
	Market economy			
	Africa	301.58	793.54	1362.72
57.	Algeria	243.64	1081.2	1847.31
58.	Tunisia	359.52	505.88	878.13

APPENDIX 16--Continued

PER CAPITA REAL GROSS DOMESTIC PRODUCT
DEFLATED AT 1975 US $

	Countries	1960	1970	1980
	Asia	531.10	835.69	1236.87
59.	Cyprus	840.0	1300.38	1628.57
60.	Iran	652.48	1113.38	1092.91
61.	Iraq	504.23	961.29	1734.62
62.	Lebanon	494.44	596.0	1218.75
63.	Malaysia	320.99	575.24	960.29
64.	Syria	374.47	468.25	786.05
	Latin America	577.32	878.36	1044.49
65.	Brazil	530.59	742.44	1280.14
66.	Chile	961.64	1215.96	1405.41
67.	Dominican Republic	420.69	442.22	420.34
68.	Jamaica	637.50	894.44	681.82
69.	Mexico	913.48	1274.35	1737.63
70.	Peru	497.25	700.74	741.57
	High income Market economy	6768.45	4501.02	6894.16
71.	Libya	1083.33	5015.79	6844.83
72.	Hong Kong	227.59	500.0	2770.83
73.	Kuwait	44850.00	16642.86	10250.0
74.	Saudi Arabia	1783.33	3687.10	7291.67
75.	Singapore	881.25	1623.81	3400.0
76.	United Arab Emirates	1900.0	3850.0	17550.0
77.	Trinidad Tobago	437.5	2040.0	3090.91
78.	Venezuela	2984.93	2648.60	3955.03

APPENDIX 17

GRAIN DEMAND 1960
(million mt)

Countries	Rice	Wheat	Feed
Developed			
CPEs	0.78	80.28	19.46
1. Bulgaria	0.04	4.81	0
2. Czechoslovakia	0.06	2.84	0.03
3. German D. Rep.	0.03	3.34	0
4. Poland	0.06	3.15	8.77
5. Romania	0.04	3.30	0
6. Yugoslavia	0.01	3.98	10.66
7. USSR	0.49	58.86	0
Market economy	12.96	33.76	61.70
8. Japan	11.91	3.85	4.41
9. Belgium	0.04	1.15	2.60
10. Denmark	0.01	0.23	4.21
11. Finland	0.01	0.45	1.38
12. German F. Rep.	0.15	4.25	10.06
13. Greece	0.05	1.48	1.23
14. Ireland	0	0.42	1.05
15. Italy	0.31	8.91	10.93
16. Netherlands	0.04	1.12	5.55
17. Norway	0.01	0.27	0.73
18. Portugal	0.12	0.72	1.18
19. Spain	0.19	4.86	4.90
20. Switzerland	0.02	0.60	0.16
21. UK	0.10	0.60	0.16
Developing			
Low income			
CPEs	8.33	23.4	0
22. Kampuchia	1.19	0.04	0
23. Vietnam Soc. Rep.	5.98	0.11	0
24. Yemen People Rep.	0.02	0.05	0
25. China People Rep.	0	22.91	0
26. Korea People Rep.	1.14	0.29	0
Market economy			
Africa	2.07	4.73	0.09
27. Egypt	0.62	2.49	0
28. Ethiopia	0	0.65	0
29. Kenya	0.01	0.09	0.02
30. Madagascar	0.70	0	0

APPENDIX 17--Continued

GRAIN DEMAND 1960
(million mt)

	Countries	Rice	Wheat	Feed
31.	Mozambique	0.08	0.03	0
32.	Somalia	0.02	0	0
33.	Sudan	0	0.12	0
34.	Tanzania	0.07	0.02	0
35.	Zaire	0	0.03	0
36.	Angola	0.02	0.03	0
37.	Ghana	0	0.08	0
38.	Ivory Coast	0.14	0.01	0.02
39.	Morocco	0.01	1.04	0
40.	Nigeria	0.23	0.08	0.05
41.	Senegal	0.17	0.05	0
42.	Zambia	0	0.01	0
	Asia	64.81	21.37	1.37
43.	Bangladesh	9.98	0.03	0
44.	India	36.06	14.20	0.35
45.	Indonesia	10.62	0.16	0
46.	Pakistan	0.99	5.45	0.12
47.	Sri Lanka	1.11	0.31	0
48.	Yemen Arab Rep.	--	--	0
49.	Jordan	0.02	0.23	0.03
50.	Korea Rep.	3.44	0.60	0.16
51.	Philippines	2.59	0.39	0.71
	Latin America	0.50	0.63	0.71
52.	Haiti	0.04	0.03	0
53.	Bolivia	0.03	0.20	0.26
54.	Colombia	0.35	0.30	0.36
55.	Ecuador	0.08	0.10	0.09
	Middle income CPEs			
56.	Cuba	0.33	0.22	0
	Market economy			
	Africa	0.01	2.27	0.09
57.	Algeria	0.01	1.75	0
58.	Tunisia	0	0.52	0.09

APPENDIX 17--Continued

GRAIN DEMAND 1960
(million mt)

	Countries	Rice	Wheat	Feed
	Asia	1.63	5.57	0.89
59.	Cyprus	0	0.1	0
60.	Iran	0.41	3.169	0.66
61.	Iraq	0.11	0.77	0
62.	Lebanon	0.02	0.26	0.13
63.	Malaysia	1.06	0.28	0.1
64.	Syria	0.03	1.00	0
	Latin America	4.38	5.69	11.15
65.	Brazil	3.74	2.60	9.82
66.	Chile	0.10	1.18	0.50
67.	Dominican Republic	0.08	0.03	0.06
68.	Jamaica	0.07	0.10	0
69.	Mexico	0.16	1.22	0.36
70.	Peru	0.23	0.56	0.41
	High income Market economy	0.79	0.91	0.08
71.	Libya	0.01	0.14	0
72.	Hong Kong	0.38	0.11	0
73.	Kuwait	0.02	0.02	0
74.	Saudi Arabia	0.09	0.26	0
75.	Singapore	0.19	0.08	0
76.	United Arab Emirates	0	0	0
77.	Trinidad Tobago	0.04	0.08	0
78.	Venezuela	0.06	0.22	0.08

APPENDIX 17--Continued

GRAIN DEMAND 1970
(million mt)

Countries	Rice	Wheat	Feed
Developed			
CPEs	1.53	112.74	25.02
1. Bulgaria	0.04	2.54	NA
2. Czechoslovakia	0.08	5.03	0.03
3. German D. Rep.	0.03	3.37	NA
4. Poland	0.08	3.95	11.65
5. Romania	0.10	3.60	NA
6. Yugoslavia	0.05	4.63	13.34
7. USSR	1.15	89.62	NA
Market economy	12.74	35.31	97.70
8. Japan	11.69	4.98	13.74
9. Belgium	0.04	1.1	3.23
10. Denmark	0.01	0.28	6.0
11. Finland	0.02	0.35	1.69
12. German F. Rep.	0.11	4.05	15.79
13. Greece	0.05	1.68	2.24
14. Ireland	0	0.36	1.19
15. Italy	0.29	10.22	18.22
16. Netherlands	0.03	1.04	4.85
17. Norway	0	0.28	1.05
18. Portugal	0.13	0.79	1.52
19. Spain	0.22	3.99	11.89
20. Switzerland	0.02	0.61	1.28
21. UK	0.13	5.58	15.01
Developing			
Low income			
CPEs	10.71	33.2	0
22. Kampuchia	1.76	0.22	0
23. Vietnam Soc. Rep.	7.04	1.06	0
24. Yemen People Rep.	0.04	0.13	0
25. China People Rep.	0	31.39	0
26. Korea People Rep.	1.87	0.40	0
Market economy			
Africa	3.61	7.98	0.48
27. Egypt	1.23	3.49	0
28. Ethiopia	0	0.85	0
29. Kenya	0.03	0.17	0.29
30. Madagascar	1.22	0	0

APPENDIX 17--Continued

GRAIN DEMAND 1970
(million mt)

	Countries	Rice	Wheat	Feed
31.	Mozambique	0.08	0.09	0
32.	Somalia	0.03	0.02	0
33.	Sudan	0	0.24	0
34.	Tanzania	0.13	0.04	0
35.	Zaire	0	0.09	0
36.	Angola	0.03	0.08	0
37.	Ghana	0	0.07	0
38.	Ivory Coast	0.29	0.12	0.12
39.	Morocco	0.03	2.35	0
40.	Nigeria	0.29	0.24	0.07
41.	Senegal	0.25	0.07	0
42.	Zambia	0	0.06	0
	Asia	78.8	33.31	2.5
43.	Bangladesh	11.49	0.09	0
44.	India	41.51	21.69	0.37
45.	Indonesia	13.83	0.57	0
46.	Pakistan	2.02	7.68	0.17
47.	Sri Lanka	1.44	0.56	0
48.	Yemen Arab Rep.	0.01	0	0
49.	Jordan	0.02	0.27	0.11
50.	Korea Rep.	4.95	1.90	0.57
51.	Philippines	3.53	0.55	1.28
	Latin America	0.63	0.71	0.67
52.	Haiti	1.05	0.04	0
53.	Bolivia	0.04	0.21	0.29
54.	Colombia	0.43	0.31	0.31
55.	Ecuador	0.11	0.15	0.17
	Middle income CPEs			
56.	Cuba	0.50	1.07	0
	Market economy			
	Africa	0.01	2.28	0.11
57.	Algeria	0.01	1.60	0
58.	Tunisia	0	0.68	0.11

APPENDIX 17--Continued

GRAIN DEMAND 1970
(million mt)

	Countries	Rice	Wheat	Feed
	Asia	2.41	7.52	1.24
59.	Cyprus	0	0.1	0
60.	Iran	0.78	4.18	0.95
61.	Iraq	0.22	1.26	0
62.	Lebanon	0.02	0.36	0.15
63.	Malaysia	1.35	0.37	0.14
64.	Syria	0.04	1.25	0
	Latin America	5.43	7.64	17.45
65.	Brazil	4.55	3.42	13.50
66.	Chile	0.09	1.39	1.14
67.	Dominican Republic	0.14	0.08	0.08
68.	Jamaica	0	0.17	0
69.	Mexico	0.26	1.81	2.22
70.	Peru	0.39	0.77	0.51
High income				
	Market economy	0.89	1.86	0.24
71.	Libya	0.02	0.29	0
72.	Hong Kong	0.33	0.15	0
73.	Kuwait	0.04	0.07	0
74.	Saudi Arabia	0.15	0.44	0
75.	Singapore	0.20	0.21	0
76.	United Arab Emirates	0	0	0
77.	Trinidad Tobago	0.04	0.10	0
78.	Venezuela	0.11	0.60	0.24

APPENDIX 17--Continued

GRAIN DEMAND 1980
(million mt)

Countries	Rice	Wheat	Feed
Developed			
CPEs			
1. Bulgaria	0.05	2.53	5.25
2. Czechoslovakia	0.08	1.74	9.95
3. German D. Rep.	0.04	1.87	8.79
4. Poland	0.11	4.71	20.61
5. Romania	0.10	30.48	23.14
6. Yugoslavia	0.05	4.78	16.94
7. USSR	3.05	62.10	144.16
Market economy			
8. Japan	10.08	5.93	26.0
9. Belgium	0.06	1.03	2.03
10. Denmark	0.01	0.33	5.87
11. Finland	0.02	0.41	2.68
12. German F. Rep.	0.12	4.70	18.22
13. Greece	0.05	1.55	4.33
14. Ireland	0	0.30	1.26
15. Italy	0.35	10.60	16.93
16. Netherlands	0.050.05	1.03	4.71
17. Norway	0.01	0.32	1.35
18. Portugal	0.18	1.08	5.30
19. Spain	0.23	4.27	21.17
20. Switzerland	0.02	0.45	1.79
21. UK	0.14	5.49	12.58
Developing			
Low income			
CPEs			
22. Kampuchia	1.07	0.20	--
23. Vietnam Soc. Rep.	6.56	1.20	--
24. Yemen People Rep.	0.04	0.85	--
25. China People Rep.	--	71.37	--
26. Korea People Rep.	2.42	0.85	
Market economy			
Africa			
27. Egypt	1.46	7.12	2.99
28. Ethiopia	0	0.64	0
29. Kenya	0.03	0.23	0.10
30. Madagascar	1.62	0	0

APPENDIX 17--Continued

GRAIN DEMAND 1980
(million mt)

	Countries	Rice	Wheat	Feed
31.	Mozambique	0.12	0.14	0
32.	Somalia	0.05	0.08	0.44
33.	Sudan	0	0.55	0
34.	Tanzania	0.21	0.10	0.92
35.	Zaire	0.18	0.17	0
36.	Angola	0.05	0.12	0
37.	Ghana	0.08	0.14	0.14
38.	Ivory Coast	0.58	0.17	0.08
39.	Morocco	0.02	3.32	1.08
40.	Nigeria	1.19	1.37	0.41
41.	Senegal	0.37	0.12	0.11
42.	Zambia	0	0.13	0.09
	Asia			
43.	Bangladesh	13.59	2.64	0.05
44.	India	52.90	35.16	2.32
45.	Indonesia	21.25	1.22	1.06
46.	Pakistan	2.05	10.77	0
47.	Sri Lanka	1.66	0.80	0
48.	Yemen Arab Rep.	0.02	0.48	0
49.	Jordan	0.03	0.37	0.25
50.	Korea Rep.	5.53	1.80	4.54
51.	Philippines	4.81	0.79	2.84
	Latin America			
52.	Haiti	0.07	0.13	0.30
53.	Bolivia	0.06	0.29	0.47
54.	Colombia	1.18	0.47	0.70
55.	Ecuador	0.19	0.29	0.32
	Middle income CPEs			
56.	Cuba	0.49	1.00	0
	Market economy			
	Africa			
57.	Algeria	0.01	3.00	0
58.	Tunisia	0	1.46	0.52

APPENDIX 17--Continued

GRAIN DEMAND 1980
(million mt)

	Countries	Rice	Wheat	Feed
	Asia			
59.	Cyprus	0	0.09	0.17
60.	Iran	1.38	5.95	2.47
61.	Iraq	0.48	2.45	0.71
62.	Lebanon	0.02	0.37	0.39
63.	Malaysia	1.52	0.39	1.14
64.	Syria	0.07	1.90	1.10
	Latin America			
65.	Brazil	6.26	7.10	35.59
66.	Chile	0.09	1.89	1.21
67.	Dominican Republic	0.26	0.18	0.39
68.	Jamaica	0.06	0.14	0.23
69.	Mexico	0.37	22.23	6.52
70.	Peru	0.47	0.88	0.77
	High income Market economy			
71.	Libya	0.05	0.64	0
72.	Hong Kong	0.36	0.18	0.61
73.	Kuwait	0.10	0.20	0
74.	Saudi Arabia	0.48	1.20	0.83
75.	Singapore	0.20	0.10	0.70
76.	United Arab Emirates	0.20	0.11	0
77.	Trinidad Tobago	0.06	0.11	0.19
78.	Venezuela	0.39	0.66	1.88

Sources: (1) United States Department of Agriculture, Foreign Agricultural Services, Foreign Agriculture Circular, Reference tables on Rice-Supply-Utilization for Individual Countries, 1982. FG 22-82.

(2) U.S.D.A. Foreign Agricultural Services. Foreign Agricultural Circular, Grains. Washington, D.C. FG 9-76, May 1976. FG 4.81.

APPENDIX 18

PER CAPITA GRAIN DEMAND
Kg/per capita

Countries	1960	1970	1980
Developed			
CPEs			
1. Bulgaria	614	304	879
2. Czechoslovakia	214	359	769
3. German D. Rep.	184	199	641
4. Poland	403	482	714
5. Romania	181	182	2419
6. Yugoslavia	796	888	976
7. USSR	277	374	788
Market economy			
8. Japan	218	292	359
9. Belgium	412	455	306
10. Denmark	967	1284	1218
11. Finland	418	448	648
12. German F. Rep.	250	329	374
13. Greece	333	446	618
14. Ireland	525	517	473
15. Italy	408	535	489
16. Netherlands	583	455	411
17. Norway	281	341	410
18. Portugal	229	271	669
19. Spain	331	479	690
20. Switzerland	144	303	353
21. UK	354	372	324
Developing			
Low income			
CPEs			
22. Kampuchia	251	279	143
23. Vietnam Soc. Rep.	206	193	148
24. Yemen People Rep.	070	113	468
25. China People Rep.	035	038	075
26. Korea People Rep.	172	163	183
Market economy			
Africa			
27. Egypt	120	142	276
28. Ethiopia	033	33	020
29. Kenya	017	43	022
30. Madagascar	132	179	186

APPENDIX 18--Continued

PER CAPITA GRAIN DEMAND
Kg/per capita

Countries	1960	1970	1980
31. Mozambique	017	021	025
32. Somalia	010	018	158
33. Sudan	010	017	030
34. Tanzania	010	013	069
35. Zaire	002	004	012
36. Angola	011	020	024
37. Ghana	012	008	031
38. Ivory Coast	053	100	105
39. Morocco	091	158	218
40. Nigeria	008	11	039
41. Senegal	003	014	039
42. Zambia			
Asia			
43. Bangladesh	196	170	184
44. India	118	118	136
45. Indonesia	116	121	155
46. Pakistan	071	163	156
47. Sri Lanka	143	160	165
48. Yemen Arab Rep.	--	002	089
49. Jordan	165	174	203
50. Korea Rep.	170	236	313
51. Philippines	134	141	166
Latin America			
52. Haiti	017	020	086
53. Bolivia	140	126	146
54. Colombia	72	049	087
55. Ecuador	63	056	100
Middle income CPEs			
56. Cuba	81	183	151
Market economy			
Africa			
57. Algeria	160	121	161
58. Tunisia	145	155	309

APPENDIX 18--Continued

PER CAPITA GRAIN DEMAND
Kg/per capita

	Countries	1960	1970	1980
	Asia			
59.	Cyprus	200	167	371
60.	Iran	209	208	257
61.	Iraq	124	159	280
62.	Lebanon	228	212	244
63.	Malaysia	178	177	224
64.	Syria	219	205	357
	Latin America			
65.	Brazil	246	226	387
66.	Chile	244	279	287
67.	Dominican Republic	059	067	141
68.	Jamaica	106	094	195
69.	Mexico	049	085	417
70.	Peru	110	124	119
	High income Market economy			
71.	Libya	125	163	238
72.	Hong Kong	169	123	240
73.	Kuwait	200	157	214
74.	Saudi Arabia	073	095	299
75.	Singapore	169	195	417
76.	United Arab Emirates	--	--	388
77.	Trinidad Tobago	150	140	327
78.	Venezuela	049	189	197

APPENDIX 19

EFFECTS OF INCOME CHANGES ON GRAIN DEMAND
(mmt.)

Countries	1960-1970				1970-1980			
	Wheat	Rice	Feed	Total	Wheat	Rice	Feed	Total
Developed CPEs								
1. Bulgaria	1.067	-0.003	--	1.064	0.555	-0.003	0	0.552
2. Czechoslovakia	0.422	-0.003	0.009	0.428	0.726	-0.004	0.009	0.731
3. German D. Rep.	0.587	-0.002	--	0.585	0.605	-0.002	0	0.603
4. Poland	0.649	-0.005	3.624	4.268	0.809	-0.006	4.787	5.590
5. Romania	1.282	-0.006	--	1.276	1.409	-0.014	0	1.395
6. Yugoslavia	0.840	-0.001	4.514	5.354	0.977	-0.004	5.647	6.620
7. USSR	8.585	-0.026	--	8.559	13.099	-0.061	0	13.038
Market economy								
8. Japan	1.210	4.668	4.500	10.378	0.419	1.226	3.512	5.156
9. Belgium	0.127	0.006	0.874	1.006	0.059	0.003	0.531	0.593
10. Denmark	0.022	0.001	1.211	1.234	0.012	0.001	0.775	0.788
11. Finland	0.051	0.001	0.472	0.524	0.024	0.002	0.356	0.382
12. German F. Rep.	0.417	0.018	3.001	3.436	0.237	0.008	2.806	3.051
13. Greece	0.271	0.011	0.685	0.967	0.152	0.006	0.616	0.774
14. Ireland	0.035	--	0.263	0.298	0.023	0	0.231	0.254
15. Italy	1.001	0.043	3.735	4.799	0.559	0.020	3.033	3.612
16. Netherlands	0.101	0.004	1.517	1.622	0.056	0.002	0.801	0.859
17. Norway	0.024	0.001	0.199	0.224	0.028	0	0.314	0.342
18. Portugal	0.112	0.023	0.557	0.692	0.071	0.014	0.413	0.498
19. Spain	0.798	0.039	2.448	3.285	0.244	0.017	2.207	2.467
20. Switzerland	0.044	0.002	0.035	0.081	0.015	0.001	0.093	0.109
21. UK	0.265	0.006	1.923	2.194	0.200	0.006	1.636	1.84

APPENDIX 19--Continued

EFFECTS OF INCOME CHANGES ON GRAIN DEMAND
(mmt.)

Countries	1960-1970				1970-1980			
	Wheat	Rice	Feed	Total	Wheat	Rice	Feed	Total
Developing								
Low income								
CPEs								
22. Kampuchia	0	0.002	0	0.002	0	0.042	0	0.042
23. Vietnam Soc. Rep.	-0.001	0.722	0	0.723	-0.005	0.821	0	0.816
24. Yemen People Rep.	-0.001	0.004	0	0.005	-0.001	0.007	0	0.006
25. China People Rep.	-0.328	0	0	-0.328	-0.453	0	0	-0.453
26. Korea People Rep.	-0.005	0.547	0	0.542	-0.006	0.677	0	0.671
Market economy								
Africa								
27. Egypt	0.054	0.230	0	0.284	0.255	1.524	0	1.779
28. Ethiopia	0.015	0	0	0.015	0.019	0	0	0.019
29. Kenya	0.007	0.014	0.004	0.025	0.048	0.144	0.204	0.396
30. Madagascar	0	0.798	0	0.798	0	3.428	0	3.428
31. Mozambique	-0.001	-0.032	0	-0.033	0.001	0.008	0	0.009
32. Somalia	0	-0.012	0	-0.012	0	0.004	0	0.004
33. Sudan	0.011	0	0	0.011	-0.007	0	0	-0.007
34. Tanzania	0.002	0.142	0	0.144	0.001	0.064	0	0.065
35. Zaire	0.006	0	0	0.006	-0.003	0	0	-0.003
36. Angola	-0.001	-0.006	0	-0.007	-0.002	-0.013	0	-0.015
37. Ghana	0.001	0	0	0.001	,0.001	0	0	-0.001
38. Ivory Coast	0.001	0.180	0.004	0.185	0.007	0.289	0.017	0.313
39. Morocco	0.012	0.002	0	0.014	0.114	0.025	0	0.139
40. Nigeria	0	0.015	0	0.015	0.022	0.451	0.016	0.489
41. Senegal	0	0.025	0	0.025	0.015	0.880	0	0.895
42. Zambia	0.001	0	0	0.001	-0.002	0	0	-0.002

APPENDIX 19--Continued

EFFECTS OF INCOME CHANGES ON GRAIN DEMAND
(mmt.)

	Countries	1960-1970 Wheat	Rice	Feed	Total	1970-1980 Wheat	Rice	Feed	Total
	Asia								
43.	Bangladesh	0.001	6.279	0	6.280	0.004	7.618	0	7.622
44.	India	0.161	6.929	0.029	7.119	0.276	8.961	0.034	9.271
45.	Indonesia	0.001	1.539	0	1.540	0.026	10.889	0	10.915
46.	Pakistan	0.276	0.852	0.044	1.172	0.074	0.331	0.012	0.417
47.	Sri Lanka	0.009	0.520	0	0.529	0.013	0.557	0	0.570
48.	Yemen Arab Rep.	0	0	0	0	0	0	0	0.015
49.	Jordan	0.010	0.015	0.010	0.035	0.062	0.078	0.183	0.323
50.	Korea Rep.	0.054	5.215	0.104	5.373	0.117	5.181	0.256	5.554
51.	Philippines	0.006	0.632	0.074	0.712	0.015	1.583	0.246	1.844
	Latin America								
52.	Haiti	-0.001	-0.013	0	-0.014	0.005	0.082	0	0.087
53.	Bolivia	0.067	0.140	0.083	0.290	0.026	0.070	0.035	0.131
54.	Colombia	0.019	0.312	0.022	0.353	0.077	1.494	0.074	1.645
55.	Ecuador	0	-0.001	0	-0.001	0.070	0.711	0.031	0.812
	Middle income CPEs								
56.	Cuba	0	0	0	0	0	0	0	0
	Market economy								
	Africa								
57.	Algeria	1.564	0.060	0	1.624	0.295	0.012	0	0.307
58.	Tunisia	0.055	0	0.019	0.074	0.130	0	0.041	0.171
	Asia								
59.	Cyprus	0.009	0	0	0.009	0.004	0	0	0.004

APPENDIX 19--Continued

EFFECTS OF INCOME CHANGES ON GRAIN DEMAND
(mmt.)

Countries	1960-1970				1970-1980			
	Wheat	Rice	Feed	Total	Wheat	Rice	Feed	Total
60. Iran	0.368	0.411	0.256	1.024	-0.013	-0.020	-0.010	-0.043
61. Iraq	0.115	0.138	0	0.253	0.167	0.244	0	0.411
62. Lebanon	0.009	0.006	0.015	0.030	0.062	0.029	0.086	0.177
63. Malaysia	0.037	1.159	0.044	1.239	0.041	1.247	0.052	1.339
64. Syria	0.041	0.010	0	0.051	0.140	0.037	0	0.177
Latin America								
65. Brazil	0.183	2.521	-2.039	0.664	0.436	5.562	-5.084	0.914
66. Chile	0.055	0.045	-0.069	0.031	0.038	0.024	-0.092	-0.030
67. Dominican Republic	0	0.007	-0.002	0.005	-0.004	-0.012	0.002	-0.01
68. Jamaica	0.007	0.048	0	0.055	-0.007	0	0	-0.007
69. Mexico	0.085	0.107	-0.074	0.119	0.116	0.160	-0.420	-0.144
70. Peru	0.040	0.159	-0.087	0.112	0.008	0.038	-0.015	0.031
High income Market economy								
71. Libya	0.154	-0.004	0	0.150	0.032	-0.001	0	0.031
72. Hong Kong	0.041	-0.050	0	-0.010	0.207	-0.165	0	0.042
73. Kuwait	-0.004	0.001	0	-0.003	-0.008	0.002	0	-0.006
74. Saudi Arabia	0.084	-0.011	0	0.073	0.131	-0.016	0	0.115
75. Singapore	0.020	-0.018	0	0.002	0.070	-0.024	0	0.046
76. United Arab Emirates	0	0	0	0	0	0	0	0
77. Trinidad Tobago	0.089	-0.016	0	0.073	0.016	-0.002	0	0.014
78. Venezuela	-0.008	0.001	-0.005	-0.012	-.090	-0.006	0.064	0.148

APPENDIX 20

UNEXPLAINED RESIDUAL LEFT OVER OF CEREAL IMPORTS
(mmt)

Countries	1960-1970		1970-80	
	Income Effect	Residual Left Over	Income Effect	Residual Left Over
Developed				
CPEs				
1. Bulgaria	1.064	0.137	0.552	1.196
2. Czechoslovakia	0.428	1.089	0.731	-0.151
3. German D. Rep.	0.585	4.096	0.603	2.555
4. Poland	4.268	-1.085	5.590	-10.824
5. Romania	1.276	2.339	1.395	-0.076
6. Yugoslavia	5.354	-9.084	6.620	-6.497
7. USSR	8.559	13.412	13.038	4.804
Market economy				
8. Japan	10.378	-7.460	5.156	-3.399
9. Belgium	1.006	-0.300	0.593	-0.714
10. Denmark	1.234	-0.195	0.788	-1.040
11. Finland	0.524	0.065	0.382	-0.038
12. German F. Rep.	3.436	5.585	3.051	-4.275
13. Greece	0.967	-0.185	0.774	0.339
14. Ireland	0.298	-0.310	0.254	-0.386
15. Italy	4.799	-0.550	3.612	-3.710
16. Netherlands	1.622	-2.507	0.859	-0.987
17. Norway	0.224	-0.117	0.342	-0.152
18. Portugal	0.692	0.798	0.498	0.686
19. Spain	3.285	0.394	2.467	1.309
20. Switzerland	0.081	0.223	0.109	-0.165
21. UK	2.194	8.450	1.842	-4.594
Developing				
Low income				
CPEs				
22. Kampuchia	0.002	0.647	0.042	-2.099
23. Vietnam Soc. Rep.	0.723	-2.747	0.816	0.170
24. Yemen People Rep.	0.005	0.075	0.006	0.027
25. China People Rep.	-0.328	-1.338	-0.453	56.986
26. Korea People Rep.	0.542	-2.550	0.671	0.366

APPENDIX 20--Continued

UNEXPLAINED RESIDUAL LEFT OVER OF CEREAL IMPORTS
(mmt)

	Countries	1960-1970		1970-80	
		Income Effect	Residual Left Over	Income Effect	Residual Left Over
	Market economy				
	Africa				
27.	Egypt	0.284	0.356	1.779	1.140
28.	Ethiopia	0.015	0.657	0.019	-0.768
29.	Kenya	0.025	1.165	0.396	-0.985
30.	Madagascar	0.798	-0.524	3.428	-3.397
31.	Mozambique	-0.033	-0.069	0.009	-0.458
32.	Somalia	-0.012	0.152	0.004	0.143
33.	Sudan	0.011	0.978	-0.007	0.206
34.	Tanzania	0.144	0.065	-0.065	-0.186
35.	Zaire	0.006	0.525	-0.003	-0.170
36.	Angola	-0.007	-0.015	-0.015	-0.050
37.	Ghana	0.001	0.077	-0.001	-0.540
38.	Ivory Coast	0.185	-0.130	0.313	-0.245
39.	Morocco	0.014	1.576	0.139	3.272
40.	Nigeria	0.015	-1.929	0.489	-1.558
41.	Senegal	0.025	0.147	0.895	-1.025
42.	Zambia	0.001	0.103	-0.002	-0.300
	Asia				
43.	Bangladesh	6.280	-6.280	7.622	-8.356
44.	India	7.119	-5.485	9.271	-13.982
45.	Indonesia	1.540	-1.728	10.915	-4.916
46.	Pakistan	1.172	-5.171	0.417	0.564
47.	Sri Lanka	0.529	-0.279	0.570	-0.523
48.	Yemen Arab Rep.	0	0.355	0.015	-0.162
49.	Jordan	0.035	-0.162	0.323	-0.195
50.	Korea Rep.	5.373	-2.306	5.554	-7.054
51.	Philippines	0.712	-0.787	1.844	-0.693
	Latin America				
52.	Haiti	-0.014	0.165	0.087	-0.228
53.	Bolivia	0.290	-0.084	0.131	-0.161
54.	Colombia	0.353	-0.525	1.645	-0.428
55.	Ecuador	-0.001	0.059	0.812	-1.004

APPENDIX 20--Continued

UNEXPLAINED RESIDUAL LEFT OVER OF CEREAL IMPORTS
(mmt)

Countries	1960-1970		1970-80	
	Income Effect	Residual Left Over	Income Effect	Residual Left Over
Middle income CPEs				
56. Cuba	--	0.194	--	0.711
Market economy				
Africa				
57. Algeria	1.624	-1.787	0.307	1.115
58. Tunisia	0.074	0.588	0.171	0.356
Asia				
59. Cyprus	0.009	0.139	0.004	0.137
60. Iran	1.024	-0.950	-0.043	1.880
61. Iraq	0.253	-0.387	0.411	0.564
62. Lebanon	0.030	0.027	0.177	-0.279
63. Malaysia	1.239	-0.570	1.339	-1.2504
64. Syria	0.051	-0.118	0.177	1.041
Latin America				
65. Brazil	0.664	-1.642	0.914	-0.117
66. Chile	0.031	-0.533	-0.030	0.224
67. Dominican Republic	0.005	-0.141	-0.010	0.237
68. Jamaica	0.055	0.018	-0.007	0.082
69. Mexico	0.119	2.640	-0.144	4.683
70. Peru	0.112	0.145	0.031	-0.420
High income Market economy				
71. Libya	0.150	-0.074	0.031	0.177
72. Hong Kong	-0.010	-0.007	0.042	-0.051
73. Kuwait	-0.003	0.048	-0.006	0.027
74. Saudi Arabia	0.073	0.163	0.115	1.440
75. Singapore	0.002	0.303	0.046	0.180
76. United Arab Emirates	0	0	0	0.056
77. Trinidad Tobago	0.073	-0.043	0.014	0.065
78. Venezuela	-0.012	0.369	0.148	0.918

LIST OF REFERENCES

Abdel Salam, Salah A. Food Self Sufficiency and International Grain Trade. Unpublished Master's thesis. Tucson: University of Arizona, 1982.

Adams, F. Gerard, and Jere R. Behrman. Economic Models of World Agricultural Commodity Markets, Cocoa, Coffee, Tea, Wool, Cotton, Sugar, Wheat and Rice. Cambridge, Mass.: Ballinger Pub. Co., 1976.

Bachman, Kenneth L., and Leorando A. Paulino. Rapid Food Production Growth in Selected Developing Countries: Analysis of Underlying Trends, 1961-1976. Research Report No. 11. Washington: International Food Policy Research Institute, October, 1979.

Balaam, David N., and Michael J. Carey, eds. Food Politics, The Regional Conflict. Totowa, N.J.: Allanheld, Osmun Publishers, 1981.

Bigman, David. Food Policies and Food Security Under Instability, Modeling and Analysis. Lexington, Mass.: D. C. Heath and Company, 1985.

Blakeslee, Leroy L., Early O. Head, and Charles F. Farmingham. World Food Production, Demand and Trade. Ames: Iowa State University, 1973.

Chatifield, Charlotte. Food Composition Tables. Washington: FAO, 1949.

Epp, Donald J. Changes in Regional Grain and Livestock Prices, Under European Economic Community Policies. Ann Arbor: Michigan State University, 1968.

Falcon, Walter P., and Eric A. Monke. International Trade in Rice. Palo Alto: Food Research Institution Studies, 1979-80, Vol. 17(3):279-306.

Food and Agriculture Organization of the United Nations. Production Year Book, 1960, Vol. 14. Rome: FAO, 1960.

_____. Production Year Book, 1964, Vol. 17. Rome: FAO, 1964.

_____. Production Year Book, 1982, Vol. 36. Rome: FAO, 1982.

_____. The State of Food and Agriculture, 1982. Rome: FAO, 1982.

_____. Trade Year Book, 1958, Vol. 12. Rome: FAO, 1958.

_____. Trade Year Book, 1963, Vol. 17. Rome: FAO, 1963.

_____. Trade Year Book, 1982, Vol. 36. Rome: FAO, 1982.

_____. World Food Problems, Rice Grain of Life. Rome: FAO, 1966.

Grennes, Thomas, Paul R. Johnson, and Marie Thursby. The Economics of World Grain Trade. New York: Prager Publisher, 1978.

Harle, Vilho, ed. The Political Economy of Food. Westmead, Fanborough, Hants., England: Suxon House, 1978.

Hillman, Jimmye S. "The Role in Agriculture in the World Economy, Problem of Increasing Agricultural Productivity in Less Advanced Countries," Journal of Farm Economics, Vol. 43, No. 2 (May, 1961).

Hillman, Jimmye, ed. International Trade and Agriculture: Theory and Policy. Boulder: Westview Press, 1979.

Holmes, R. A. Estimation of Demand Elasticities for Substitute Food. Canada: University of British Columbia, 1966.

International Monetary Fund. International Financial Statistics, Year Book, 1985. Washington: IMF, 1985.

International Wheat Council. Review of World Wheat Situation, 1980-1981. London: IWC, January, 1982.

Josling, Timothy. Developed Country Agricultural Policies and Developing-Country Supplies: The Case of Wheat. Research Report 14. Washington: International Food Policy Research Institute, March, 1980.

Kementa, Jan. Elements of Econometrics. New York: Macmillan Publishing Co. Inc., 1971.

Marci, Sayed Ahmed. The World Food Crisis. London: Longman Group Ltd., 1976.

Monke, Eric A. International Grain Trade, 1950-1980. Tucson: The University of Arizona, June, 1983.

Morawetz, David. Twenty-Five Years of Economic Development 1950-1975. Washington: The World Bank, 1977.

Morrow, Daniel T. The Economics of the International Stock Holding of Wheat. Research Report 18. Washington: International Food Policy Research Institute, 1980.

Nelson, Gerald C. Time for Tapioca, 1970 to 1980: European Demand and World Supply of Dried Cassava. Palo Alto: Food Research Institute Studies, 1983.

Petzel, Todd E., and Eric A. Monke. The Integration of the International Rice Market. Palo Alto: Food Research Institute Studies, Vol. 17, No. 3, 1980, pp. 307-326.

Regier, Donald W., and O. H. Goolsby. "Foreign Agricultural Economic Report 63," Growth in World Demand for Feed Grains Related to Meat and Livestock Products and Human Consumption of Grain. Washington: USDA, 1970.

Regier, Donald W. "Foreign Agricultural Economic Report 152," Livestock and Derived Feed Demand in the World GOL Model. Washington, D.C.: USDA, 1978.

Rojko, Anthony S., Francis S. Urban, and James J. Naise. "Foreign Agricultural Economic Report 75," World Demand Prospects for Grain in 1980, with Emphasis on Trade by Less Developed Countries. Washington: USDA, 1971.

Sarma, J. S., and Patrick Yeng. Livestock Products in the Third World: Past Trends and Projections to 1990 and 2000. Research Report 49. Washington: International Food Policy Research Institute, April, 1985.

Scobie, Grant M. Government Policy and Food Imports, the Case of Wheat in Egypt. Research Report 29. Washington: International Food Policy Research Institute, 1981.

Simpson, James R., and Donald E. Farris. The World's Beef Business. Ames: Iowa State University Press, 1982.

Sinha, Radha, Ed. The World Food Problem Consensus and Conflict. Glascow: Pergaman Press, 1978.

Solimano, Gio-gio, and Lance Taylor, eds. Food Prices and Nutrition in Latin America. Tokyo: The United Nations University, 1980.

Sorenson, Vernonl. International Trade Policy: Agriculture and Development. Ann Arbor: Michigan State University, 1975.

Tang, Anthony M., and Ston Bruce. Food Production in the People's Republic of China. Research Report 15. Washington: International Food Research Institute, May 1980.

Timmer, C. Peter. "China and World Food System," Research in Domestic and International Agribusiness Management. Washington: JAI Press Inc., Vol. 2, 1981, pp. 75-118.

Timmer, C. Peter, and Henry Alderman. "Estimating Consumption Parameters for Food Policy Analysis," American Journal of Agricultural Economics, Vol. 61, 1979, pp. 982-987.

Todaro, Michael P. Economic Development in the Third World. 2nd ed. New York: Longman Inc., 1982.

United Nations. Yearbook of National Accounts Statistics, Vol. III. Rome: UN, 1973.

United States Department of Agriculture, "Foreign Agriculture Economic Report," No. 90, The Feed, Livestock Economy of Eastern Europe, Prospects to 1980. Washington: USDA, 1973.

_____. Foreign Agricultural Services. "Grains," Foreign Agricultural Circular, FG 9-76. Washington: USDA, May, 1979.

_____. Foreign Agricultural Services. "Livestock and Meat," Foreign Agricultural Circular, FLM 7-78. Washington: USDA, August, 1978.

_____. Foreign Agricultural Services. "Livestock and Meat," Foreign Agricultural Circular, FLM 5-81. Washington: USDA, July, 1980.

_____. Foreign Agricultural Services. "Reference Tables on Feed," Foreign Agricultural Circular, FG 4-81. Washington: USDA, 1976.

_____. Foreign Agricultural Services. "Reference Tables on Rice Supply Utilization for Individual Countries, Foreign Agricultural Circular, FG 22-82. Washington: USDA, 1976.

_____. Foreign Agricultural Services. "Reference Tables on Wheat and Coarse Grain," Foreign Agricultural Circular, FG 1975-76. Washington: USDA, 1979.

World Bank. Commodity Trade and Price Trends. Baltimore: The Johns Hopkins University Press, 1981.

The World Bank. World Development Report, 1980. New York: Oxford University Press, 1980.

_____. World Development Report, 1982. New York: Oxford University Press, 1982.