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**The Increasing Role of Wheat Consumption and Imports  
in the Developing World**

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**CIMMYT's Economics Program**

**Working Paper No.05/83**

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## P R E F A C E

This study follows from the 1981 study of World Wheat Facts and Trends which summarized and interpreted changes in world production, consumption, trade, and prices of wheat over the last two decades. One of the major findings of that study was the rapid increase in consumption and imports of wheat by developing countries. This report describes in some detail and broadly interprets these changes. An understanding of this increase in wheat consumption and imports is of considerable interest to us at CIMMYT as we see the gap between wheat production and consumption widening in many countries and in particular, as we receive requests from national programs and donors to develop wheats for the tropical belt of countries.

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## DEFINITIONS

We have used a number of terms and regional aggregates in this report which are defined as follows.

**Imports** - Gross imports by a country or region without taking into account exports or re-exports.

**Net Imports** - Imports less exports. For most developing countries and regions net imports are little different to imports except where a region includes a country which is an exporter (e.g. Argentina in the Southern Cone of Latin America). Also several European countries export and import wheats to obtain the required mix of qualities.

**Utilization** - Production plus net imports. For most developing countries where animal feed use of wheat is low and stocks do not change drastically, wheat utilization averaged over a three year period correlates closely with consumption of wheat as a food.

**Per Capita Calorie Supply** - Derived from FAO Food Balance Sheets as utilization per capita adjusted for changes in stocks, milling, feed use, seed use, industrial use, and waste.

**Food Aid** - All wheat imported on concessional terms in bilateral programs or as part of the World Food Program.

**Annual Growth Rates** - Compounded annual growth rates calculated as:

$$g=100 [\ln (X_t/X_{t_0})]/t$$
, where  $X_t$  is the average for period  $t$  (e.g. 1979-81),  $X_{t_0}$  is the average for the period  $t_0$  (e.g. 1961-65), and  $t$  is the number of years between the midpoints of the two periods (i.e. 17).



## REGION AGGREGATES:

### DEVELOPING COUNTRIES:

Eastern and Southern Africa: All Sub-Saharan countries east of Angola, Chad, and Zaire but excluding South Africa.

Western Africa: Angola, Chad, Zaire, and all Sub-Saharan countries to the west.

North Africa: Morocco to Egypt.

Mideast Countries of Asia: Turkey to Afghanistan.

South Asia: Pakistan to Bangladesh and Sri Lanka.

Southeast Asia and Pacific: Burma to Philippines and Indonesia and Pacific Islands.

East Asia: China, Korea DPR, and Republic of Korea.

Mexico, Central America, and Caribbean: Mexico to Panama and Caribbean Islands.

Andean Region: Bolivia, Colombia, Ecuador, Guyana, Peru, Surinam, and Venezuela.

Southern Cone: Argentina, Brazil, Chile, Paraguay, and Uruguay.

### DEVELOPED COUNTRIES

Developed Market Economies: Australia, Canada, Israel, Japan, New Zealand, South Africa, USA, and Western Europe.

Eastern Europe and USSR

### TROPICAL DEVELOPING COUNTRIES

A subgroup of developing countries that is entirely between 23°N and 23°S latitude. It includes all countries of Sub-Saharan Africa (except South Africa and Lesotho), Southeast Asia, Central America and Caribbean (except Mexico), Andean Region, Sri Lanka, Yemen Arab Republic and Yemen Democratic Republic.

THE INCREASING ROLE OF WHEAT CONSUMPTION  
AND IMPORTS IN THE DEVELOPING WORLD

Introduction

The driving force in the world wheat economy has dramatically changed over the last three decades. In the immediate post war period, wheat trade was dominated by the developed market economies, with the USA, Canada and Australia exporting wheat that was in large part destined to Western Europe and Japan. During the 1960s and particularly the 1970s, the developing countries and, to a lesser extent, Eastern Europe and the USSR, assumed a greater role in world wheat imports and Western Europe emerged as a net wheat exporter. The developing countries share of world wheat imports increased from one-fourth of the total in 1955 to two-thirds in 1982. While wheat consumption has essentially levelled off in most developed countries, consumption in developing countries is increasing rapidly.

Rising wheat consumption and an increasing dependence on wheat imports in much of the developing world has received little attention in analyses of the world food economy. Such analyses have often focused on short term fluctuations in supply or demand and prices, an approach which emphasizes the role of the Soviet Union. Furthermore, recent long term projections of world wheat supply and demand have seriously underestimated the pace of change in developing countries. For example, USDA and FAO projections of wheat imports by developing countries for 1985, which were made in 1977/78, had already been exceeded by over 25 percent in 1981.

Increased wheat consumption and import dependence in developing countries have important implications for food policy and food security. The extent to which many developing countries have become dependent on wheat imports, has reached high levels. Furthermore, wheat imports in many countries that are not traditionally wheat producers have been associated with investments in specialized milling and baking industries which cannot be easily converted to processing of local foods, even if domestic food production does offer the possibility of substituting for wheat imports. Finally, some developing countries in the tropics have

responded to increased wheat imports by establishing wheat research and production programs. These programs were begun even though the factors underlying increased wheat imports were not well understood; nor has the local potential for wheat production been adequately analyzed in economic terms.

Our purpose here is to describe in more detail the trends in wheat consumption and imports in developing countries and to shed some light on the underlying causes of increasing wheat consumption in developing countries. It is intended that this analysis serve as a basis for developing realistic policies regarding domestic production and imports of wheat and wheat products.

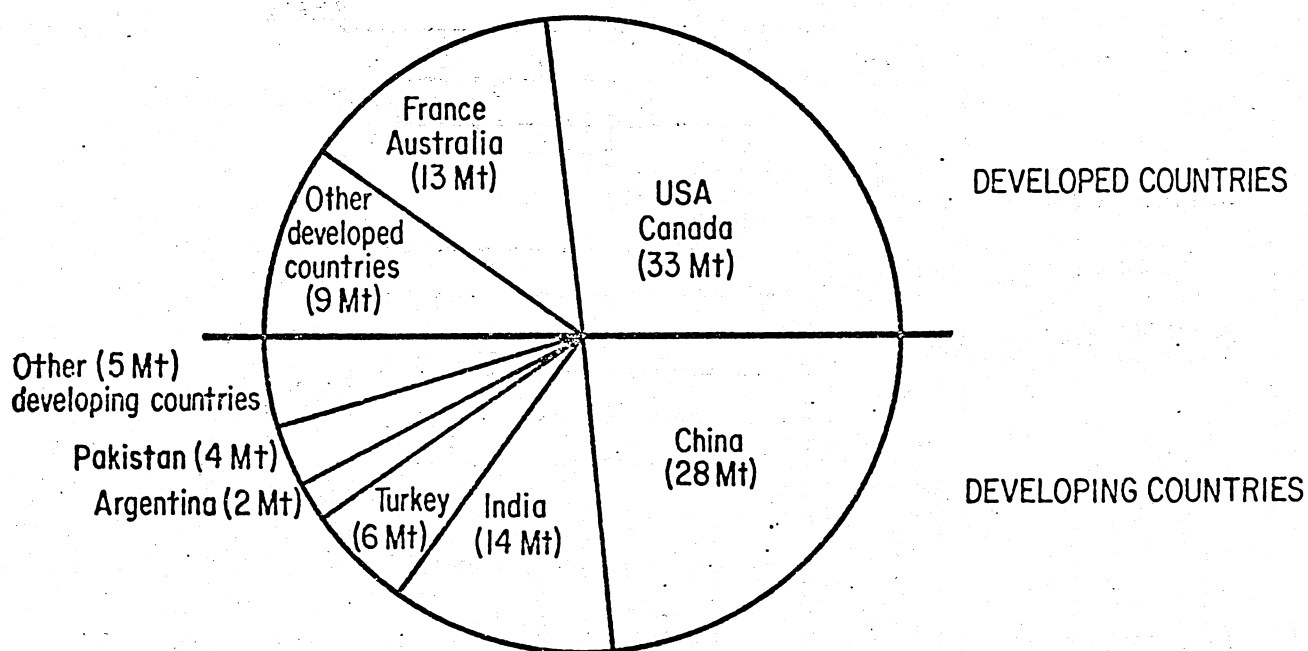
We begin with an overview of the trends of the last decade, during which wheat consumption and imports in developing countries rapidly accelerated. This leads to a more detailed description of wheat consumption and imports, respectively. Finally, we synthesize the major factors underlying these trends and suggest some implications for wheat production and consumption policies in developing countries.

### The Rapid Increase in the Role of Wheat in Developing Countries in the Decade of the 1970s

#### Production Increases in Major Producing Countries

World wheat production increased by 115Mt in the decade from 1969-71 to 1979-81. Although developing countries accounted for only 29 percent of world wheat production at the beginning of the decade, they produced half of the total increase in production during the 1970s (see Figure 1). However, the five largest wheat producers in the developing world (China, India, Turkey, Pakistan, and Argentina) produced 93 percent of the developing world's increased production. These five countries expanded their wheat production at an annual rate of 5.4 percent, largely through yield increases (Figure 2). In the remaining developing countries, which have some 24M ha of wheat and account for one third of wheat consumption, production increased by less than 4Mt in the 1970s, an annual growth rate of only 1.5 percent and considerably less than the population growth rate.

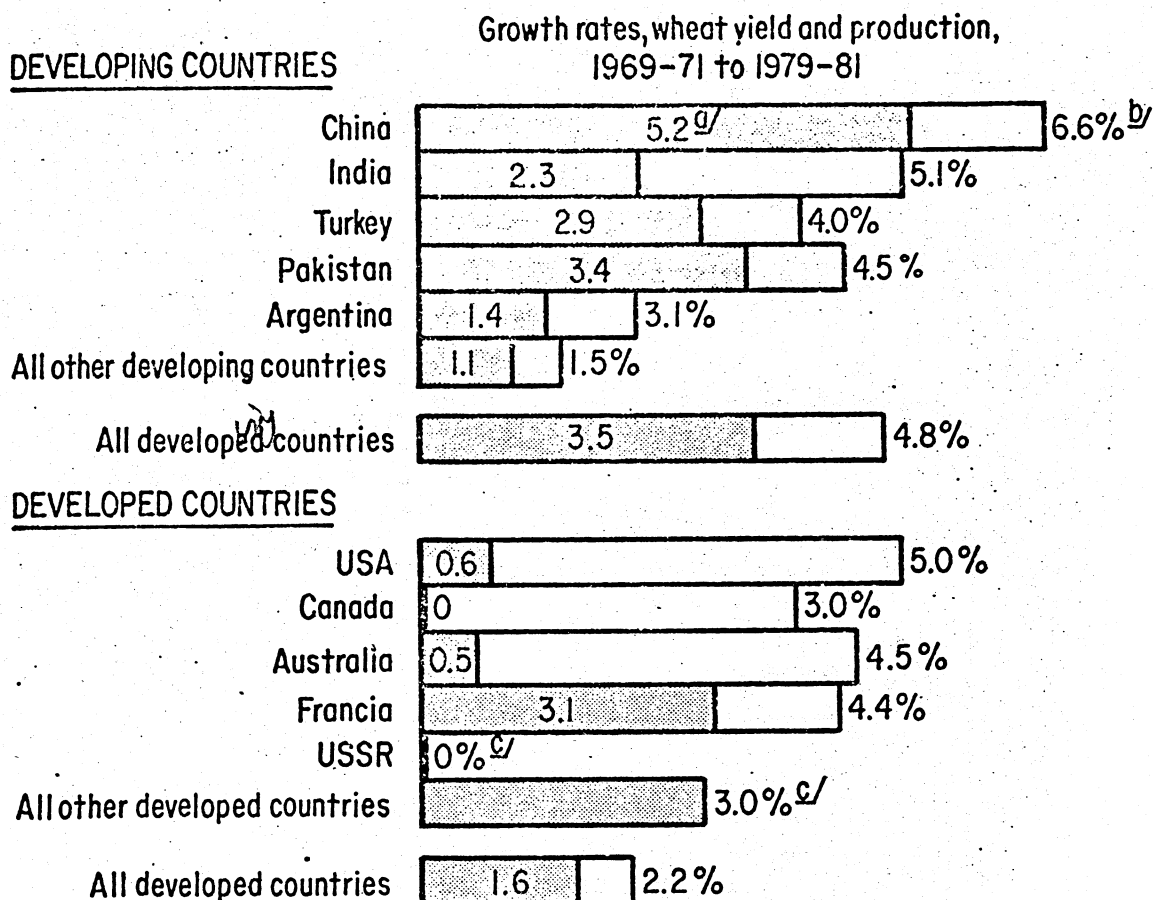
Figure 1. Shares in Increased World Wheat Production from 1969-71 to 1979-81.



Total Increase in World Wheat Production of 116 Mt, 1969-71 to 1979-81.

Source: FAO Data Tapes, 1982.

Figure 2. Comparative Wheat Statistics of Major Wheat Producers.



a/ Annual growth rate yield.

b/ Annual growth rate production.

c/ Yield increase greater than production increase due to declining area.

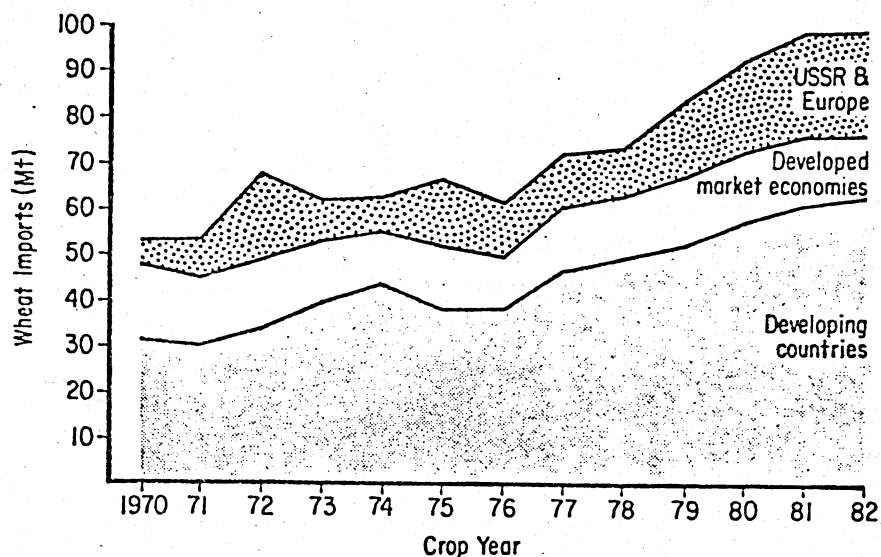
Source: Calculated from FAO Data Tapes, 1982.

In developed countries, a similar pattern of increasing wheat production emerges. The four major wheat exporting countries (USA, France, Canada, and Australia), which provided 33 percent of all developed country production in 1969/71, accounted for 80 percent of the increase in wheat production in developed countries in the 1970s (Figure 1). The USA alone produced an additional 26Mt, or nearly half the increase. However, more area planted to wheat rather than yield increases, accounted for the bulk of this additional wheat production by exporting countries (France is the major exception) (Figure 2).<sup>1/</sup> In contrast, wheat production stagnated in the USSR, the world's largest wheat producer.

#### Wheat Imports by Developing Countries Double in the 1970s

During the 1970s, world wheat trade almost doubled, from just over 50Mt in 1969-71 to 100Mt in 1981 (Figure 3). Nearly all of the additional wheat produced by the four major exporting countries entered world trade.

Figure 3. World Wheat Imports, 1979-1982.



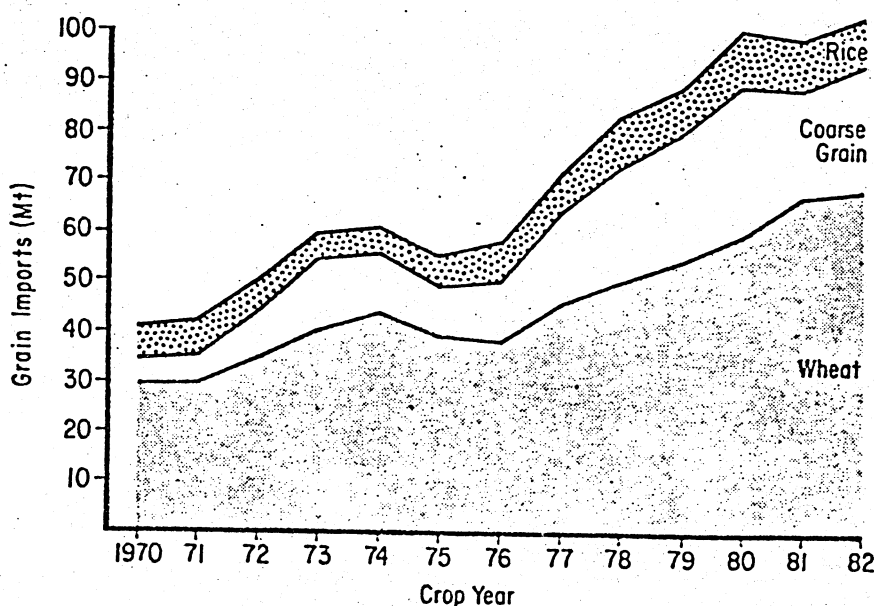
Source: FAO Data Tape, 1982.

1/ The relaxation of government restrictions on wheat area with the increased wheat prices of the 1970s was a major factor in this area expansion; low yield increases were in part due to producers bringing less favorable land into production.

Wheat imports by developing countries have continually increased, setting new records every year since 1976. From 1976 to 1982, developing countries have imported on average an additional 4Mt of wheat every year to reach 63Mt in 1981, double the amount imported in 1971. The portion of wheat imports going to the USSR also increased sharply over the same period, and accounted for about 20 percent of the total, although year-to-year variability was quite high. Wheat imports by developed countries (Western Europe and Japan) have barely changed (about 14Mt) and their share of total wheat trade fell from 30 percent to 14 percent.

Wheat has increased its dominance as a food grain import of developing countries. Although imports of coarse grains by developing countries rose very rapidly in the 1970s (Figure 4), most of these imports were destined to middle income countries for animal feed. Only about 0.5Mt of maize is imported for food purposes.<sup>1/</sup> Imports of rice, the single most important food staple of developing countries, increased much more slowly than wheat. Hence, at the end of the 1970s, wheat accounted for 86 percent of food grain imports by developing countries.

Figure 4. Grain Imports by Developing Countries.



Source: FAO Data Tape, 1982.

1/ For more details see CIMMYT World Maize Facts and Trends, 1981.

## Wheat Consumption Shifts to Developing Countries

Rapid increases in production and imports in the 1970s were associated with extremely rapid increases in wheat consumption in developing countries. Total wheat consumption, approximated by production plus net imports, has grown by 5.4 percent annually and nearly doubled from 1969 to 1982. Almost all of this increase has been due to the direct consumption of wheat as food.<sup>1/</sup>

Perhaps the most striking aspect of the pattern of wheat consumption in developing countries over the last two decades is the growing gap between production and consumption in most countries. Nearly two thirds of all the wheat consumption by developing countries occurs in the four largest producers (China, India, Pakistan, and Turkey), where production has increased faster than consumption in the aggregate. Less than 10 percent of the wheat consumed by these four countries is imported and most of this by China.

Wheat consumption in the rest of the developing world, however, has risen even faster, growing at an annual rate of 5.8 percent relative to a growth in wheat production of only 1.5 percent. Imports of wheat to this group of countries have grown extremely rapidly, by about 10 percent per year throughout the decade of the 1970s. As a group, these countries now account for nearly 80 percent of wheat imports by developing countries, and nearly half of world wheat trade. At the beginning of the 1970s, they imported 40 percent of the wheat they consumed but by the end of the decade this figure had increased to 62 percent.

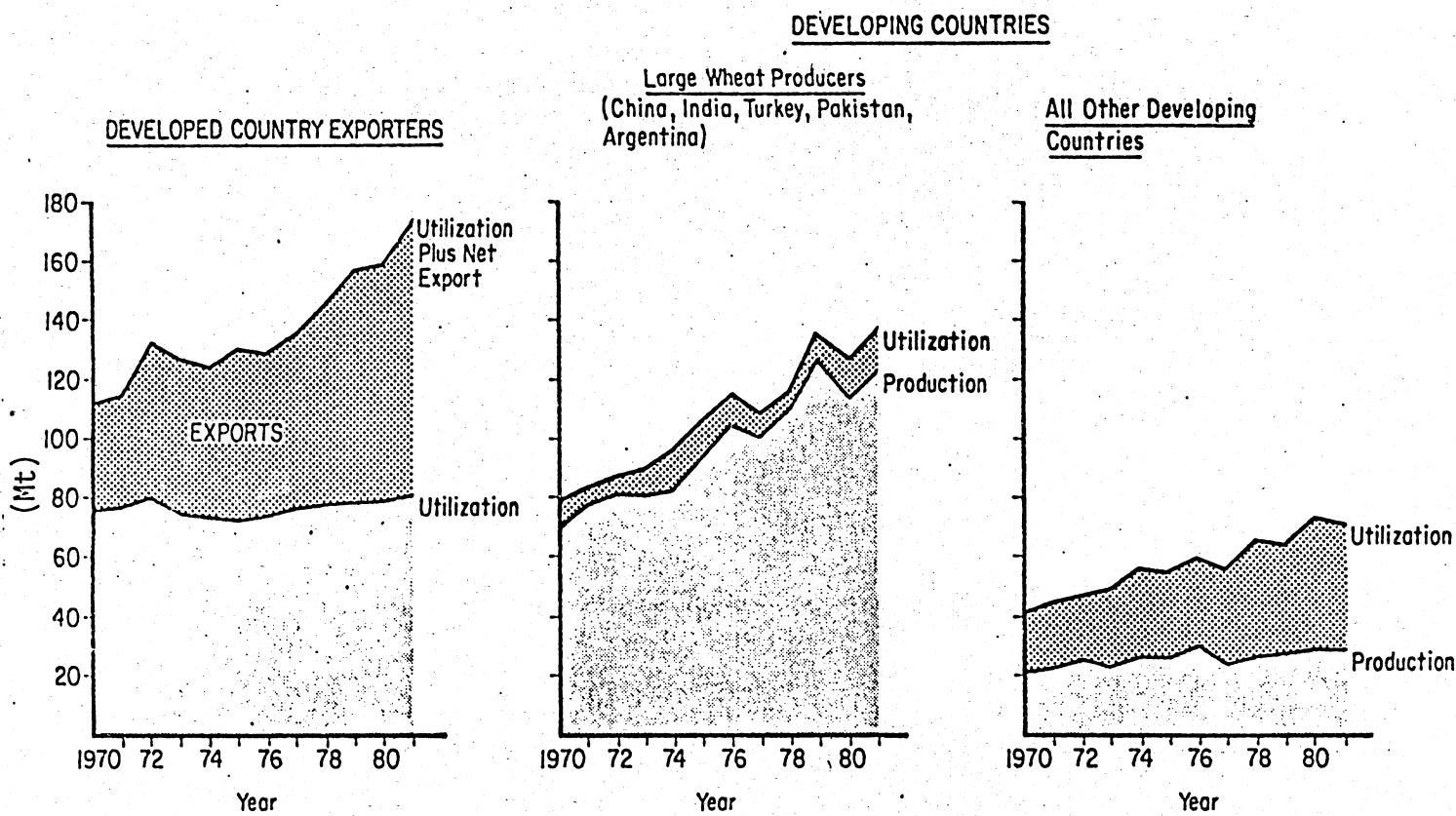
In the 1970s, wheat consumption increasingly diverged from production in much of the developing world. These trends are shown diagrammatically in Figure 5. Thus, during a period of unprecedented expansion in world wheat production, over 80 percent of the additional wheat produced was consumed by developing countries. By the beginning of the 1980s, all developing countries (except Argentina and Turkey) were net wheat importers.

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<sup>1/</sup> Animal feed use of wheat has also expanded (at over 5 percent annually) but still represents only about 3 percent of the wheat consumed in developing countries and is concentrated in a few countries of the Middle East such as Turkey and Iran.



Figure 5. Growth of Wheat Production, Utilization, Exports and Imports for Aggregated Groups of Countries.

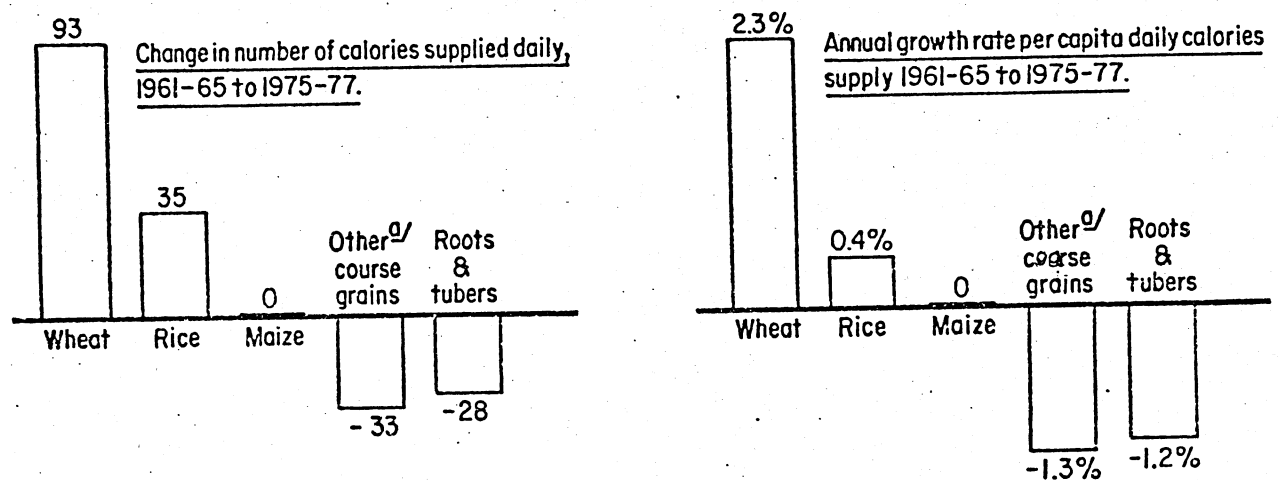


## A Closer Look at Wheat Consumption in the Developing World

### The Substitution of Wheat and Rice for Other Food Staples in Consumer Diets

Starchy staples (cereals, roots and tubers) provide close to 70 percent of the total calories consumed in developing countries. These starchy staples also provided about half the increase in calorie supply in developing countries over the last two decades. By far the most important component of this increase, both absolutely and relatively, came from wheat; the per capita consumption of wheat as food grew by an average of 2.3 percent per year from 1961. Rice consumption also increased, but at a much slower rate (0.4 percent). The direct consumption of coarse grains as food, especially sorghum, millet, and of roots and tubers, declined (Figure 6). Although rice is by far the most important single food source in developing countries, wheat now contributes as many calories as all coarse grains combined. In less than 15 years, wheat has moved from providing 20 percent of cereal calories in developing countries to a 27 percent share.

Figure 6. Absolute and Relative Changes in Per Capita Calorie Supply of Staple Foods in Developing Countries, 1961-65 to 1975-77.



<sup>a/</sup> Includes sorghum, millet, barley and other minor cereals.

Source: FAO Food Balance Sheets, 1975-77.

This increase in wheat consumption in developing countries represents a widespread change in national diets. In all developing regions of the world, wheat ranked either first or second in its contribution of additional staple calories over the periods 1961-65 to 1975-77 (Table 1).<sup>1/</sup> Wheat also increased its share of the total calories provided by cereals in all regions.

In regions where wheat traditionally has been consumed (North Africa and the Middle East) the growth rates in per capita wheat consumption were between 0.7 and 1.5 percent per year, while in regions where wheat traditionally has not been consumed, such as West Africa and Southeast Asia, growth rates were over 5 percent per year. Rice also played an important role in increases in the supply of calories in six of the ten regions.

In all of the regions where the consumption of wheat increased, there were other staples that registered significant declines (Table 1). In some cases these declines occurred in the major staple for the region, such as maize in Mexico and Central America, or rice in South Asia. Wheat replaced maize as the most important staple for the Andes. In other cases, the declines were in staples of medium importance, such as millets and sorghum in West Africa, or barley in the Middle East.

The nature of these substitutions is further illustrated by the distribution of consumption changes among individual countries of the developing world. Figure 7 shows that in more than 59 percent of the countries examined, the per capita consumption of wheat increased more than 1.5 percent per year; in only 10 percent of the countries examined was there a significant decline in per capita wheat consumption. The increases for rice by country were similar, but not so extreme; for coarse grains and roots and tubers more countries showed consumption decreases than increases.

#### Wheat Consumption Patterns at the Household Level

Increases in wheat consumption, aggregated by region and by coun-

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<sup>1/</sup> In the Southern Cone of Latin America, wheat's contribution to increased calorie supply was negligible (0.2% per capita per year) but this occurred despite an overall decline in consumption of starchy staples in that region where incomes are relatively high.

Table 1. Changes in Food Supply of Various Staples by Region, 1961-65 to 1975-77.

	Staple Food						All Staples
	Wheat	Rice	Maize	Sorghum /Millet	Other Cereals <sup>a/</sup>	Roots & Tubers	
(Change in daily food calories supplied per capita)							
Eastern & Southern Africa	26	11	49*	-21*	-37	-21*	6
Western Africa	39	30	11	-97*	2	-4*	-17
North Africa	183*	11	-34*	-24	5	8	149
Middle East of Asia	167*	42	-4	-40	-43	9	131
South Asia	96*	-76*	-2	-39	-4	16	-8
Southeast Asia	38	107*	3	0	-5	-23	120
East Asia	128*	142*	-6	-7	-18	-78	161
Mexico, Central America	59*	24	-24*	-3	1	-3	54
Andean Countries	23*	71*	-42*	0	-18	-6	28
Southern Cone, L.A.	14*	-1*	4	0	0	-39	-22
<hr/>							
All developing countries	93	35	0	-23	-13	-28	67
All developed countries	-69	-10	9	--	-32	-31	-103

a/ Barley, rye, teff, fonio, etc.

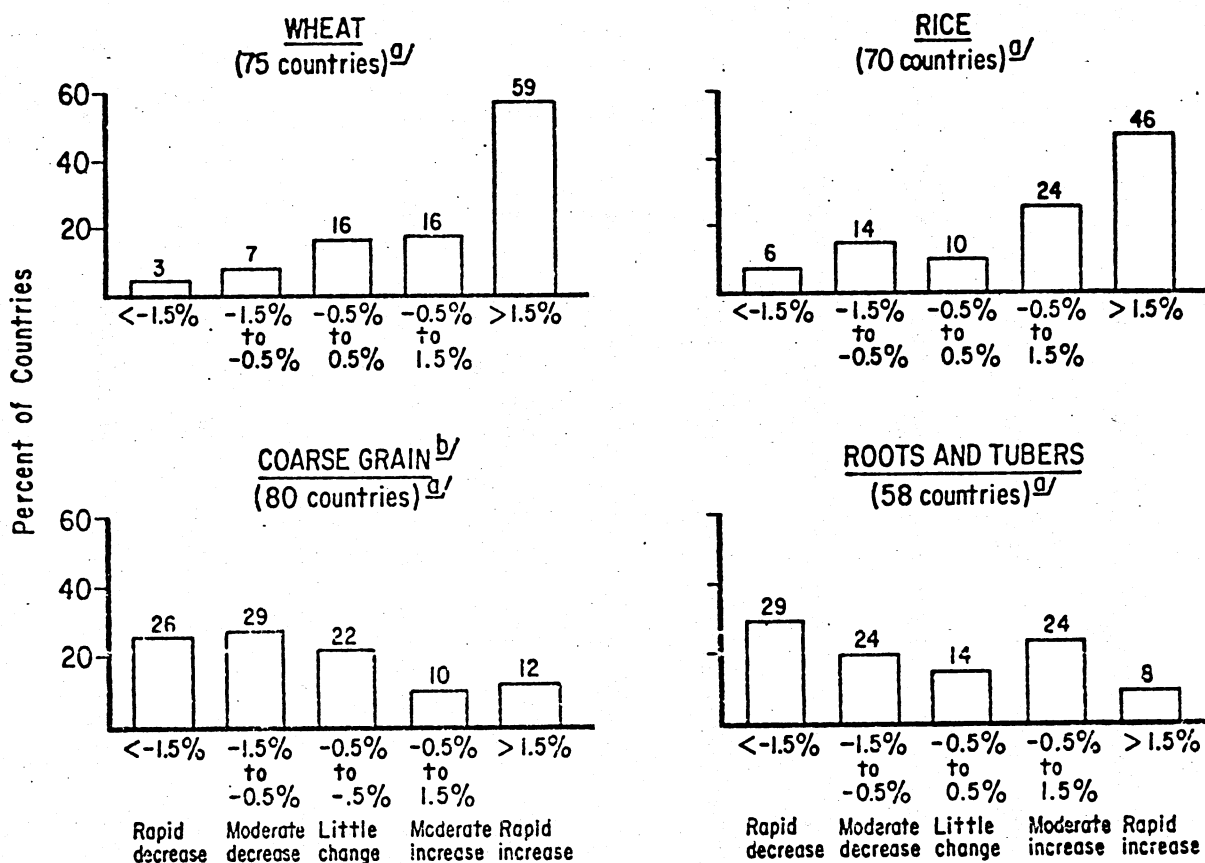
\* Staple food of region contributing over 10 percent of daily calorie supply.

○ Crops that increased by over 20 calories/day in food supply.

□ Crops that decreased by over 20 calories/day in food supply.

Figure 7. Classification of Developing Countries by Annual Rate of Change in Supply of Various Staples to Human Consumption.

Annual Growth Rate Per Capita Consumption (Percent Per Year)



<sup>a/</sup> Calculated for developing countries where the food staple constitutes at least 50 calories per day and where population is over 0.5 m.

<sup>b/</sup> Includes all cereals other than wheat or rice.

try, mask considerable variation within countries. In the first place, the consumption of wheat is usually higher in urban areas of the developing world than in rural areas, especially in countries where wheat is not traditionally a staple food (Table 2). Wheat consumption also rises

Table 2. Consumption of Wheat and Wheat Products in Rural and Urban Areas of Developing Countries.

	Year	Annual Per Capita Consumption of Wheat Products (kg / year)	
		Rural Areas	Urban Areas
<u>Countries or Regions with High Per Capita Wheat Consumption (over 100 kg/year)</u>			
India - Punjab State	1974/75	130	117
Egypt	1974/75	109	178
Pakistan	1971/72	108	92
<u>Countries or Regions with Intermediate Per Capita Wheat Consumption (30-100 kg/year)</u>			
Peru	1972/73	28	43
Mexico	1968	26	49
Sri Lanka	1981	26	57
Bangladesh	1973-74	59	32
India-Bihar State	1974/75	39	57
Sudan	1982	25	84
Kenya	1974/75	10	30
<u>Countries or Regions with Low Per Capita Wheat Consumption (less than 30 kg/year)</u>			
Brazil	1975	9	29
Indonesia-Java	1980	3	32
Costa Rica	1969	22	29
Guatemala	1969	15	49
Honduras	1969	8	30
Ghana-South	1962	3	21
Malawi	1968/69	.6	5
Philippines	1975/79	5	18
India-Andhra Pradesh State	1974/75	2	9

Sources: India: Government of India (1977); Egypt: Alderman, von Braun and Sakr (1982). Figures are totals of wheat grain, flour, bread and noodle consumption; Bangladesh: Government of Bangladesh (1977); Brazil: Fundação Instituto Brasileiro de Geografia e Estatística (1978); Peru: Lizardo de las Casas Maya (1977); Mexico: Banco de Mexico (1968). Figures for urban areas are for cities over 500,000 persons; Sri Lanka: Steinberg et al., (1981); Sudan: Franklin et al., (1982); Kenya: Shah and Froberg (1980); Indonesia: Magiera (1981). Figures are for Jakarta and the rest of Java; Costa Rica and Guatemala: FAO (1973); Pakistan and Mali: FAO (1977).

with incomes, usually at a rate faster than that for any other staple, including rice. Table 3 presents a few examples of these trends. These differences tend to be more extreme in rural than in urban settings and in countries where wheat is not traditionally consumed. For example, the highest income group (top one third of households) in Indonesia consumes about 15 times as much wheat per capita as the lowest income group (bottom third) while the comparable ratio from urban Punjab, India is only about 1.1.

Table 3. Per Capita Consumption of Wheat and Wheat Products by Income Class.

	Year	Income Class		
		Poorest 25 Percent	Middle 50 Percent	Highest 25 Percent
(kg/capita/year)				
<u>Countries or Regions with High Per Capita Wheat Consumption (over 100 kg/year)</u>				
Punjab State, India-Rural	1974/75	99	134	183
-Urban	1974/75	111	120	123
Iran-Urban	1969	127	134	140
Iraq-Nationwide	1971	137	180	212
Pakistan-Urban (Rawalpindi)	1981	99	96	91
<u>Countries or Regions with Intermediate Per Capita Wheat Consumption (30-100 kg/year)</u>				
Sudan-Khartoum	1982	61	101	130
Sri Lanka	1969-70	31	32	31
Bihar State, India-Rural	1974/75	16	37	72
-Urban	1974/75	40	61	73
Bangladesh-Urban	1973-74	67	59	50
<u>Countries or Regions with Low Per Capita Wheat Consumption (less than 30 kg/year)</u>				
Malawi-Nationwide	1968/69	.4	2.4	5.8
Brazil-Rural	1975	3	10	15
-Urban	1975	20	29	36
Philippines-Manila	1973/77	14	16	21
-Rural Central Luzon	1973/77	4	6	8
Andhra Pradesh State, India				
-Rural	1974/75	1	2	2
-Urban	1974/75	3	8	18
Indonesia	1976	.4	2	8

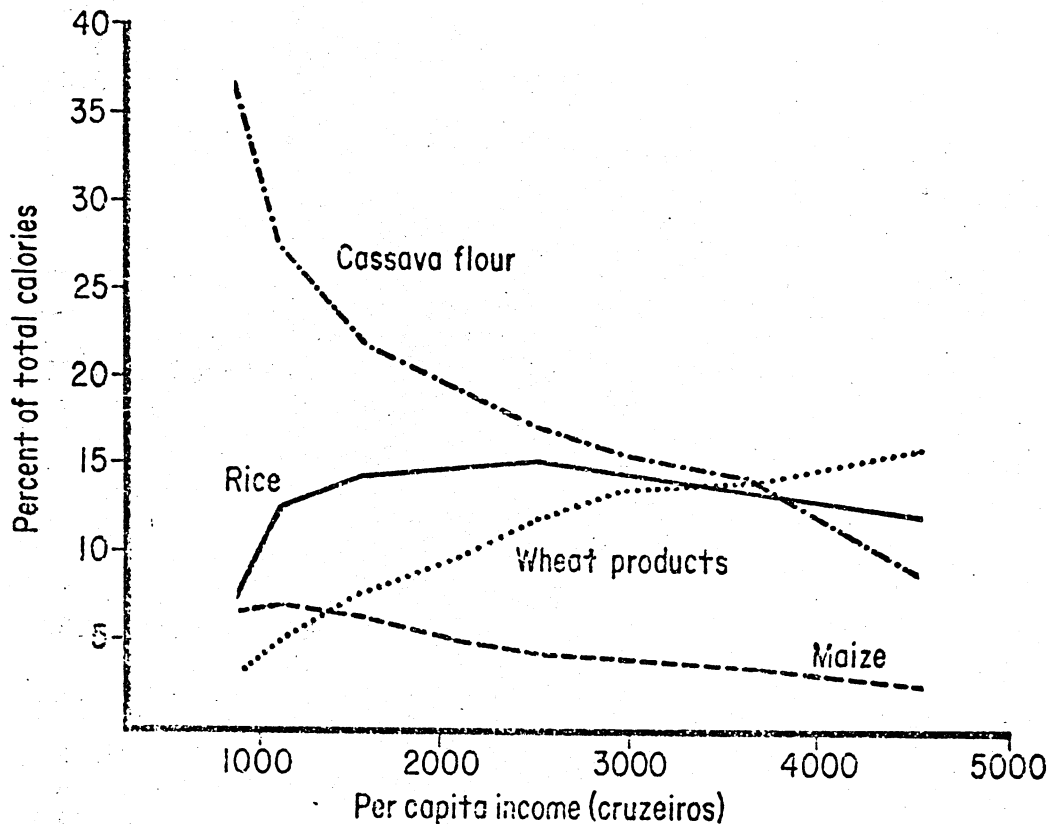
a/ Calculated from expenditure data using the average food consumption of wheat for the country as a conversion factor. Average country food consumption of wheat was taken from FAO (1960).

Sources: Iran, Iraq, Pakistan, Malawi-FAO (1977); Brazil-Fundação Instituto Brasileiro de Geografia e Estatística (1978); India-Government of India (1977); Sudan-Franklin, et al. (1982); Philippines-Bouis (1982); Pakistan-Khan (1982); Bangladesh-Govt. of Bangladesh (1977); Sri Lanka-Govt. of Sri Lanka (no date); Indonesia-Magiera (1981).

The direct correlation between the increasing consumption of wheat and higher incomes reflects not only greater total food consumption, but also considerable substitution. Figure 8 relates the consumption of four staples in northeast Brazil to per capita income levels. As incomes rise, wheat and rice are clearly substituted for cassava and maize; the greater importance of wheat compared to rice among higher income groups is also demonstrated.

Another measure of the importance of wheat to different income groups is given by the income elasticity of demand.<sup>1/</sup> Some income

Figure 8. Rice, Cassava, Wheat, and Maize as Contributors to Apparent per Capita Energy Consumption, Northeast Brazil, 1975/76, by Income Class.



Source: T. T. Poleman, "Quantifying the Nutrition Situation in Developing Countries", Food Research Institute Studies., 1; 1-58; 1981.

<sup>1/</sup> These elasticities measure the percentage increase in consumption of a product given a one percent increase in income.



elasticities for wheat, rice and maize are presented in Table 4. The elasticities for wheat for many countries are between 0.5 and 1, especially in Sub-Saharan Africa, whereas income elasticities for maize for direct consumption are always lower and at times negative.

Table 4. Estimate of Income Elasticities for Wheat, Rice and Maize.

	<u>Year</u>	<u>Wheat or Wheat Product</u>	<u>Rice</u>	<u>Maize</u>
<u>Countries or Regions with High Per Capita Wheat Con- sumption (over 100 kg/year)</u>				
Iran - Rural	1971	-0.1	2.3	na
- Urban	1971	.1	0.7	na
Iraq - Nationwide	1971	.4	.2	na
Pakistan - Rural	1972	0.3	0.3	na
- Urban	1972	-0.1	0.6	na
<u>Countries or Regions with Medium-Level Per Capita Consumption of Wheat (30-100 kg/year)</u>				
Mexico	1977	.61	.35	-0.17
Sudan	1982	.70	na	.27 (sorghum)
Sri Lanka-Rural	1969-73	-.15 Flour	.36	na
-Urban	1969-73	.42 Bread	.36	na
Peru - Lima	1971	.1	0	-0.5
Venezuela - Barcelona	1968	.3	-0.1	-1.6
<u>Countries or Regions with Low Per Capita Wheat Con- sumption (less than 30 kg/cap)</u>				
Brazil - Rural	1975	.32	.17	-.04
- Urban	1975	.12	.32	-.15
Philippines - Nationwide	1973-76	.41	.1	-.4
Indonesia - Urban	1969	1.0	.1	-.9
Kenya - Mombassa	1969	.7	.6	.2
Malawi-Nationwide	1968	1.0	1.2	.2
East Africa	1981	.5	.6	.3
West Africa	1981	.9	.7	.2

Sources: Iran, Iraq, Pakistan, Peru, Venezuela, Kenya, Malawi - FAO (1977); Mexico - Lustig (1980); Sudan - Franklin et al. (1982); Sri Lanka - Alderman and Timmer (1980); Brazil - Gray (1982); Phillipines - Bouis (1982); Indonesia - Magiera (1981); East and West Africa - Christensen et al. (1981).

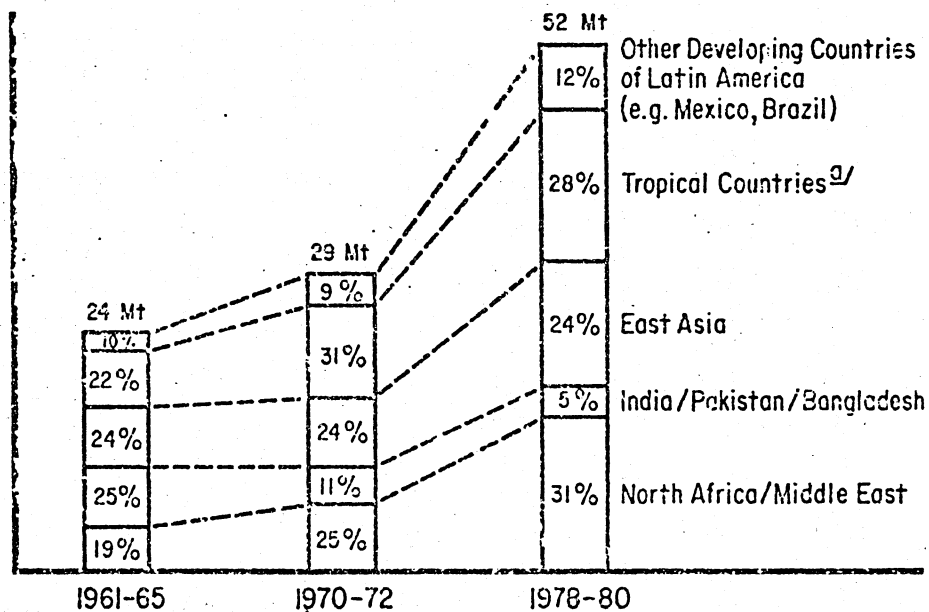
## A Closer Look at Wheat Imports by Developing Countries

### The Major Wheat Importers in the Developing World

The changing pattern of wheat imports by developing countries is shown in Figure 9. Five major groups of developing countries are displayed. The countries of the traditional wheat belt of the Middle East and North Africa are the most important wheat importers. Their imports increased dramatically during the 1970s, from 7Mt in 1970-72 to 16Mt in 1978-80 (estimated in 1982/83 to be 19Mt) with 10Mt (12Mt in 1982/83) destined for North Africa alone. The growth of wheat imports in this region was to some extent associated with increased oil export earnings in several countries. However, other countries that were oil importers, especially Morocco and Tunisia, also at least doubled their wheat imports in the 1970s. Turkey is a notable exception in this group of countries. Rapid increases in wheat production substituted for imported wheat in the early 1970s and enabled some exports of wheat in recent years.

The wheat-producing countries of Latin America (with the exception of Argentina) have all more than doubled wheat imports in the 1970s to reach 6Mt by the end of the decade.

Figure 9. Share of Total Wheat Imports by Major Developing Country Regions.



a/ Countries lying between latitude 23°N and 23°S. For a full definition, see page (iv).

A third major wheat-importing region is East Asia, dominated by China but with the Republic of Korea also consistently importing 1.5-2.0Mt annually. Chinese wheat imports jumped to about 13.5Mt in the last two years, to make that country the world's second largest wheat importer after the USSR.

The last major group of wheat-importing countries consists of those nations lying entirely between 23°N and 23°S latitude. This tropical belt includes nearly all of Sub-Saharan Africa, Southeast Asia, Central America and the Caribbean (less Mexico), and the Andean Zone (see Regions, page iv for a complete list). Together these countries have a population of nearly 900 million people, a little over one-quarter of the developing world's population. However, wheat is now successfully grown in this tropical belt only at higher elevations and, in fact, the combined wheat production of these countries is only one percent of the total production of developing countries. But together they imported 15Mt of wheat in 1978-80 (estimated at 17Mt in 1982/83), nearly 30 percent of all wheat imports by developing countries. The growth of wheat imports in this group of countries has been a steady 6 to 7 percent per year during both the 1960s and 1970s.

In contrast, wheat imports by South Asia (excluding Sri Lanka) have fallen from 6Mt to 3Mt, largely due to rapid production increases in India and Pakistan. These countries, which held the largest share of wheat imports in the 1960s, now account for only 5 percent of the wheat imports of developing countries, although they constitute a quarter of the developing world's population.

Wheat imports in the 1970s were widely distributed across countries. The five largest importers (USSR, China, Japan, Egypt, and Brazil) each imported over 4Mt, and together they accounted for over 40 percent of total wheat imports in 1978-80. In 1978-80, 19 countries (including 14 developing nations) imported over 1Mt of wheat annually. Some 70 countries (including 54 developing nations) imported over 100,000 tons annually (Table 5).

#### Per Capita Wheat Imports and Utilization

Aggregate import figures do not give an accurate picture of the degree of dependence on wheat imports among countries of different

Table 5. Distribution of World Wheat Imports, 1978-80\*.

		Annual Net Wheat Imports, 1978-80					
		Over 4 Mt (44 percent share)	2-4 Mt (12 percent share)	1-2 Mt (18 percent share)	0.5-1.0 Mt (15 percent share)	0.2-0.5 Mt (7 percent share)	0.1-0.2 Mt (2 percent share)
DEVELOPING COUNTRIES		China (9.3 Mt) Egypt (5.2 Mt) ✓ Brazil (4.3 Mt)	Algeria	Korea Rep. ✓ Morocco ✓ Bangladesh Iraq Vietnam Iran Pakistan Cuba Nigeria Indonesia	Chile Mexico Sri Lanka Peru Saudi Arabia Venezuela Philippines China (Taiwan) Tunisia Lybia	Malaysia Korea D.P.R. Colombia Yemen Arab Rep. Syria Singapore Lebanon Jordan Bolivia Ethiopia Sudan Ecuador Kuwait	Hong Kong Ivory Coast Thailand Zaire Jamaica Dominican Rep. Ghana Angola Mozambique India Haiti Senegal Zambia Yemen Dem. Cameroon Guatemala El Salvador
	DEVELOPED COUNTRIES	USSR (11.9 Mt) Japan (5.7 Mt)	Italy Poland United Kingdom		Portugal Germany D.R. Czechoslovakia Yugoslavia Israel Netherlands	Belgium-Luxemburg Switzerland Norway Ireland Finland	

\* Order of countries reflects a declining level of net imports.

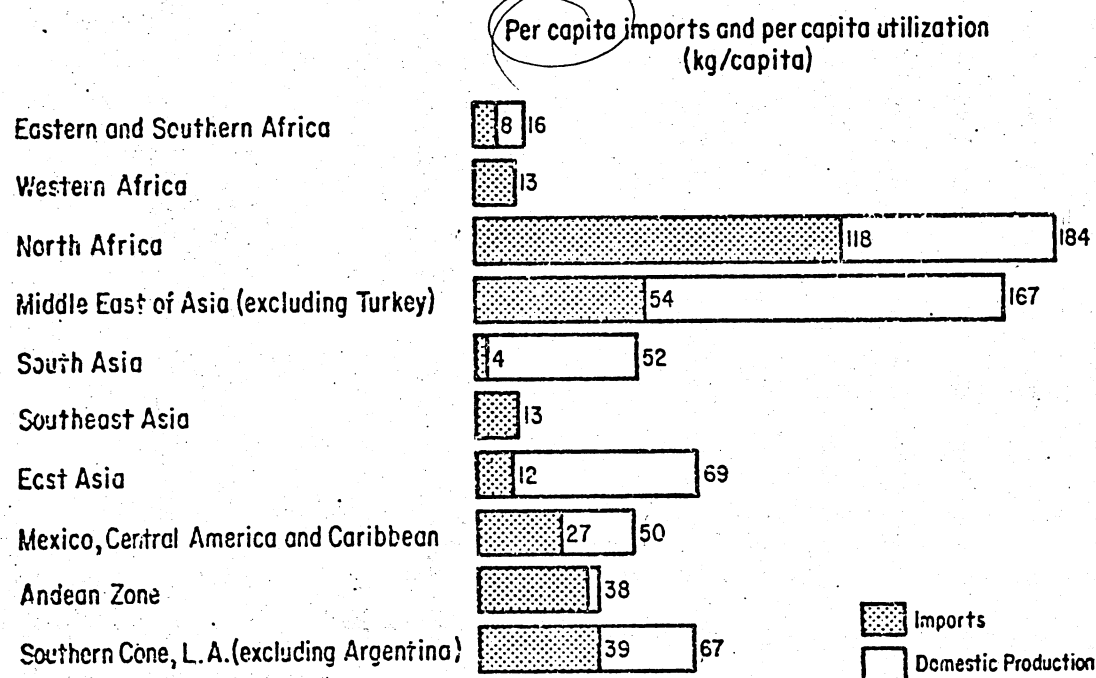
Source: FAO Data Tapes.

sizes. This dependency is best expressed by analyzing per capita imports, or the percent of wheat consumed that is imported. Figure 10 shows that per capita wheat imports are highest in North Africa and the Middle East, the region of highest per capita utilization where wheat products are the staple of the diet. Wheat imports in these regions in 1978-80 averaged 54kg/capita in the Middle East (excluding Turkey) and a very high 112kg/capita in the five countries of North Africa which collectively imported nearly two thirds of the wheat they consumed.

The next highest per capita wheat imports occurred in Latin America. Excluding Argentina and Mexico, Latin America imported 39kg/capita out of a total wheat utilization of 56kg/capita in 1978-80. Cuba, with 122kg/capita, had the highest wheat imports in this group of countries. The Andean region, as well as the Central American and Caribbean countries, imported over 90 percent of their wheat requirements.

South Asia and East Asia are also important wheat-consuming regions, but per capita imports are lower than other regions (Figure 10). This reflects a dynamic domestic wheat industry, as well as a large population base.

Figure 10. Per Capita Wheat Utilization (kg/capita) and Imports (kg/capita) for Developing Country Regions, 1978-80.



Source: FAO Data Tapes.

The two tropical regions of Sub-Saharan Africa and Southeast Asia had the lowest per capita wheat utilization (13-16kg/capita), but almost all of it was imported. However, given that most wheat in these regions is destined to urban areas, per capita wheat consumption in urban areas may be quite high.<sup>1/</sup>

#### The Importance of Food Aid in Wheat Imports

Since most food aid is provided as wheat or wheat flour, food aid has been historically important in world wheat trade, especially in wheat imports by developing countries. With the increased contributions of Canada, Australia and the EEC in recent years under the Food Aid Convention of the International Wheat Council, the proportion of cereal food aid provided as wheat has been about 80 percent. The pattern of wheat imports may be related to food aid distribution, especially to the extent that food aid affects real prices of imports and local producer and consumer prices. (This is discussed later on page 37).

In the early 1960s, an average of 11Mt of wheat was provided as food aid to developing countries, nearly all of it by the USA. This amounted to 46 percent of all wheat imports by developing countries<sup>2/</sup> (Table 6 and 7). In several major wheat importing countries (e.g. India and Egypt) wheat food aid averaged around 90 percent or more of wheat imports. Over the last two decades, the amount of wheat imported as food aid has declined to 6.3Mt (in 1978-80) only 12 percent of total wheat imports by developing countries. However, some recipient countries continue to import substantial quantities of wheat as food aid. Egypt, after a gap in the early 1970s, is now the largest importer of wheat as food aid, receiving nearly one third of all wheat food aid--the equivalent of 45kg/capita annually. South Asia, particularly Bangladesh and Sri Lanka, also continue as an important recipient region, although its share of total food aid has declined. Latin American and Middle East countries that were important recipients in the early 1960s now account

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1/ With a ratio of rural to urban consumption of 5:1 and 20 percent of the population in urban areas, urban consumption for a country consuming 15kg/capita would be over 40kg/capita.

2/ This share is 58 percent when China, which did not receive food aid, is excluded.

for only a small proportion of the total. In contrast, countries of Eastern Africa and Southeast Asia have significantly increased both the absolute amount and their proportionate shares of wheat food aid compared to the early 1960s (Table 6).

Table 6. Wheat Imported as Food Aid by Regional Aggregates of the Developing World.

	<u>Percent Regional share of total wheat food aid</u>		<u>Percent of wheat imported as food aid</u>	
	1961-65	1978-80	1961-65	1978-80
Eastern & Southern Africa	} 1	8	15	42
Western Africa		3	15	8
North Africa	19	34	78	20
Middle East of Asia	10	6	59	6
South Asia	50	30	88	49
Southeast Asia	0	11	4	14
East Asia	5	5	9	2
Mexico, Central America	1	2	6	3
Andean Countries	3	2	24	6
Southern Cone, L.A.	<u>12</u>	<u>0</u>	<u>52</u>	<u>1</u>
All Developing Countries	101	101	46	12

Source: B. Huddleston (personal communication) and FAO Data Tapes.

Except for Eastern Africa, the proportion of wheat imported as food aid is now much lower for all regions, than it was in 1961-65. For the largest recipients, food aid is typically 20-33 percent of total wheat imports (Table 7). The major exception is Bangladesh, which imports 80 percent of its wheat on concessional terms or as grants. Some smaller countries, especially in Eastern Africa, also import over half of their wheat as food aid.

Table 7. The Role of Food Aid in Wheat Imports in Selected Developing Countries.

<u>Region and Country</u>	<u>Wheat Food Aid</u>		<u>Wheat Food Aid as</u> <u>Percent Wheat Imports</u>		<u>Wheat</u> <u>Food</u> <u>Aid/</u> <u>Capita</u>	<u>Cumulative</u> <u>Food Aid</u> <u>/Capita</u>
	1961-65 (Mt)	1978-80 (Mt)	1961-65 (percent)	1978-80 (percent)	1978-80 (kg/cap)	1955-80 (kg/cap)
<u>Subsaharan Africa</u>						
Ghana	.01	.05	10	38	5	69
Somalia	0	.06	6	73	17	120
Sudan	.06	.13	60	58	7	144
<u>North Africa/Middle East</u>						
Egypt	1.49	1.81	89	35	44	409
Tunisia	.20	.15	95	24	24	515
Jordan	.06	.10	42	35	33	551
Turkey	.59	0	100	0	0	170
Iran	.18	0	76	0	0	46
<u>South, Southeast &amp; East Asia</u>						
India	5.47	.11	89	0	0	91
Bangladesh	na	1.24	na	80	14	na
Sri Lanka	.08	.24	28	29	16	253
Indonesia	.04	.26	43	25	2	29
Rep. Korea	.50	.29	91	16	8	298
<u>Latin America</u>						
Brazil	1.12	0	52	0	0	92
Colombia	.08	0	100	0	0	56
Bolivia	.09	.10	63	38	19	306

Source: B. Huddleston (personal communication) and FAO Data Tapes.

#### Wheat versus Rice in Food Grain Trade

Rice is the other major food grain in international trade, accounting for 14 percent of food grain imports (rice and wheat) by developing countries, down from 17 percent in 1961-65. There are some important differences among countries and regions in the balance of wheat and rice in food grain imports. The share of rice in food grain imports tends to be higher in some traditionally rice-producing regions of Western Africa



and Southeast Asia (Table 8). However, even in these regions rice imports have expanded less rapidly than wheat. The Middle East, which is not a rice-producing region, is now the second largest rice-importing region after Southeast Asia. Led by the oil exporting countries, rice imports have increased more rapidly than wheat and now represent 24 percent of total food grain imports. Overall, some 20 developing countries import 100,000 tons or more of rice, compared to 56 countries that meet this criterion for wheat imports. Only five of these 20 countries--all traditional rice-consuming nations--import more rice than wheat.<sup>1/</sup> In addition, the traditional rice-producing countries found in West Africa (from Guinea to Ivory Coast) generally favor rice imports.

Table 8. Composition of Food Grain Imports in Developing Countries, 1961-65 and 1978-80.

	Total Food Grain Imports <sup>a/</sup>		Percent of Food Grain Imports as Rice	
	1961-65 (Mt)	1978-80 (Mt)	1961-65	1978-80
Eastern and Southern Africa	.63	1.43	26	14
Western Africa	.93	3.90	44	37
North Africa	2.71	10.38	0	1
Middle East	2.12	7.55	15	24
South Asia	7.83	4.44	20	13
Southeast Asia	3.47	7.89	61	41
East Asia	5.81	12.74	2	4
Mexico, Central America, Caribbean	1.61	3.64	22	11
Andean	1.19	2.64	4	5

a/ Based on gross imports of rice and wheat; South Asia, East Asia, North Africa, the Andean Zone, and Western Europe/Japan are net exporters of rice.

Source: FAO Data Tapes.

1/ Madagascar, Senegal, Indonesia, Singapore, and Hong Kong.

A few tropical countries, such as Sri Lanka, Cuba, and Vietnam, have reduced rice imports substantially at the same time that they have rapidly increased wheat imports, apparently in an effort to reduce total costs of food grain imports and the risks imposed by variable rice prices in relation to wheat.

There are also important differences in the year to year variability in rice and wheat imports, and these differences are related to the staple crop of the country. As expected, wheat imports by wheat-producing countries are most variable, while wheat imports by tropical countries generally show a steady trend upward with little year-to-year deviation (Table 9). This reflects the dependence of these countries on wheat imports to feed steadily growing urban populations. Variations in rice imports show a similar tendency to be higher for rice-producing countries and lower for countries that do not produce rice—especially those of the Middle East. However, rice imports are generally more variable than wheat, probably because of the wider swings in the world price of rice. (Falcon and Monke, 1980).

Table 9. Index of Variability of Wheat and Rice Imports for Selected Wheat Producing and Non-Wheat Producing Countries, 1966-1980. <sup>a/</sup>

<u>Wheat Producing Countries</u>			<u>Non-Wheat Producing Countries</u>		
	<u>Wheat</u>	<u>Rice</u>		<u>Wheat</u>	<u>Rice</u>
	(%)	(%)		(%)	(%)
Syria	54	32	Ghana	20	46
Iran	44	49	Indonesia	26	29
Morocco	13	nc	Philippines	12	nc
Mexico	82	nc	Honduras	11	50
Chile	31	62	Venezuela	12	nc

<sup>a/</sup> Calculated as  $I = CV \sqrt{1 - \bar{R}^2}$  where CV is the coefficient of variability and  $\bar{R}^2$  is the corrected coefficient of determination. The lower the index, I, the less the variability around the trend line. [Cuddy and Della Valle (1978)].

nc Not calculated because country was self sufficient or an exporter for part of the period.

Source: FAO Data Tapes.

Another major difference in rice and wheat trade is the importance of developing country exporters in world rice trade. During 1978-80, nine developing countries, led by Thailand, China, and Pakistan, exported over 100,000 tons of rice, accounting for two-thirds of world rice exports. In contrast, only three developing countries were net exporters of wheat and these made up only 6 percent of total world wheat trade. Significantly, all but one of these rice-exporting countries (India) were net wheat importers. Assuming a rice export price of twice the wheat import price, five of the remaining eight exporters<sup>1/</sup> exported enough rice to pay for the wheat imported. The major exceptions were China and Egypt, the two largest wheat-importing countries of the developing world.

In sum, there is a tendency for countries to favor importing wheat or rice, depending on which is the traditional staple food of the country. However, this is not a strong relationship. Rapid increases in wheat and rice imports often reflect efforts to diversify diets--for example, rice imports by the Middle East and wheat imports by Southeast Asian countries. However, in every region of the developing world, except South Asia, food grain imports have increased, and in each case wheat has accounted for the largest share of the increase.

#### Increasing Import Dependence in Most Countries

Table 10 shows the relationship between production, consumption and imports of wheat by (developing country) regions. In the last two decades, per capita wheat utilization has increased most (in absolute terms) in regions where wheat is traditionally consumed. This is true for the Middle East and North Africa regions. In relative terms, however, wheat utilization increased more rapidly in the tropical regions (e.g. Western Africa and Southeast Asia) where wheat consumption was minimal in the early 1960s.

Increases in wheat production have been less than consumption increases in most regions and countries, leading to greater import dependence. Per capita wheat production increased in only three regions, and in only one of these (South Asia) did production outpace consumption

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<sup>1/</sup> Burma, Pakistan, Thailand, Korean Democratic Republic, and Uruguay.

Table 10. Relationship Between Wheat Utilization, Production, and Imports in Major Developing Country Regions.

	Wheat Utilization Per Capita 1978-80 (kg/cap)	Wheat Imports Per Capita 1978-80 (kg/cap)	Increase in Wheat Utiliza- tion/cap 1961-65 to 78-80 (kg/cap)	Percent of Increased Utilization Imported	Growth Rate 1961-65 to 78-80	
					Wheat Util/ cap (Percent/year)	Wheat Prod/ cap
Eastern and Southern Africa	16	8	4.1	66	1.8	0
Western Africa	13	13	8.6	100	6.6	c/
North Africa	184	118	54.0	90	2.2	-1.6
Middle East (except Turkey)	167	54	39.0	51	1.2	0
South Asia	52	4	16.2	a/	2.3	4.0
Southeast Asia	13	13	7.4	100	5.2	c/
East Asia	69	12	32.8	17	4.0	4.1
Mexico, Central America, Caribbean	50	27	13.1	70	1.9	-0.2
Andes	38	35	4.5	100	.8	-6.2
Southern Cone (except Argentina)	67	38	16.3	59	3.3	1.3
<u>All Developing</u> <u>Countries</u> d/	61	14	20.0	26	2.5	2.4

a/ Production increased faster than utilization so that imports decreased.

b/ Production decreased so that imports increased to maintain per capita utilization.

c/ Non-wheat producing regions.

d/ Includes Argentina and Turkey.

Source: FAO Data Tapes.

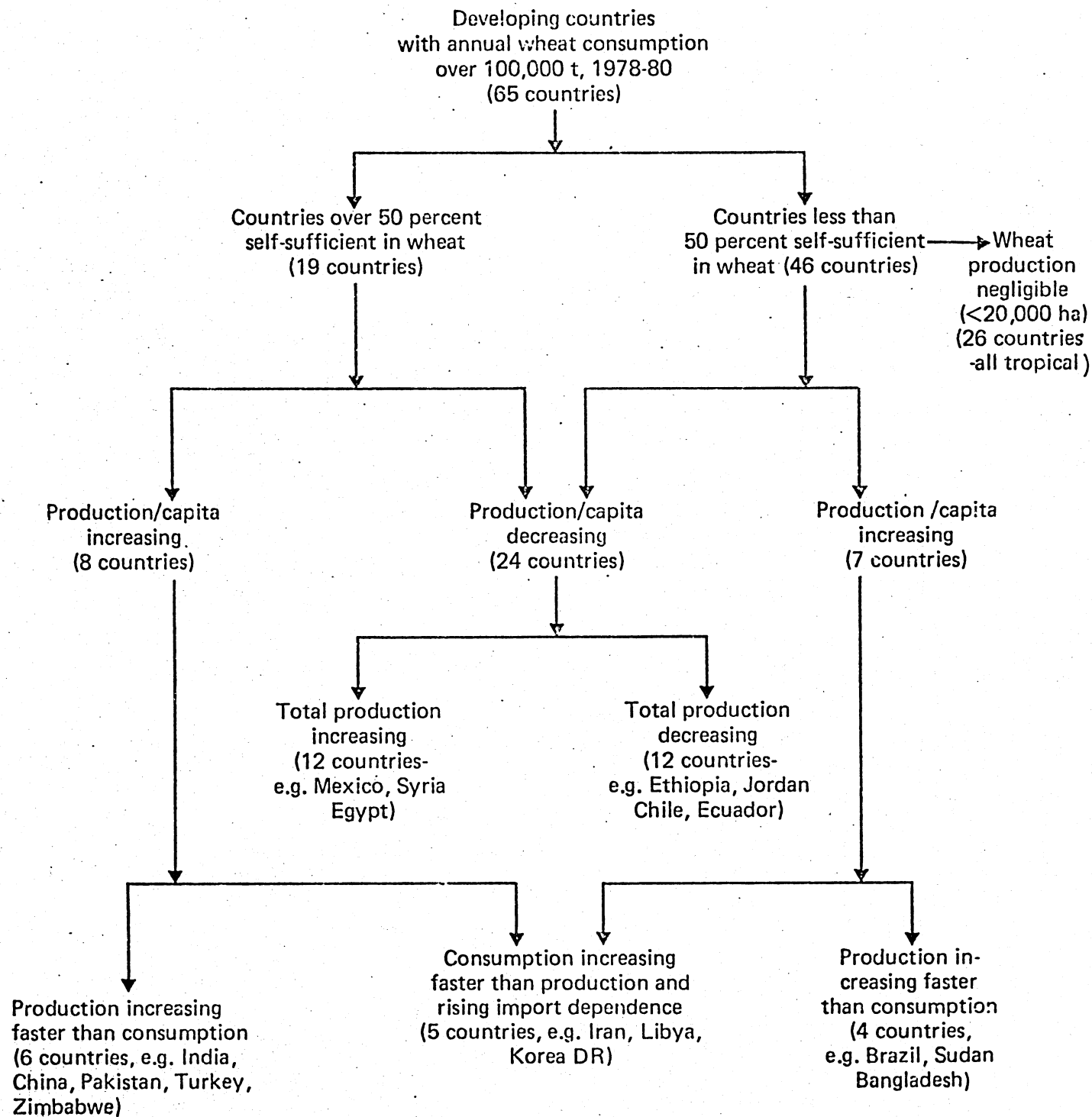
leading to some import substitution (Table 10). Per capita wheat production was unchanged in three regions (East Africa, the Middle East [excluding Turkey], and Mexico-Central America), while it significantly declined in North Africa and was reduced by half in the Andean region.

Figure 11 contrasts the production and consumption performance of the 65 developing countries that consumed over 100,000 tons of wheat. Forty-six of these countries (over half of them in the tropical belt) were dependent on imports to meet 50 percent or more of their requirements. Of the 39 countries in the group that produced wheat (i.e. 20,000 ha or more), per capita production increased in only 15 countries, and production outpaced consumption in only 10 of these countries, thus enabling a reduction in the percentage of wheat imported. Significantly, the largest wheat producers and consumers fell in this latter group (Figure 11).

The picture that clearly emerges is that of rapid increases in per capita wheat consumption made possible through increased domestic production in a few countries, most notably the four largest wheat producers. In most cases, however, increased consumption of wheat has been supported by increased imports. Imports accounted for over 50 percent of the increased consumption in all regions (except South Asia and East Asia) and provided for practically all of the increased consumption in Sub-Saharan Africa, North Africa, Southeast Asia, and the Andean Region.

Almost all wheat-consuming developing countries became more dependent on wheat imports, as measured by the percentage of imports in consumption. (Only in Turkey, India and Zimbabwe did per capita wheat imports actually decline). This increasing dependency on imports largely occurred in the wheat-producing countries; the proportion of countries producing at least two-thirds of their requirements dropped from 67 to 41 percent between 1961-65 and 1978-80. Meanwhile, dependence on wheat imports continues at a high level in the tropical countries. Only 5 countries in this group of 35 produced even one-third of the wheat they required in 1978-80.

Figure 11. Classification of Developing Countries by Import Dependence and Production Performance in Wheat, 1961-65 to 1978-80.



Source: Calculated from FAO Data Tapes.

## Factors Influencing Increased Wheat Consumption and Imports in Developing Countries

Recent research has identified some of the major factors leading to increased wheat consumption and imports by developing countries. These include country level studies of the wheat industry (e.g. Scobie, 1981, Magiera, 1981, Franklin, et al., 1982), as well as our own cross-country regression analysis of wheat imports by 55 countries that do not produce wheat and whose per capita wheat imports varied from 3kg to 120kg (see Appendix A). Tentative results suggest that several key economic variables explain up to 80 percent of the variation in wheat consumption across countries. These variables can be classified into five major groups that affect the demand and/or supply sides: 1) rising incomes and urbanization, 2) food aid, 3) consumer pricing policies, 4) lagging production of staple foods, and 5) market promotion and institutional arrangements in the wheat processing industry.

### Rising Incomes and Urbanization

The data presented earlier indicate that wheat consumption in most countries, especially those where wheat is not a traditional staple, is closely related to income levels and is significantly higher in urban areas. Cross-sectional analysis across countries clearly shows that national per capita income (and the associated levels of urbanization) is the major factor explaining variation in wheat consumption across countries (Appendix A). There are several factors underlying this relationship. First, wheat products are often preferred foods so that, as incomes rise, they are substituted for other staple foods, particularly coarse grains. Relatively high and rapidly rising incomes have been a major factor promoting increased wheat consumption in the Middle East and North Africa.

Second, the level of urbanization is closely associated with national per capita income. Urbanization influences wheat consumption in a number of ways. On the demand side, a premium is attached to convenience foods that require little or no preparation, especially for meals other than the main meal. This reflects the higher opportunity cost of food preparation in the home, due to higher incomes and womens' participation

in outside employment (Franklin et al., 1982), and also the higher costs of fuel for cooking in urban areas.<sup>1/</sup> These factors particularly favor bread consumption, even though the price of bread is usually nearly double the price of wheat flour, and also often higher than traditional staple foods. The preference for bread in urban areas is clearly shown by the data for Egypt (Table 11) where a high and increasing proportion of wheat products are consumed as bread in urban areas compared to rural areas.

On the supply side, government marketing agencies faced with providing food to a rapidly expanding urban population at reasonable prices often find it easier to turn to imports than to procure urban food supplies in rural areas, especially in those countries where large cities are located on coastal waters. Imports for urban consumers help overcome problems of bottlenecks in domestic transportation, rural storage, year-to-year fluctuations in supplies and problems of quality control. Wheat imports are cheaper and more readily available than rice; hence, wheat imports to satisfy urban consumers have become common.

This process is most advanced in Latin American countries, where over half the population now lives in urban areas. In the Andean region, for example, wheat is now the most important cereal staple, and nearly

Table 11. Composition of Retail Purchases of Wheat and Wheat Products, Egypt by Rural and Urban Areas.

<u>Wheat Product</u>	<u>1954/55</u>		<u>1974/75</u>	
	<u>Rural</u>	<u>Urban</u>	<u>Rural</u>	<u>Urban</u>
	(percent)		(percent)	
Grain	75 <sup>a/</sup>	9	49 <sup>a/</sup>	4
Flour	17	23	33	14
Bread	7	68	18	81
Total	100	100	100	100

a/ Includes consumption of home grown grain.

Source: Alderman et al., (1982).

<sup>1/</sup> Urban consumers are also more exposed to influences of developed countries where bread is usually a traditional staple.



all of it is imported. The recent jump in wheat imports by China is also due to a policy to supply large urban conglomerates of the east coast with imported food, again wheat. Not surprisingly, the eight countries of Sub-Saharan Africa<sup>1/</sup> with per capita wheat consumption below 5kg annually in 1976-78 are land-locked countries with very low levels of urbanization. In this situation, importation of wheat loses some of its cost advantage relative to domestic cereal production, primarily because of high transportation costs for grain imports.

The burden of feeding urban populations is most acute in Sub-Saharan Africa, where population growth in 35 major capitals now averages 9 percent annually. At this rate not only the marketed food surplus but also the associated marketing, transportation, and storage requirements must double in size every eight years simply to maintain per capita urban food consumption at current levels. It is not surprising then that Sub-Saharan Africa has one of the highest growth rates of wheat consumption (7 percent) based on imported wheat, at the same time that average per capita incomes and food availability have declined. Moreover, this trend could continue, since less than 20 percent of Africa's population currently live in cities (Table 12).

Table 12. Economic Characteristics of Regional Aggregates.

	Percent Pop- ulation in Urban Areas 1979-81	GNP per Capita 1979-81 (US\$1980)	Cereal Production Per Capita 1979-81 (kg/cap)	Growth Rates 1961-65 to 1979-81		
				Urban Population	GNP/ Capita	Cereal Prod/ Capita
Eastern & Southern Africa	16	307	139	6.5	0.1	-.9
Western Africa	25	641	107	6.1	2.6	-1.3
Middle East	48	2616	301	5.5	6.0	.1
North Africa	45	1238	166	4.2	3.8	-1.2
South Asia	22	231	165	3.8	1.4	.3
Southeast Asia	23	684	211	3.9	4.2	.7
East Asia	15	351	244	5.6	4.1	1.5
Mexico & C.Amer.	58	1691	288	4.6	2.7	1.0
Andean Zone	67	1609	114	4.8	2.8	.6
Southern Cone	71	2111	354	4.0	3.7	.6

Source: World Bank (1982) and FAO Production Yearbook (various issues).

1/ Mali, Upper Volta, Niger, Chad, Central African Republic, Rwanda, Burundi, and Malawi.

## Food Aid

Wheat imports through food aid have also been a factor in increased wheat consumption in some countries. The most direct effect is to lower the real price of wheat imports to the country (often to half or less than half of the price of commercial imports) and, in many cases, to provide wheat free of charge. However, a complex of other factors will determine the final effect of food aid on total wheat imports: the elasticity of commercial wheat imports with respect to foreign exchange saved by food aid; the impact on domestic agricultural production, especially through possible reduction in prices for local cereals; and the long run impact of possible changes in food preferences toward foods, especially wheat products, imported under food aid.

As might be expected, countries that receive significant amounts of wheat food aid (e.g. Bangladesh, Bolivia and the Sudan) have higher per capita wheat imports than non-food aid countries of comparable levels of incomes and urbanization<sup>1/</sup>. Furthermore, current commercial imports of wheat are positively associated with the amount of food aid received as wheat in the past (see Appendix A). For example, Sri Lanka, The Republic of Korea and Brazil have among the highest cumulative imports per capita of wheat as food aid and are now relatively high consumers and commercial importers of wheat. This effect of historical food aid reflects several factors, such as a) an established consumer exposure and even preference for wheat products, b) market promotion activities often associated with food aid programs (see Table B.2), c) development of a wheat-processing industry based on food aid imports, and d) institutionalization of subsidy programs for wheat products to keep consumer prices from rising too rapidly as government agencies phase in commercial sources of wheat supplies (see next section). To some extent, tropical countries that do not produce wheat can avoid these effects if they receive food aid in the form of cereals that are locally produced and if they distribute it through targeted nutrition interventions or open market sales at non-subsidized prices. In recent years, Indonesia and Senegal have largely accepted food aid in the form of rice, while a few countries of East Africa have imported maize in food aid programs.

<sup>1/</sup> Countries receiving significant amounts of food aid also often have low prices of wheat products as discussed in the next section.

Finally, the possible negative impact of food aid on domestic food production is a subject of continuing controversy. In the Andean region, domestic wheat production declined in response to reduced producer prices for wheat during the 1960s when most wheat was imported as food aid (Dudley and Sandilands, 1975; Valderrama, 1979). In other cases, such as Brazil, domestic producer prices were supported at above world prices and domestic wheat production increased rapidly. This was in part made possible by food aid shipments (Hall, 1980).

### Consumer Pricing Policies<sup>1/</sup>

In the developing world there has been a persistent and widespread intervention of governments in providing food to urban consumers at "reasonable" prices. This intervention is often most complete in the case of wheat and least developed for coarse grains. The result is that wheat products based on imported wheat are often cheaper relative to other grains.

The most common and direct intervention has been to provide direct subsidies on wheat flour and bread. In many cases these subsidies represent 50 percent or more of the cost of providing the product to consumers. The price of bread for selected countries shown in Table 13, demonstrates this effect. The most widespread and largest subsidies on bread occur in the Middle East and North African countries, nearly all of which import wheat. Bread prices in these countries are often only a quarter of prices prevailing in such countries as Hong Kong and Panama, which might be regarded as having "world prices".<sup>2/</sup> The largest subsidy is in Egypt, the second largest wheat importer of the developing world. Heavy subsidies on bread also occur in many Latin American countries, especially Cuba, Mexico, Ecuador, and Brazil, although there is a movement to eliminate subsidies in several countries of this region (Colombia, and Peru have already done so). Countries of South Asia also

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<sup>1/</sup> A complete set of data on consumer prices and pricing policy is found in Appendix C.

<sup>2/</sup> Note that over 80 percent of the bread price in countries where bread is based on imported wheat without significant market distortions, is accounted for by the cost of transportation, marketing and processing the wheat from the farm gate (in the exporting country) to the consumer.

Table 13. Consumer Prices of Bread and Rice in Selected Developing Countries, 1980.

	<u>Bread Price</u> (US¢/kg)	<u>Rice Price</u> (US¢/kg)	<u>Ratio Price</u> <u>Bread/Rice</u>
<u>Countries with Bread Subsidy</u>			
Egypt	9	20	.45
Iraq	20	64	.29
Syria	22	-	-
Morocco	25	-	-
Sri Lanka	26	29	.89
Turkey	30	128	.23
Mexico	31	100	.31
Poland	31	-	-
Israel	31	92	.33
India	39	24	1.63
Brazil	39	66	.54
Sudan	40	225	.18
Pakistan	45	56	.80
Cuba	46	61	.75
Bolivia	47	101	.46
Ivory Coast	57	47	1.21
<u>Countries without Bread Subsidy</u>			
Zambia	65	68	.96
Tanzania	72	147	.49
Panama	82	55	1.49
Hong Kong	85	66	1.28
Burma	106	31	3.36
Costa Rica	111	49	2.26
Cameroon	113	70	1.60
Korea	114	111	1.03
Philippines	116	34	3.41
Liberia	118	62	1.90
Rwanda	183	89	2.06

Source: ILO Bulletin of Labour Statistics, October, 1980 and CIMMYT Economics Survey (see Appendix C).

subsidize wheat products, although subsidies are lower (generally 15-30 percent) and are targeted toward poorer urban consumers through ration shops. A substantial wheat subsidy also operates in China (Lardy, 1983). Even in Sub-Saharan Africa and Southeast Asia where nearly all wheat is imported, several countries subsidize bread; however, these subsidies are often lower and high milling and marketing margins may result in fairly high bread prices, as in Indonesia. Finally, some relatively high income countries such as Poland, USSR, and South Africa have substantial bread subsidies.

In a few countries (e.g. Pakistan, Egypt, Argentina and Mexico in some years) low consumer prices for wheat products have been made possible by maintaining producer prices below world prices although in all cases (except Argentina) direct government subsidies have played a more important role. Aside from these countries there is little evidence that governments have favored urban consumers through paying low prices to producers; for most countries producer prices are maintained at or above import prices (Byerlee and Sain, 1983).<sup>1/</sup>

The impact of subsidies not only reduces the absolute price of wheat products, but also reduces their price relative to other food staples since subsidies are usually specific to wheat products (and sometimes rice). Table 14 shows the expected prices of wheat products relative to rice and maize if domestic prices were to reflect world prices. Of course, these ratios are crude guides since there is often substantial variation in quality, especially for rice.<sup>2/</sup> However, even assuming the higher rice quality, the ratio of bread to rice prices should not be less than one.

A number of countries, especially those with relatively open economies and little government control of the wheat industry, have a ratio of bread to rice prices of between one and two (as expected given world prices) (Table 13). However, many countries (generally those with large wheat subsidies) have bread prices well below the price of rice. These

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1/ These calculations were made at official exchange rates. In some countries, conversion at a shadow exchange rate would result in significantly lower wheat prices.

2/ The price of bread, which is not a traded product, is also a function of local baking costs, especially labor costs, the type of ingredients and the extent of packaging.

Table 14. Approximate Ratios of Import Parity Prices of Bread, Wheat Flour, Rice and Maize.

	Ratio of Price of Wheat Product to Price of Competing Staple <sup>a/</sup>	
	Relative to Rice	Relative to Maize
Wheat Bread	1.5 (1.0 - 1.7) <sup>b/</sup>	3.0 (2.6) <sup>c/</sup>
Wheat Flour	1.0 (.7 - 1.1) <sup>b/</sup>	2.0 (1.6) <sup>c/</sup>

a/ Assumes: Export prices of Wheat, Rice and Maize of x, 2x and .75x respectively, freight and handling .3x, marketing markup of 15 percent of cif price, milling rate .72x, and bread/flour price ratio of 1.75. In the case of wheat flour an additional 10 percent markup has been added to represent the mill to retail margin.

b/ The range of price ratios is given in parenthesis. The upper range is for a rice exporting country where transportation costs are eliminated from rice prices. The lower range is for a country such as Nigeria or Middle Eastern countries which import higher priced rice which is valued at a 50 percent premium over Thai 5 percent broken rice which is usually used as an indicator of world rice prices.

c/ Maize prices are based on imported yellow maize. Many countries however consume white maize which often carries a premium price on world markets. Ratios in brackets assume that white maize sells for the same price as wheat in world markets.

include some countries, such as Sri Lanka and Brazil, where rice is (or was) a staple food.

In many countries, price intervention to raise or lower rice prices also affects the relative price ratio (Table 15). Korea and Japan have low wheat flour to rice price ratios because of high domestic support prices for rice. In contrast, Burma and Thailand, which apply export taxes to rice, have a high price ratio for wheat flour and also the lowest per capita consumption of wheat in Asia. Finally, Thailand and the Philippines also apply high implicit or explicit import duties to wheat and this raises the cost of wheat flour substantially.

The bias in pricing policy in favor of wheat products is generally even stronger in the case of coarse grains. Table 16 shows wheat flour prices relative to maize prices in countries where wheat is imported and maize is an important local staple. Given world prices, transport and

Table 15. Comparison of Wheat Flour and Rice Prices in Selected Rice Consuming Countries of Asia.

<u>Country</u>	<u>Location</u>	<u>Year</u>	<u>National Per Capita Wheat Consumption</u> 1979-81 (kg/year)	<u>Price Wheat Flour</u> (US¢/kg)	<u>Price Rice</u> (US¢/kg)	<u>Ratio Price Flour to Rice</u>	<u>Comments</u>
Bangladesh	Joydepur	1981	25	.20	.27	.8	Flour and rice distributed through ration shops at moderately subsidized prices
India	Coimbatore	1981	50	.33	.34	1.0	
Pakistan	Urban	1982	142	.16	.50 <sup>a/</sup>	.3	Flour subsidized
Indonesia	Central Java	1980	8	.32	.32	1.0	
Japan	Yatabe	1979	53	.45	1.54	.3	High domestic support price for rice. Wheat imported at low or zero duties
Korea	Hwaseongun	1981	50	.34	1.00	.3	
Burma	Rangoon	1981	2	.41	.13	3.1	Export tax on rice
Thailand	Bangkok	1983	4	.74	.35	2.1	High import duty on wheat
Philippines	Central Luzon	1980	15	1.03	.30	3.3	High implicit tariff on wheat imports
Malaysia	Selangor	1982	36	.35	.34	1.0	
China	Tsinan	1981	74	.34	.28	1.2	

a/ Basmati rice

Source: Based on Palacpac (1982) supplemented by information from CIMMYT sources.

Table 16. Retail Wheat Flour and Maize Grain Prices for Selected Countries in 1982.

	<u>Wheat Flour</u> <u>(US¢/kg)</u>	<u>Maize Grain</u> <u>(US¢/kg)</u>	<u>Ratio Price</u> <u>Wheat Flour/</u> <u>Maize Grain</u>	<u>Comment</u>
Bolivia	18	28	0.6	Subsidy on flour
Costa Rica	36	23	1.6	
Dominican Republic	40	40	1.0	
Guatemala	45	21	2.1	Subsidy on maize
Egypt	9	19	0.5	Subsidy on flour
Ecuador	26	62	0.4	Subsidy on flour
Ghana <sup>a/</sup>	131	255	0.5	Overvalued exchange rate <sup>a/</sup>
Haiti	59	26	2.3	
Honduras	48	23	2.1	
Ivory Coast	31	36	0.9	Subsidy on flour
Kenya	33	24	1.4	
Lesotho	43	26	1.7	
Nigeria	58	52	1.1	Overvalued exchange rate <sup>a/</sup>
Zimbabwe	31	122	1.4	Subsidy on wheat and maize

<sup>a/</sup> Nigeria and Ghana also import maize at the same exchange rate but this is largely yellow maize destined to the feed industry and does not affect local maize prices sold for food.

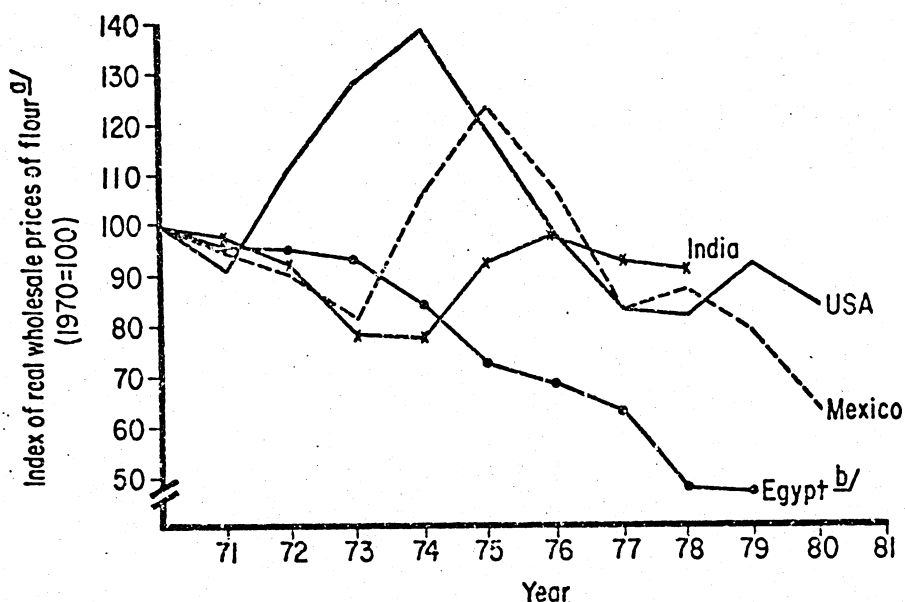
Source: CIMMYT Economics Survey.

milling costs, wheat flour based on imported wheat would be 2.0-2.5 times more expensive than local maize grain. This is the case in such countries as Honduras, Colombia, and Haiti. In other cases (such as Ecuador, Egypt, and the Ivory Coast), a subsidy is applied to wheat flour but not to maize grain so that the price of maize is actually higher than that of wheat flour. In Ghana and Nigeria, there is no wheat subsidy, but overvalued exchange rates combined with import duties or quantitative restrictions on maize imports effectively reduce the price of wheat flour based on imported wheat relative to local maize. Furthermore, in recent years some countries have instituted two-tiered exchange systems with a lower exchange rate for essential imports. Wheat is generally included in the latter category (e.g. Mexico, Ecuador, and Bolivia). There are also a number of countries (e.g. Nigeria and Venezuela) in which tariff rates are higher on maize relative to wheat, presumably to protect local maize growers.



Favorable pricing policies for wheat and wheat products have often resulted in reduced real bread prices to consumers over time. Figure 12 and 13 show price indices for bread and wheat flour in the 1970s (deflated by the consumer price index) in several wheat importing countries. (See Appendix C for a complete set of data). In each case (except Senegal where the wheat subsidy was reduced) the real price declined relative to an index of flour or bread prices in the USA or Hong Kong and, indeed, in many cases the real price fluctuations do not reflect the sharp jump in world prices experienced in 1974-75. To some extent these decreases in real prices reflect changes in the world wheat price and changes in exchange rates associated with favorable terms of trade for wheat importing countries. This is particularly true for oil exporting countries, where the real price of wheat (deflated by the unit value of exports of these countries) has fallen over 80 percent in the

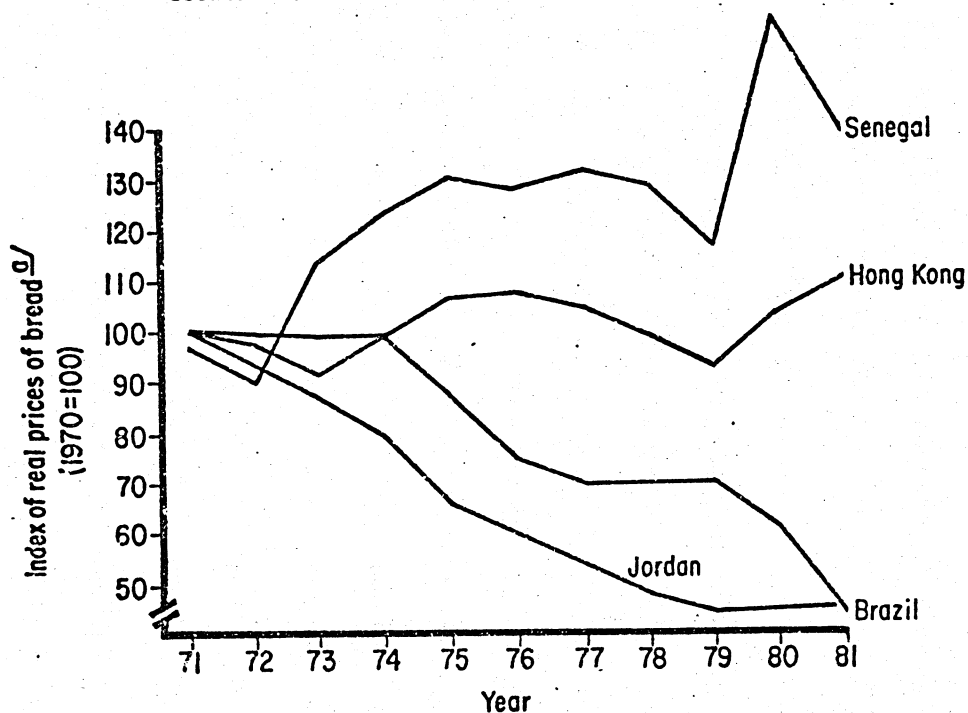
Figure 12. Indices of Real Prices of Wheat Flour in Selected Countries.



a/ Wholesale price deflated by consumer price index.  
 b/ Based on price of wheat paid by millers.

Source: CIMMYT Economics Survey.

Figure 13. Index of the Real Price of Bread in Selected Wheat Importing Countries.



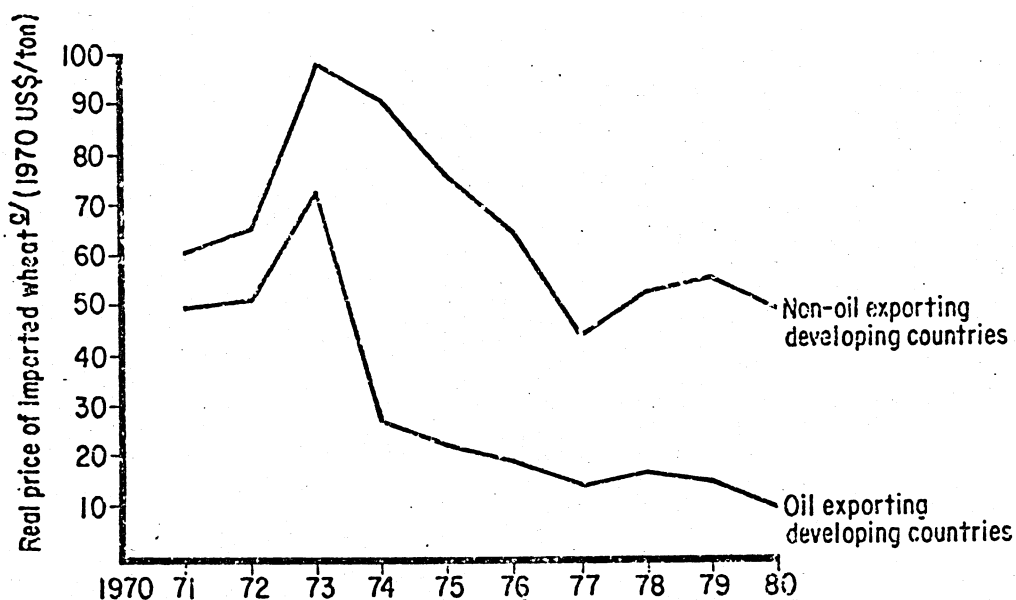
a/ Retail price deflated by consumer price index.

Source: CIMMYT Economics Survey.

1970s. (See Figure 14). Meanwhile, the price of wheat to developing countries that do not export oil is similar to the price prevailing at the beginning of the decade and has probably increased in the last two years of declining commodity prices for developing country exports. In addition, many of these countries have suffered from increasingly overvalued exchange rates, which has reduced the real price of wheat products based on imported wheat to consumers.<sup>1/</sup> However, in most cases the decline in the real price of bread products reflects an increase in consumer subsidies as governments have been reluctant to raise prices in line with inflation and have absorbed the difference in the budget.

<sup>1/</sup> In many countries an overvalued exchange rate results from a domestic rate of inflation higher than the rate of inflation in that country's main trading partners. That is the real price of imported items tends to fall relative to domestically produced items.

Figure 14. Real Price of Imported Wheat to Non-Oil Exporting and Oil Exporting Developing Countries.

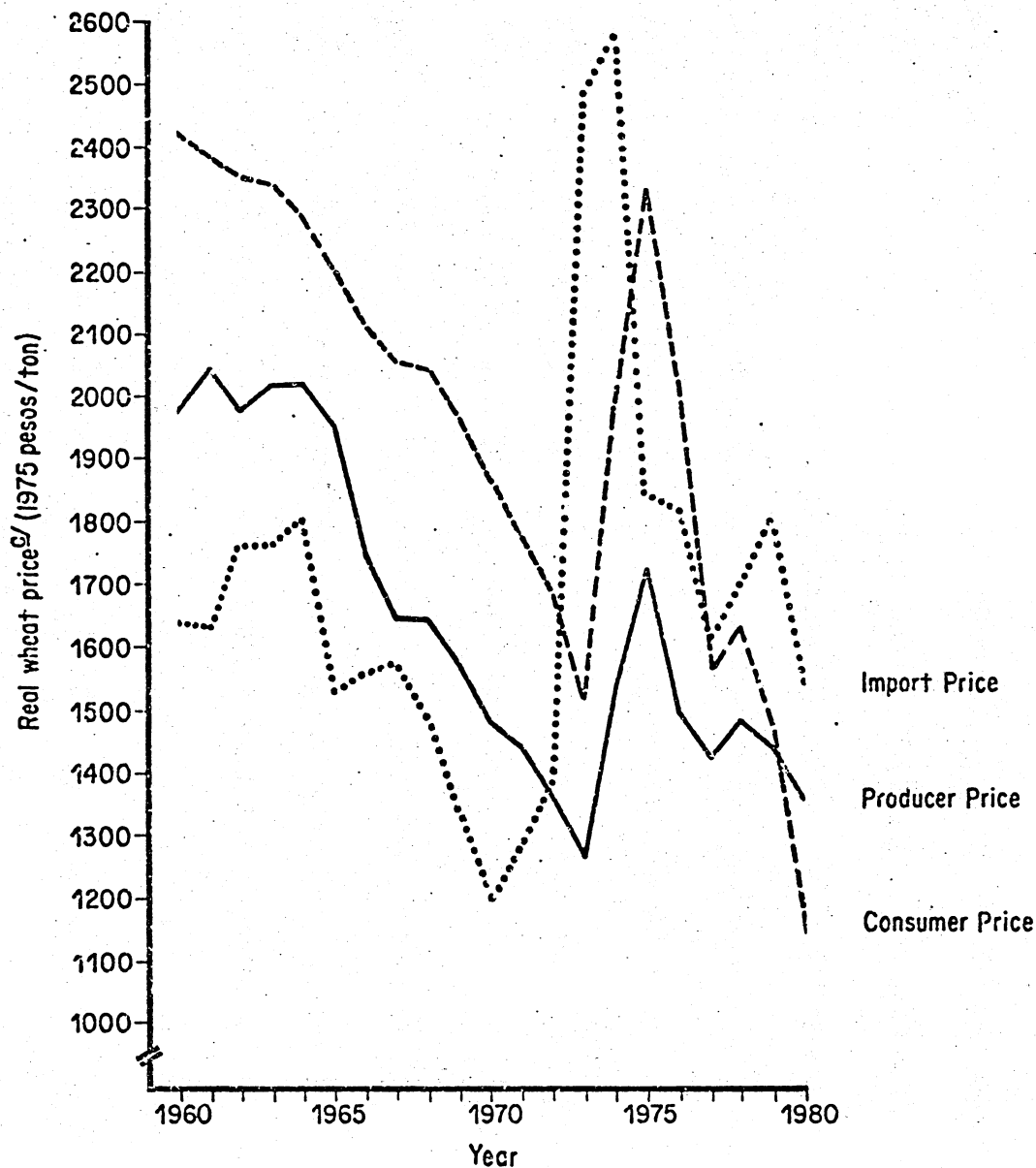


a/ Export price of US No.2HRW (Hard Red Winter) wheat, gulf ports, deflated by unit value of exports of developing countries. Export unit values obtained from IMF, International Financial Statistics, various issues.

Figure 15 shows these effects for Mexico, where both the producer and consumer price of wheat followed the world price (although at a somewhat lower level), but the consumer price of wheat decreased sharply at the end of the decade in a period of rapid inflation.

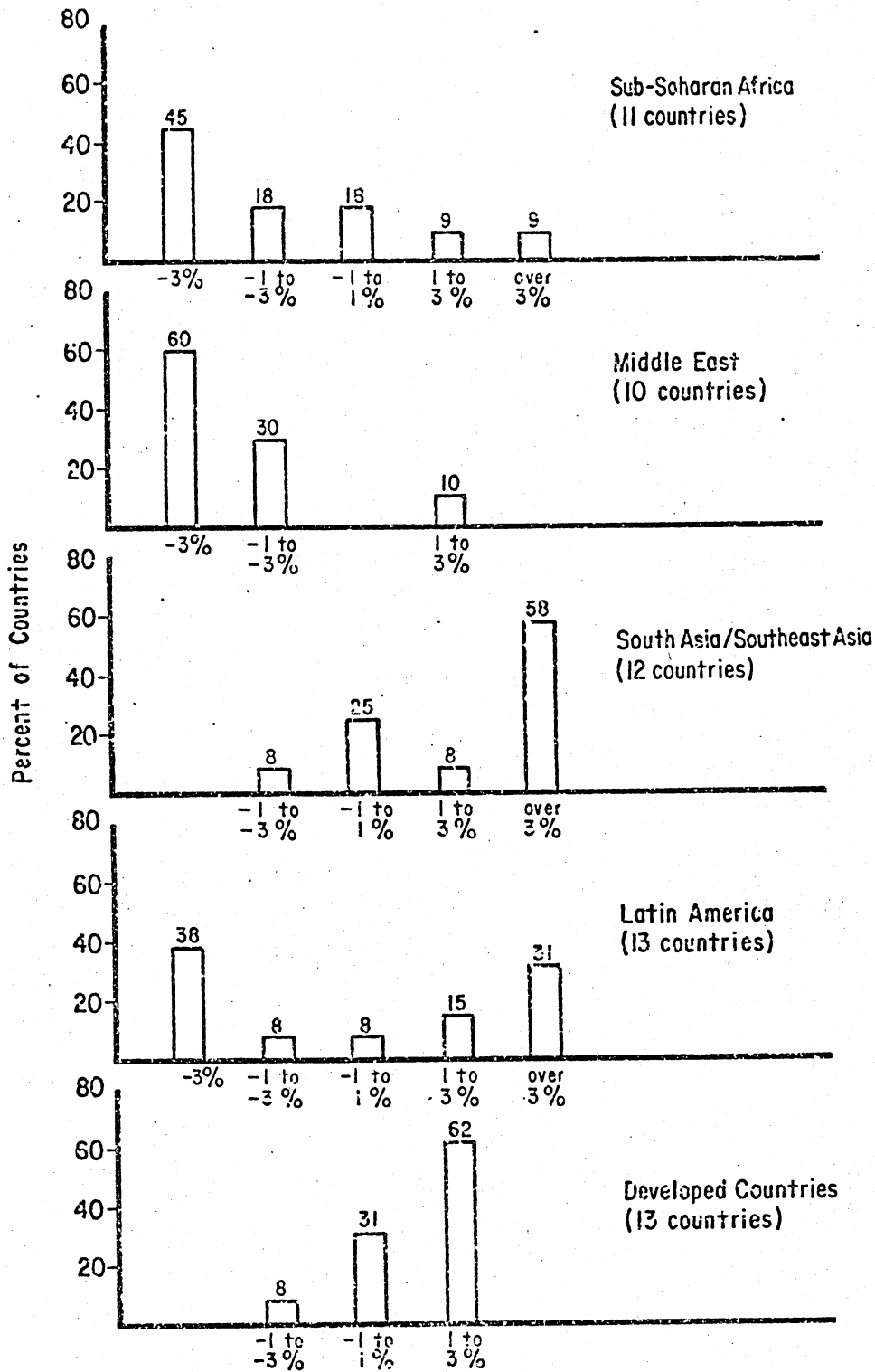
Changes in real prices of wheat products are summarized in Figure 16. As expected, the sharpest decrease in real prices has occurred in the Middle East, where a strong currency for oil exporting countries and increasing subsidies in most countries have led to decreases in real prices of 5 percent or more annually. Sub-Saharan Africa also has pricing policies that have favored lower real prices for wheat products, in large part produced by overvalued exchange rates. Real bread prices in Latin American countries are mixed, while countries in South and Southeast Asia generally show a sharp increase in real prices associated with changing policies, such as reduced subsidies (e.g. Sri Lanka) or increased tariffs (e.g. Philippines).

Figure 15. Real Producer and Consumer Prices for Wheat in Mexico, Compared to World Prices.



a/ Import prices (cif Texas border) assumed to be equal to FOB Gulf Ports price for US No.2H1W (Hard Red Winter) wheat converted to pesos at the official exchange rate. Producer prices are the average farm prices and consumer prices are the wholesale price of flour to bakers converted to wheat equivalent. The Mexican consumer price index was used to convert to constant prices.

Figure 16. Classification of Countries by Annual Percent Change in Real Prices of Bread in the 1970s.



Annual Average Percent Change in Real Bread Price.

Source: Appendix C, Table C.2. Only countries consuming 100,000 tons or more of wheat are included.

Over time, the relationship between wheat prices and the prices of competing cereals has changed sharply in some countries (Table 17). In countries with substantial subsidies, such as Brazil and Mexico, wheat flour prices have fallen sharply relative to rice and especially to maize in Brazil.<sup>1/</sup> On the other hand, where subsidies have been reduced on wheat flour (e.g. Senegal), or domestic prices raised by tariffs (Philippines), the price of wheat flour has increased relative to other cereals. In general, the effect of these price changes is seen in wheat consumption. Wheat consumption increased rapidly in the 1970s relative to other cereals in Brazil, Mexico and the Sudan but per capita wheat consumption declined in Colombia and Senegal. In Venezuela the ratio of bread to maize prices fell from 2 in 1950 to 1.2 in 1970, due to favorable exchange rates for wheat and elimination of tariffs on wheat imports. During this period, wheat based on imports, replaced in large part the traditional staple, maize (Carbonell and Rothmann, 1976).

wrong  
see table  
B2

There are undoubtedly many reasons for the bias in price policy toward wheat products (De Janvry, 1982). Urban populations, particularly

Table 17. Changes in Real Prices of Wheat Flour, Rice and Maize in Selected Countries, 1969 to 1979.

	Period	Percent Change in Real Retail Prices		
		Wheat Flour	Rice	Maize or Other Coarse Grain
Sao Paulo, Brazil	1969-79	-46	-1	167
Cali, Colombia	1970-80	7	-3	62 <sup>a/</sup>
Mexico	1970-80	-48	18	-19 <sup>b/</sup>
Khartoum, Sudan	1971-81	-44	na <sup>b/</sup>	1 <sup>b/</sup>
Djakarta, Indonesia	1969-79	-22	-8 <sup>b/</sup>	9 <sup>c/</sup>
Dakar, Senegal	1970-80	163	-30	-10 <sup>c/</sup>
Manila, Philippines	1968-78	168	-19	7

- a/ Maize tortillas.
- b/ Sorghum.
- c/ Millet

Source: Appendix C.

<sup>1/</sup> Mexico also heavily subsidizes maize.

middle and upper income groups, who consume much of the imported wheat are an important political power base capable of influencing policy. In some cases, too, governments have instituted subsidy programs targeted to the urban poor. Wheat products are also favored for urban food subsidy programs because the control of prices is facilitated by dependence on imports which usually pass through a small number of flour mills. Governments have also been reluctant to raise bread prices at the same rate as inflation. Hence, real bread prices tend to decline most rapidly in periods of rapid inflation, such as occurred in the 1970s. Also, in some Latin American countries, subsidies were instituted when food aid was phased out, again to avoid sharp rises in consumer prices. Recently, economic difficulties in many countries and pressure from the IMF has led to efforts to reduce or eliminate food subsidies, but subsidies on bread are generally the last stronghold. In the Sudan this year most consumer subsidies were removed but those on bread remained.

There is ample evidence that wheat consumption is sensitive to prices, especially in countries where wheat is a secondary food. Estimated price elasticities of demand for wheat, which show the percent change in wheat consumption with a 1 percent change in wheat prices, range from about -0.3 in Egypt and India, to -0.5 to -0.7 in the Philippines and Sub-Saharan Africa, to -1.8 in Indonesia (see Table 18). The

Table 18. Price Elasticities of Demand for Wheat Products in Selected Countries.

	<u>Own Price Elasticity</u>	<u>Cross Price Elasticity with Respect to Rice</u>	<u>Cross Price Elasticity with Respect to Maize</u>
Egypt	-.30	.1	.2
Philippines	-.78	.8	na
Indonesia	-1.78	.8	.1 <sup>a/</sup>
Sudan	-.40	na	.5 <sup>a/</sup>
Brazil <sup>b/</sup>	-.85	1.1	.05
Sri Lanka	-1.14 <sup>c/</sup>	na	na

a/ Sorghum.

b/ Middle 50 percent of income distribution.

c/ Bread.

na = not available or not applicable.

Source: Egypt-Ewis, et al. (1983); Philippines-Bouis (1982); Indonesia-Magiera (1981); Sudan-Franklin, et al. (1982); Brazil-Gray (1982); Sri Lanka-Adelman and Timmer (1980).

estimated price elasticity from cross-country analysis of wheat consumption in tropical countries is  $-0.6$  (see Appendix A). These price elasticities, combined with the sharp declines in real prices, may explain half or more of the rapid increase in wheat consumption in many countries (e.g. Franklin et al., 1982).<sup>1/</sup> A recent study from Egypt, the second largest wheat importer in the developing world, indicates that commercial wheat imports would be eliminated if wheat prices to producers and consumers reflected world prices (Scobie, 1981).

### Staple Food Production

High levels of wheat imports are also significantly associated with lagging domestic food production. Countries with agricultural sectors with an export crop orientation (such as Cuba and Malaysia), as well as some poorer countries (such as Sri Lanka and Bolivia), have relatively low per capita staple food production and high per capita wheat imports. Likewise, countries with significantly declining per capita food production (such as Nigeria and Somalia) have relatively high growth rates of wheat imports. Increased wheat imports to North Africa reflect the fact that this region has a negative per capita growth rate of production of its staple food, wheat ( $-1.2$  percent/year).

### Promotion of Wheat Products

Although it is difficult to quantify the effects, wheat consumption has been actively promoted, especially by the exporting countries. Food aid programs of developed country exporters often have an explicit market development objective that largely emphasizes wheat. Marketing agencies of the exporting countries actively provide technical aid and training for the establishment of local milling and baking industries both in traditional wheat-consuming countries and those countries where wheat is not a traditional food. Other cereals experience less promotion. Exports of rice are much smaller and also less dominated by developed country exporters. Coarse grains are usually only actively promoted as livestock feeds.

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<sup>1/</sup> For example, in Brazil a decline of real bread prices of 4 percent annually and a price elasticity of  $-0.8$  implies an increase in per capita consumption of bread of 3.2 per cent annually.



A related phenomena is the development of an influential milling and baking industry in developing countries--often with strong ties to grain exporting firms, the milling industry of developed countries, or to grain shipping interests. Over the last decade, this industry has developed particularly rapidly in the tropical belt of countries; flour imports have been increasingly replaced by wheat grain to be milled locally, and consumers have switched from flour to processed wheat products, especially bread. This local wheat processing industry, of course, has a vested interest in increasing wheat imports and consumption.

### Summary and Implications

The story of increasing wheat consumption and imports in the developing world has few parallels, both in the rate of change and the almost universal nature of the change across a large number of countries. Wheat consumption has grown rapidly almost everywhere, and usually more rapidly than any other cereal. Much of this increase has come about through the substitution of wheat for other staple foods, especially coarse grains and roots and tubers.

The largest absolute increases in wheat consumption have occurred in the traditional wheat belt of the Middle East and North Africa, and except for Turkey, the gap between production and consumption has widened throughout this region. Imports have supplied the bulk of the increase, especially in North Africa, where per capita wheat production is falling.

In the large mixed cereal economies of India, Pakistan, and China, significant increases in wheat consumption have occurred, but due to rapid production increases the gap between production and consumption has decreased. By the end of the 1970s, in fact, these countries had become less dependent on wheat imports. Although China has rapidly increased wheat imports in the last three years, the proportion of total consumption imported is still low relative to most other countries.

The most interesting case is the rapid increase in wheat consumption in the tropical belt of countries (23°N to 23°S), where wheat is not a staple food and is currently grown only at higher elevations. These countries import over 90 percent of the wheat they consume. Food imports nearly always favor wheat, even though rice, maize, or sorghum/millet are usually the staple cereals.

Despite the diversity among countries, the factors promoting these changes are much the same. On the demand side they include increasing population, rising per capita incomes and rapid urbanization, combined in many cases with favorable pricing policies toward wheat products, especially in relation to other cereals. On the supply side, the major factor is the lag in local food production, combined with policies and infrastructural development that favor the feeding of urban populations through imports. Food aid in the form of wheat has also played a part in

some countries.

In the future, it is unlikely that the growth of wheat consumption and imports can maintain the rapid pace of the 1970s. The most immediate prospect for a slow-down in the trend is in the Middle East and North African countries, where wheat consumption has reached very high levels and cannot be expected to continue to increase at the same rate. In the high-income countries of this region, per capita consumption is expected to level off and even decline. Moreover, there is clearly a great deal of potential for increasing wheat production in this region, as demonstrated by the rapid increase in dryland wheat production in Turkey in the 1970s.

In South Asia and East Asia, there may be a slow-down in the rate of increase of wheat production. Rapid production gains in the late 1960s and 1970s were achieved in large part through increased irrigation, in combination with the use of high yielding varieties and more intensive management practices, especially fertilizer. However, the development of newly irrigated lands has slowed in each case (and in some cases declined with salinity problems), and the use of high yielding wheat varieties has reached high levels (90 percent of the wheat farmers, for example, in Haryana and Punjab States of India use HYVs). While there is still much potential for increasing yields through improved production practices, the gains will probably be slower in the future. Hence, wheat imports to China are likely to remain at high levels and India may have returned to the wheat market as a major wheat importer on a periodic basis.

Finally, in the tropical belt of countries, there is little immediate prospects for efficient local wheat production, except in a few countries with extensive highland areas (e.g. Ethiopia and Colombia) or where residual moisture is sufficient to harvest an early maturing variety in the cool season (e.g. northern Thailand). Typically, wheat consumption in these countries increases very rapidly from a very low base in the early stages of development, as is occurring in much of Sub-Saharan Africa and Southeast Asia. For middle income countries, such as those of Central America and the Andean region where per capita consumption averages 35kg/person, growth is much slower. Consumption may peak at 50 to 60kg/person, as evidenced by such relatively high income

countries as Venezuela and the Republic of Korea<sup>1/</sup>, where per capita consumption levelled out at these rates of consumption in the 1970s. However, as we have shown, much also depends on the particular strategies followed by governments in local food production, as well as consumer pricing policies for wheat products and other staple foods. The increasing foreign exchange constraint faced by many countries, and pressure to reduce budget deficits by cutting food subsidies, might cause some slowing of the trend. However, despite the adverse global economic conditions of the last two years, wheat imports by developing countries have continued to increase, even though imports of other cereals have stagnated.

The increase in consumption of wheat and dependence on wheat imports occurring in most developing countries is to some extent to be expected in a dynamic and increasingly interdependent world economy. It is often an efficient strategy for a country to focus on exports of commodities in which they have a comparative production advantage and to import food. The Ivory Coast and Malaysia are examples of countries where agricultural investment has been targeted to export crops; food imports, primarily wheat, are used to satisfy urban food requirements. Furthermore, there is a natural tendency everywhere for consumers with increasing incomes to diversify their diets. This means that countries that traditionally consume rice tend to import wheat, while countries where wheat is a staple often import rice.

Yet the speed of change and the high levels of dependence on wheat imports raise questions about the desirability of the trend. First, many countries have reached very high levels of dependency on wheat imports, such as 120kg/person in North Africa (65 percent of consumption) and the Andean region at 35kg/person (92 percent of consumption). Food supply, especially to urban areas of these regions, is evidently exposed to variability in the international market at a time when many previously food dependent nations of the developed world have moved toward food self sufficiency. Furthermore, many developing countries are facing serious foreign exchange deficits, which will place increasing pressure to sub-

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<sup>1/</sup> The Republic of Korea does meet our definition of a tropical country but is an example of a non-wheat consuming country that expanded wheat consumption rapidly in the post-war years.

stitute for food imports. Second, the level of wheat imports in many cases does not reflect an efficient food strategy, but rather investments and pricing policies that discriminate against the development of local food production potential and favor imports. Finally, the increasing reliance on wheat imports is to some extent an irreversible process. Food supply systems for urban consumers are built around investments in port facilities, infrastructure, and marketing that may not be easily converted to handling locally produced food grains (Nyberg, 1979). This is particularly true in the case of tropical countries that do not produce wheat; the investment in wheat milling and baking industries is highly wheat specific and provides a vested interest in continuing wheat imports even when local food production is increasing. For example, over the last decade, Nigeria and Indonesia have developed a local flour milling capacity for 1.5-2.0Mt of wheat annually, even though there is no immediate prospect of local wheat production. Sri Lanka, another country where wheat production is minimal, has just completed construction of the largest flour mill in the world.

It is beyond the scope of this study to provide policy recommendations, but there do emerge a number of important research areas that merit further attention. In many countries of Sub-Sahara Africa and Latin America, the best alternative to wheat imports for urban populations is increased production of local coarse grains, especially maize. But in addition to increasing production and developing associated marketing facilities, greater acceptance of maize and other coarse grains will require the development of more convenience-type foods, especially in urban areas. One possibility that has received some research attention is the use of composite flours for bread making. At present, one of the major constraints on this approach seems to be the pricing policies that favor imported wheat over locally produced cereals. This renders it unprofitable for bakers to use flour mixtures, even when technically feasible.<sup>1/</sup>

On the supply side, food deficit countries can also consider alternative forms of cereal imports. White maize is often preferred to yellow

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1/ As we showed earlier, maize grain is often more expensive than wheat flour.

maize for food consumption, although international trade in white maize is very limited and imported maize is not promoted for food use. Food aid could also be targeted more specifically to the food staple of the country, with tropical countries receiving cereals other than wheat.<sup>1/</sup> Imports of wheat as wheat flour would also provide a more temporary nature to wheat imports than the establishment of local milling industries. There has been a tendency for the proportion of flour in wheat trade to decline, even though there is little evidence that it is efficient for countries where wheat is not produced to establish a capital intensive local milling capacity (the high levels of protection on local flour mills is evidence of this).

Finally, an increasing number of countries in the tropical belt have reacted to increased wheat consumption by establishing local wheat research and production programs. Although wheat production is sometimes technically feasible, there has often not been a sufficient accounting of the real costs of research and production resources before such investments are committed. We believe that government strategies to reduce dependence on wheat imports should consider both the demand and supply side, within a broader food policy context that includes wheat and competing staples.

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1/ One difficulty with this approach in the case of coarse grains is the inconsistency between local consumer tastes (e.g. preference for white maize) and the type of grain available in the world market (i.e. yellow maize).

## APPENDIX A

### Cross-Country Regression Analysis of Wheat Imports by Tropical Countries

A cross-sectional regression model was used to analyze variation in wheat imports and consumption in non-wheat producing countries of the tropical belt where wheat is not a traditional food staple (23°N to 23°S latitude). A total of 56 developing countries were included in the analysis based on the following criteria a) the country has a population of at least 0.5 million, b) it imports more than 60 percent of its wheat consumption.<sup>1/</sup>

Variables included in the model reflect both demand factors related to incomes and prices as well as supply factors reflecting domestic food production and export earnings. Urbanization and food aid were included as variables operating on both the supply and demand side.

Related cross-sectional analyses have been conducted by Huddleston (1982) to explain cereal import dependency and by Mitchell (1981) to explain wheat and coarse grain imports. Jabara (1982) used pooled cross-sectional and time series data to analyze wheat import demand for a smaller number of middle-income countries. The current analysis differs from these by focussing on wheat consumption in non-wheat producing countries and by including a broader range of independent variables.

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<sup>1/</sup> The full list of countries: Africa; Burundi, Madagascar\*, Mauritius, Malawi, Mozambique, Rwanda, Somalia\*, Zambia, Angola\*, Benin, Cameroon, Central Afr.Rep., Chad\*, Congo, Sudan, Gabon\*, Ghana, Guinea\*, Ivory Coast, Liberia, Mali, Mauritania\*, Niger, Nigeria, Senegal, Sierra Leone, Togo, Upper Volta, Zaire\*; Asia-Pacific; Yemen Dem.Rep.\*, Yemen Arab Rep.\*, United Arab Emirates\*, Sri Lanka, Fiji\*, Hong Kong, Indonesia, Malaysia, Papua New Guinea\*, Philippines, Singapore, Thailand; and in Latin America: Brazil, Costa Rica, Cuba\*, Dominican Rep., El Salvador, Guatemala\*, Guyana, Haiti, Honduras, Jamaica\*, Nicaragua, Panama, Trinidad and Tobago\*, Bolivia, Colombia, Ecuador, Peru, Venezuela. Consumer price data was not available for 15 of the countries (designated with an asterisk) and Ghana was not included because of an unrealistic exchange rate leading to a final sample of 41 countries.

The preliminary model chosen was as follows:

$$WUT_i, WUC_i = a + b_1 GNP_i + b_2 EXPE_i + b_3 URB_i + b_4 STF_i + b_5 FA_i + b_6 CUF_i + b_7 BRP_i + b_8 BRR_i + e_i$$

$WUT_i$  = Total wheat consumption per capita (kg/person), 1979-81 calculated as total wheat imports (including food aid) plus production (if any);

$WUC_i$  = Wheat consumption per capita (kg/person), 1979-81, calculated as commercial wheat imports plus production (if any);

$GNP_i$  = Gross national product per capita, US\$ 1980;

$EXPE_i$  = Export earnings per capita, 1979-81;

$URB_i$  = Percent of population in urban areas, 1980;

$STF_i$  = Staple food production per capita (kg/person), 1979-81;

$FA_i$  = Wheat imported per capita as food aid (kg/person), 1979-81;

$CUF_i$  = Cumulative wheat imported as food aid per capita (kg/person), 1955 to 1975;

$BRP_i$  = Retail bread price in 1979-80 (US cents per kg of bread);

$BRR_i$  = Ratio of retail price of bread to rice price in 1979, 1980 or 1981 (US cents per kg of rice);

$i$  = Country.

Data on wheat consumption and staple food production were obtained from FAO sources (FAO tapes and FAO Production Yearbook). Food aid data was obtained from Barbara Huddleston (IFPRI, personal communication) with some modifications from USDA sources. Bread and rice prices were obtained from the ILO, Bulletin of Labor Statistics (various issues) and supplemented by personal communication with colleagues in several countries. All currency conversions were made at the official exchange rate as reported in IMF, International Financial Statistics.

As expected both export earnings and level of urbanization were highly correlated with level of income (GNP) (correlation coefficient of



0.73 and 0.83, respectively) and it was not possible to include these independent variables together. GNP gave better explanatory power and was therefore included to represent these general development indicators.

The linear equation with a quadratic term for incomes proved to be quite adequate to represent the different effects. Interaction terms were also tested but none were significant at even the 20 percent level.

Table A.1 shows the estimated regressions.<sup>1/</sup> The relatively high R<sup>2</sup> (.81) indicates that the equations explained a high proportion of the

Table A.1 Estimated Coefficients of Cross-Country Regression Analysis of Wheat Consumption.

<u>Independent Variable</u>	<u>Dependent Variable</u>	
	<u>Total Wheat Consumption (Equation 1)</u>	<u>Commercial Wheat Consumption (less food aid) (Equation 2)</u>
GNP/capita	.027 (.0053)**	.027 (.0052)**
(GNP/cap) <sup>2</sup>	-.462x10 <sup>-5</sup> (.118x10 <sup>-5</sup> )**	-.463x10 <sup>5</sup> (.117x10 <sup>-5</sup> )**
Cereal Production/cap.	-.058 (.020)**	-.058 (.020)**
Current Food Aid/cap.	.861 (.414)*	.001 (.003)
Cumulative Food Aid/cap.	.091 (.036)**	.090 (.036)**
Price of Bread	-.178 (.052)**	-.178 (.051)**
Constant	25.22	25.19
n	39	39
R <sup>2</sup>	.81	.78

<sup>1/</sup> We might also have applied a simultaneous equations model but because of the absence of data in most of the supply side parameters, we choose the simpler model.

variations in wheat consumption by this group of countries. The largest single effect on wheat consumption is due to per capita income. Elasticities calculated from the equation (see Table A.2) indicate that wheat consumption increases quite rapidly with incomes. Note that the significant negative coefficient for the quadratic term indicates that the effect of income is reduced at higher income levels and implies that wheat consumption levels out at a per capita income of about \$2900. It should be remembered, however, that the income variable includes both the effect of urbanization as well as incomes (and possibly also increased importance of export earnings).

Table A.2 Cross-Country Income and Price Elasticities for Wheat Products.<sup>a/</sup>

	<u>Income</u> <u>Elasticity</u>	<u>Price</u> <u>Elasticity</u>
Total wheat consumption including food aid	.67	-.55
Wheat consumption based on commercial imports	.75	-.63

a/ Computed from equations of Table A.1. Elasticities were estimated at the mean level for each variable.

Wheat consumption is also quite sensitive to bread prices with an estimated price elasticity of -0.6 for this group of countries. This compares to a price elasticity of -0.5 to -0.8 estimated for a smaller sample of countries by Jabara (1982). The coefficient for the ratio of bread to rice prices was significant and of the wrong sign and was not included in further analyses.<sup>1/</sup> As expected, both the income and price elasticities are somewhat higher in the case of wheat consumption based on commercial imports.

<sup>1/</sup> This may reflect the fact that rice varied from a food staple in some countries to a food of very minor importance in others. The data on rice prices also seemed to be of somewhat poorer quality.

Wheat consumption also increases with a decline in production per capita of local cereals (rice or coarse grains). This effect is not large; a 1 ton decrease in cereal production leads to an increase in imports of .06 to .07 tons. As we have shown elsewhere, wheat imports in these countries are destined largely to urban consumers. Also, it is interesting to note a negative correlation between export earnings per capita and cereal production per capita due to the strategy of several countries of emphasizing agricultural exports and importing food.

Current food aid (which is significantly and negatively correlated with GNP) increases total wheat consumption by the amount of food aid, as indicated by a coefficient of close to unity for food aid in equation 1. There appear to be no substitution effect of food aid for commercial wheat imports (equation 2), a result similar to the conclusion of Abbott (1979). However, historically cumulated food aid is a significant determinant of current wheat consumption based on commercial imports. This suggests that food aid has helped establish markets for wheat products by changing consumer preferences and market promotion. There may also be other influences as well. Food aid may have negatively affected local cereal production; however, there is no evidence of this in the sample of countries. Food aid also seems to have been a forerunner of bread subsidies in a number of countries. A significant negative correlation between historical food aid and current bread prices ( $r = -.46$ ) supports this hypothesis. Overall the coefficient of cumulative food aid indicates that for every 10 tons of food aid received from 1955-75, approximately one ton of additional wheat was added to commercial imports in 1979-81.

APPENDIX B

Country Data on Wheat Consumption and Imports.

Table B.1 Changing Patterns of Staple Food Consumption, 1961-65  
to 1975-77.

Table B.2 Statistics on Wheat Imports, Consumption and Food Aid.

TABLE B.1. Changing Patterns of Staple Food Consumption, 1961-65 to 1975-77.

	Growth Rates Per Capita Food Supply				Wheat as percent of staple calories	
	Wheat	Rice	Coarse Grains	Roots and Tubers	1961-65	1975-77
	(percent/year)					
<u>Eastern Africa</u>						
Burundi	2.9	n.a.	0.3	0.1	1.4	2.0
Ethiopia	0.1	n.a.	-1.1	0.9	12.9	14.6
Kenya	2.7	n.a.	-0.4	-1.2	4.7	7.0
Lesotho	2.8	n.a.	-1.2	n.a.	23.5	34.0
Madagascar	-1.6	1.3	-1.8	0.2	1.8	1.3
Malawi	3.1	4.9	0.4	-2.8	0.8	1.7
Mozambique	5.0	-1.2	-1.0	-0.9	3.2	6.7
Rwanda	n.a.	n.a.	0.1	3.4	0.4	1.7
Somalia	-0.3	-3.5	-0.5	1.8	8.1	3.3
Sudan	5.6	n.a.	1.1	-4.7	8.8	15.4
Tanzania	2.7	1.5	0.2	-0.6	3.1	4.3
Uganda	n.a.	n.a.	2.1	-1.7	3.0	2.2
Zambia	8.9	n.a.	-0.6	-1.4	3.6	11.3
Zimbabwe	-3.5	n.a.	0.4	n.a.	7.8	5.1
<u>Western Africa</u>						
Angola	4.5	2.9	-0.1	0.8	6.6	10.5
Benin	8.3	7.8	-1.3	-0.8	1.0	3.3
Cameroon	7.0	5.3	0	0.7	2.4	5.5
Central African Republic	2.4	5.4	-1.2	-0.7	1.6	2.4
Chad	6.9	0.9	-2.8	1.0	0.8	2.6
Congo	4.8	-0.8	7.6	-1.0	7.1	13.3
Ghana	3.0	-1.2	1.0	-1.5	4.4	6.9
Guinea	0.6	-0.1	-0.6	-1.3	2.6	3.0
Ivory Coast	4.1	0.6	-1.6	-1.3	4.1	7.4
Liberia	3.5	1.1	n.a.	-1.5	2.1	3.3
Mali	6.0	0.9	-0.1	-1.7	1.2	2.6
Mauritania	7.3	6.7	-1.8	n.a.	8.3	19.7
Namibia	n.a.	n.a.	0.3	0.8	0.5	0.4
Niger	n.a.	4.1	-1.3	0.8	0.5	1.2
Nigeria	12.4	7.8	-1.6	0.5	0.8	4.0
Senegal	5.8	-0.3	-0.3	-4.5	5.5	11.9
Sierra Leone	1.1	1.5	-0.7	-2.8	4.9	5.0
Togo	3.1	-1.0	1.3	-2.4	1.5	2.5
Upper Volta	n.a.	1.2	0.1	0.4	0.9	1.5
Zaire	2.7	4.9	2.1	-0.2	1.7	2.4

Table B.1 (continued)

	Growth Rates Per Capita Food Supply				Wheat as percent of staple calories	
	Wheat	Rice	Coarse Grains	Roots and Tubers	1961-65	1975-77
	(percent/year)					
<u>Mideast Countries of Asia</u>						
Afghanistan	-0.5	-0.1	-1.6	n.a.	67.0	64.9
Iran	3.3	3.2	1.1	1.9	74.1	75.6
Iraq	2.4	3.5	-10.3	n.a.	66.1	77.3
Jordan	0.1	-0.6	6.5	1.9	88.3	88.8
Lebanon	1.5	-2.9	n.a.	3.5	87.1	98.3
Saudi Arabia	2.9	-0.6	n.a.	n.a.	27.9	49.1
Syria	-0.4	1.1	-4.0	4.7	89.4	89.7
Turkey	0.1	0.5	-1.3	1.6	79.5	80.6
Yemen Arab Rep.	17.9	n.a.	-2.8	n.a.	2.1	23.6
Yemen Dem.	0	6.6	1.3	n.a.	51.2	43.4
<u>North Africa</u>						
Algeria	2.2	n.a.	-0.2	1.1	81.4	85.2
Egypt	0.5	0.7	-0.7	3.3	43.9	46.1
Libya	1.6	6.2	-3.5	8.3	70.0	73.6
Morocco	1.7	n.a.	-0.1	n.a.	58.3	64.0
Tunisia	3.4	n.a.	-7.2	2.7	80.1	92.5
<u>South Asia</u>						
Bangladesh	6.8	-0.8	n.a.	2.9	4.2	10.6
Bhutan	0.1	0.1	0.1	3.4	15.4	15.1
Burma	n.a.	1.6	1.0	n.a.	1.4	1.0
India	2.0	-1.3	-1.0	4.6	18.5	25.1
Nepal	5.2	1.2	-3.0	-0.9	5.3	10.5
Pakistan	2.5	2.7	-1.8	n.a.	67.4	72.1
Sri Lanka	5.6	-1.5	1.8	2.2	13.8	27.6
<u>Southeast Asia and Pacific</u>						
Hong Kong	1.4	1.1	-8.6	-0.7	18.2	25.1
Indonesia	18.7	2.3	-1.8	-2.0	0.3	2.8
Kampuchea Dem.	n.a.	-1.3	3.4	n.a.	1.2	0.8
Laos	n.a.	0.1	2.4	0.9	0.5	0.2
Malaysia	1.4	0.8	-0.9	1.2	15.6	16.7
Papua New Guinea	2.6	4.8	n.a.	-0.2	6.8	8.5
Philippines	0.6	0	3.2	0.5	7.3	7.1
Singapore	0.4	-1.6	16.5	n.a.	28.7	25.5
Thailand	n.a.	-0.2	11.3	3.1	0.6	1.1
Vietnam	11.6	-0.8	-1.7	0.8	1.5	7.1

Table B.1 (continued)

	Growth Rates Per Capita Food Supply				Wheat as percent of staple calories	
	Wheat	Rice	Coarse Grains	Roots and Tubers	1961-65	1975-77
	(percent/year)					
<u>East Asia</u>						
China	3.4	1.5	-0.6	-2.5	14.3	20.1
Korea D.P.R.	5.1	2.0	-2.7	1.3	11.2	18.5
Korea Rep.	6.2	0.2	-0.4	-4.6	7.1	15.0
Mongolia	1.9	5.0	n.a.	2.1	94.7	93.6
<u>Mexico, Central America, and Caribbean</u>						
Costa Rica	-0.3	2.2	-1.3	-1.2	33.2	30.4
Cuba	2.2	1.4	n.a.	-0.5	41.0	47.0
Dominican Rep.	3.9	2.8	-0.7	-2.6	17.2	23.6
El Salvador	1.7	2.3	0.9	n.a.	10.7	11.5
Guatemala	1.2	5.9	-1.0	n.a.	10.9	13.7
Haiti	3.4	4.9	-1.2	0.1	8.5	12.8
Honduras	0.7	3.8	-0.1	n.a.	9.1	9.9
Jamaica	0.4	2.3	4.2	5.2	61.4	50.6
Mexico	2.1	2.4	-0.4	n.a.	17.3	22.3
Nicaragua	1.5	-0.8	-0.4	3.3	11.2	13.9
Panama	-0.1	0.7	-3.5	1.3	18.0	18.7
Trinidad and Tobago	0.5	0.4	-3.0	1.2	58.0	58.7
<u>Andean Region</u>						
Bolivia	-0.6	4.5	-2.7	1.2	35.1	33.5
Colombia	0.7	2.9	-2.6	2.0	13.4	14.1
Ecuador	3.2	2.5	-1.0	0.6	21.7	28.3
Peru	0.7	1.7	-0.8	-2.2	30.4	34.0
Venezuela	0.3	5.5	0	-3.1	35.0	35.0
<u>Southern Cone, Latin America</u>						
Argentina	-0.6	0.3	2.5	-1.7	79.6	79.6
Brazil	2.0	-0.4	-0.6	-1.4	20.0	26.3
Chile	0.7	0.8	4.2	-2.1	82.0	82.3
Paraguay	-5.1	6.2	3.8	-0.2	27.5	13.1
Uruguay	-0.2	3.5	6.2	-0.2	79.0	72.8

n.a. = not analyzed since per capita supply of this staple is very small (i.e. less than 25 calories/capita in 1961-65).

Source: Calculated from FAO Food Balance Sheets, 1980.

TABLE B.2 Statistics on Wheat Imports, Consumption and Food Aid.

	Net import wheat per capita		Per capita total wheat utilization <sup>a/</sup>	Percent of to- tal utilization imported	Wheat food aid as percent of all wheat imports	Cumulative food aid per capita
	1961-65	1979-81	1979-81	1979-81	1979-81	1955-75
	(kg/ha)	(kg/ha)	(kg/ha)	(percent/year)		(kg/cap)
<u>Eastern Africa</u>						
Burundi	0.8	3.8	4.6	82	41	0.9
Ethiopia	0.4	7.9	22.3	35	57	5.1
Kenya	-3.3	4.8	17.7	27	57	0.3
Lesotho	5.1	54.8	76.4	72	14	0
Madagascar	4.0	6.5	6.5	100	5	2.2
Malawi	1.5	3.6	3.7	96	1	0.1
Mozambique	6.0	15.7	16.0	98	49	7.5
Rwanda	0.1	1.4	2.1	70	100	5.0
Somalia	6.0	37.0	37.3	99	61	20.4
Sudan	8.0	15.3	26.0	59	56	28.0
Tanzania	3.6	2.6	6.6	39	87	4.0
Uganda	3.6	0.5	1.2	39	78	0
Zambia	6.4	24.9	26.6	94	24	0.9
Zimbabwe	22.0	0	22.7	0	16	1.0
<u>Western Africa</u>						
Angola	7.8	22.2	23.6	94	1	0
Benin	2.2	12.7	12.7	100	6	3.8
Cameroon	4.8	12.6	12.8	99	2	1.1
Central African Rep.	4.2	5.3	5.3	100	9	1.4
Chad	1.0	2.3	3.6	63	49	5.2
Congo	15.1	41.7	41.7	100	3	9
Ghana	8.3	11.2	11.2	100	42	43.0
Guinea	7.1	8.6	8.6	100	20	32.4
Ivory Coast	9.1	25.7	25.7	100	0	2.0
Liberia	4.6	8.1	8.1	100	9	6.3
Mali	2.1	4.6	4.9	94	20	19.0
Mauritania	12.3	40.7	40.7	100	58	33.3
Niger	0.8	6.1	6.4	94	10	20.6
Nigeria	1.5	17.4	17.6	98	0	0.9
Senegal	12.1	18.9	18.9	100	13	13.1
Sierra Leone	7.7	7.6	7.6	100	12	5.3
Togo	3.5	12.1	12.1	100	2	1.8
Upper Volta	1.8	5.4	5.4	100	8	8.1
Zaire	3.7	5.8	6.0	97	29	21.7



Table B.2 (continued)

	Net import wheat per capita		Per capita total wheat utilization <sup>a/</sup>	Percent of to- tal utilization imported	Wheat food aid as percent of all wheat imports	Cumulative food aid per capita
	1961-65	1979-81	1979-81	1979-81	1979-81	1955-75
	(kg/ha)	(kg/ha)	(kg/ha)	(percent/year)		(kg/cap)
<u>North Africa</u>						
Algeria	31.7	144.6	216.1	67	1	80.7
Egypt	59.4	128.7	172.3	75	34	267.7
Libya	70.3	193.8	237.6	82	0	55.4
Morocco	22.4	93.1	167.0	56	6	203.3
Tunisia	34.2	99.9	231.5	43	17	438.6
<u>Mideast Countries of Asia</u>						
Afghanistan	4.7	3.5	130.0	3	137	50.3
Iran	10.1	40.6	189.3	21	0	46.0
Iraq	18.2	130.4	229.5	57	0	18.6
Jordan	69.1	104.6	126.6	83	20	285.2
Kuwait	146.1	95.9	95.9	100	0	n.a.
Lebanon	106.3	117.4	128.3	92	10	106.8
Saudi Arabia King.	17.7	93.2	111.1	84	0	0.7
Syria	-4.8	49.5	266.6	19	9	95.0
Turkey	18.6	-10.7	365.3	0	5	157.8
United Arab Emirat	134.7	90.3	91.6	99	0	0
Yemen Arab Rep.	0.5	70.5	81.7	86	2	11.2
Yemen Dem. Rep.	45.7	79.4	90.9	87	11	0.5
<u>South Asia</u>						
Bangladesh	8.2	15.3	24.4	63	77	32.3
Bhutan	2.3	19.1	35.3	54	1	9
Burma	1.1	0.4	2.3	19	78	4.6
India	9.8	0.7	50.6	1	6	87.8
Nepal	0	0.5	31.7	2	100	3.7
Pakistan	19.7	12.7	142.5	9	25	232.5
Sri Lanka	26.4	45.2	45.2	100	27	182.3
<u>Southeast Asia and Pacific</u>						
Hong Kong	32.8	35.8	35.8	100	0	24.6
Indonesia	0.9	8.2	8.2	100	15	19.5
Kampuchea Dem.	2.9	3.2	3.2	100	37	17.3
Laos	1.2	0	0	n.a.	n.a.	9.8
Malaysia	27.9	35.1	35.1	100	0	1.1
Papua New Guinea	8.5	14.3	14.3	100	n.a.	n.a.

Table B.2 (continued)

	Net import wheat per capita		Per capita total wheat utilization <sup>a/</sup> 1979-81	Percent of to- tal utilization imported 1979-81	Wheat food aid as percent of all wheat imports 1979-81	Cumulative food aid per capita 1955-75
	1961-65	1979-81				
	(kg/ha)	(kg/ha)	(kg/ha)	(percent/year)		(kg/cap)
<u>Southeast Asia and Pacific</u>						
Philippines	13.7	15.3	15.3	100	8	8.1
Singapore	40.5	48.1	48.1	100	0	1.0
Thailand	1.2	4.1	4.1	100	0	0.1
Vietnam	4.1	24.4	24.4	100	19	8.2
<u>East Asia</u>						
China	6.2	12.3	74.0	17	0	1.6
Korea D.P.R.	13.1	31.6	53.0	60	n.a.	n.a.
Korea Rep.	19.6	48.8	50.5	97	9	280.1
Mongolia	-20.2	68.1	205.3	33	n.a.	n.a.
<u>Mexico, Central America, and Caribbean</u>						
Costa Rica	41.1	43.3	43.3	100	0	10.2
Cuba	69.7	125.8	125.8	100	n.a.	1.7
Dominican Rep.	16.0	27.9	27.9	100	14	6.3
El Salvador	15.4	22.6	22.6	100	11	6.2
Guatemala	14.4	14.3	20.9	68	3	25.1
Haiti	10.8	28.5	28.5	100	16	23.9
Honduras	12.5	19.3	19.6	99	22	5.6
Jamaica	78.3	75.6	75.6	100	8	14.7
Mexico	-5.9	14.0	53.6	26	0	3.6
Nicaragua	16.4	14.2	14.2	100	96	4.8
Panama	30.0	26.9	26.9	100	0	0.4
Trinidad and Tobago	92.9	86.0	86.0	100	0	1.2
<u>Andean Region</u>						
Bolivia	41.4	54.1	64.8	84	36	266.5
Colombia	0	18.4	20.3	91	1	56.5
Ecuador	10.0	25.6	29.9	86	2	29.9
Peru	37.5	43.4	49.0	89	5	60.1
Venezuela	49.2	53.5	53.6	100	0	1.9

Table B.2 (continued)

	Net import wheat per capita		Per capita total wheat utilization <sup>a/</sup> 1979-81	Percent of to- tal utilization imported 1979-81	Wheat food aid as percent of all wheat imports 1979-81	Cumulative food aid per capita 1955-75
	1961-65	1979-81				
	(kg/ha)	(kg/ha)	(kg/ha)	(percent/year)		(kg/cap)
<u>Southern Cone, Latin America</u>						
Argentina	-148.3	-156.3	139.1	0	0	0
Brazil	28.3	33.7	54.4	62	0	86.9
Chile	30.7	85.9	165.3	52	1	159.0
Paraguay	43.2	22.6	42.7	53	18	131.1
Uruguay	-3.9	4.3	133.9	3	5	188.6

a/ Production plus net imports.

Source: FAO Tapes. Food aid data is from Huddleston (personal communication) and USDA.

## APPENDIX C

### Country Data on Consumer Prices and Pricing Policy

This appendix provides qualitative and quantitative information on consumer prices for wheat and other cereals by country as well as details of policies influencing these prices. The information is taken from many sources including personal communication with economists and others working in the countries reported. A number of qualifications are necessary with respect to the data.

1. Prices and pricing policies have been changing rapidly over the last 2-3 years and some of the information will be dated.

2. All exchange rate conversions were made at the official exchange rate. The widespread overvaluation of the exchange rates during this period would reduce real prices in a number of countries, particularly in Africa.

3. Comparison of bread prices across countries assumes a uniform product. In fact some of the price variation reflects quality variation. These differences in quality are an ever bigger problem for comparing rice prices.

4. Data for some countries were pieced together from a number of sources. Some inconsistencies are apparent. As far as possible data were taken from the capital city or a large city. No effort was made to allow for seasonal price fluctuations.

Despite these qualifications I believe the data are a reasonable representation of the situation prevailing in 1981 and 1982.

Table C.1 summarizes information on policies affecting consumer prices for wheat products. Countries have been divided into four groups, a) high price subsidy, b) moderate price subsidy, c) price neutral and d) relatively high prices for wheat products. For simplicity the extent of subsidy has been measured by the domestic wheat flour prices<sup>1/</sup> rela-

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1/ Where wheat is largely consumed as bread this is the price paid by bakers. In some cases bread is directly subsidized and a further adjustment was needed.

tive to the approximate import price equivalent, converted at the official exchange rate. In most cases, this price differential represents a direct subsidy on imported wheat. In some cases the low bread price may result from low producer prices for wheat or from extensive wheat imports under food aid programs. A number of other factors such as exchange rates and policies affecting prices of competing food staples, also influence the price of wheat products relative to other staples.

Table C.2 shows retail prices for recent years. These data provide estimates of the relative prices of different food staples. Ratios expected from world prices are shown in Table 14 on page 42. Further data on retail prices for rice and wheat flour in Asia are found in Palacpac (1982).

Table C.3 lists recent bread prices and trends during the 1970s. Data on changes in real bread prices are particularly subject to error since three statistics - beginning bread price, ending bread price and the consumer price index are required for calculation. Nonetheless, there is a striking concentration of countries with negative real price trends in the Middle East/North Africa and to a lesser degree in Sub-Saharan Africa and Latin America.

Figure C.1 shows real price trends for wheat products and competing food staples in countries for which time series data are available.

Finally, some additional notes and sources are provided.

TABLE C.1 Classification of Countries According to Consumer Prices for Wheat Products (about 1981 to 82).

<u>High Subsidy</u> (over 40 percent)	<u>Moderate Subsidy</u> (10 to 40 percent)	<u>No Significant Subsidy or Tax</u>	<u>Significant Tax or Duty on Wheat</u> (over 20 percent)	<u>Other Consumer Price Policy Interventions</u>	<u>Recent Changes</u> (1982-1983)
<u>SUB-SAHARAN AFRICA</u> <sup>a/</sup>					
Mauritania Sudan	Benin Ivory Coast Mauritius <sup>c/</sup> Somalia <sup>c/</sup> Tanzania <sup>c/</sup> Zimbabwe	Kenya Nigeria <sup>b/</sup> Senegal	Sierra Leone	Exchange rates in many countries are overvalued. This combined with tariffs or import controls on other grains (especially maize) often reduces the price of wheat products relative to local cereals (e.g. Ghana, Nigeria, Zambia, Zaire). High transport costs also lead to higher wheat prices in land-locked countries.	Recently there has been a tendency for wheat prices to increase. It is reported that in Nigeria, wheat flour prices doubled from 1982 to 1983. Other countries such as Sierra Leone have restricted wheat imports through foreign exchange rationing.
<u>MIDDLE EAST-NORTH AFRICA</u>					
Algeria Egypt Iraq <sup>c/</sup> Iran Jordan Kuwait Lybia Saudi Arabia Syria	Lebanon Morocco <sup>c/</sup> Tunisia Turkey			Most countries appear to have producer prices equivalent to or above import prices so that consumer subsidies have been met by governments revenues. A few (e.g. Egypt and perhaps Turkey) have maintained low producer prices as well. The domestic price of imported wheat in oil-producing countries has also declined due to favorable terms of trade and real appreciation of exchange rates.	Consumer subsidies continue at high levels in most countries. Only Lebanon has recently eliminated subsidies.

a/ Countries in the Southern Africa customs union set prices for wheat flour according to prices in South Africa where wheat flour to consumers is subsidized.

b/ Senegal has a subsidy on wheat but this has been reduced and an import tariff effectively cancels the subsidy.

c/ The data is for an earlier period and it is not known if this reflects current policy.

Table C.1 (continued)

<u>High Subsidy</u> (over 40 percent)	<u>Moderate Subsidy</u> (10 to 40 percent)	<u>No Signif- icant Sub- sidy or Tax</u>	<u>Significant Tax or Duty on Wheat</u> (over 20 percent)	<u>Other Consumer Price Policy Interventions</u>	<u>Recent Changes</u> (1982-1983)
<u>FAR EAST - WHEAT PRODUCERS</u>					
Pakistan	Bangladesh China India			Subsidies in India and Bangladesh are usually targeted to poor urban consumers. Pakistan has kept producer prices below import prices.	China has maintained consumer prices while increasing producer prices in recent years leading to a large food subsidy bill. India has tended to change both prices together.
<u>FAR EAST - NON-WHEAT PRODUCERS</u>					
	Indonesia Sri Lanka	China (Taiwan) Hong Kong Korea Rep. Malaysia Singapore	Burma Philippines Thailand	Korea Rep., China (Taiwan) and Japan all have small tariffs on imported wheat but substantial protection for rice leading to low wheat/rice prices. By contrast, Thailand and Burma have strong tariff protection for wheat and export taxes on rice. Indonesia subsidized wheat but high milling and marketing margins reduced the effect on prices.	Indonesia has reduced its wheat flour subsidy. Sri Lanka reduced subsidies in 1978 but food aid helps to maintain relatively low wheat prices.
<u>LATIN AMERICA</u>					
Brazil Cuba Ecuador Mexico	Argentina Bolivia Jamaica Trinidad and Tobago <sup>c/</sup>	Costa Rica Dominican Rep. Haiti Honduras Panama Peru	Colombia Guatemala	Some countries have protected local maize leading to reduced prices of wheat relative to maize (e.g. Venezuela). Overvalued exchange rates also favored wheat imports (e.g. Paraguay, Jamaica, Cuba). Argentina has taxed wheat exports which provides an implicit subsidy to consumers.	Several countries have eliminated subsidies in the 1970s (e.g. Chile, Venezuela, Colombia). More recently others have followed (Peru, Brazil, Ecuador) but exchange rate policy often reduces the real price of wheat (e.g. Ecuador).

TABLE C.2 Retail Prices for Selected Food Staples, 1979 to 82.

	Location	Currency Unit	Year	Rice	Retail Price/kg		
					Wheat Product <sup>a/</sup>	Maize or Other Staple as Specified	
<u>Sub-Saharan Africa</u>							
Benin	Cotonou	cfa.	1982	na	170**	500	
Ghana	Accra	Cedi	1979	10.4	11.2**	3.4	
			1980	12.5	24.4**	6.8	
			1981	12.5	27.0**	8.6	
			1982	na	105	125	
Ivory Coast	Abidjan	cfa.	1982	na	105	125	
Kenya	Nairobi	Shilling	1981	na	3.5*	2.55*	
Lesotho		Maloti	1982	na	.45	.27	
Nigeria	Ibadan	Naira	1981	na	.40*	.40	
Senegal	Dakar	cfa.	1979	90	95*	60 (millet)	
			1980	93	117*	73 (millet)	
			1981	89	117*	68 (millet)	
			1982	114	170*	79 (millet)	
Sudan	Khartoum	mm	1979	na	175*	120 (sorghum)	
			1980	na	200*	171 (sorghum)	
			1981	na	200*	227 (sorghum)	
			1982	na	290*	280 (sorghum)	
<u>Middle East/North Africa</u>							
Egypt	Cairo	Piaster	1982	6.0	9*	13 (white maize)	
Turkey	Ankara	Lira	1982	na	45*	40	
<u>East, Southeast and South Asia</u>							
Bangladesh	Dacca	Thakka	1982	na	6.00*	na	
India	Pantnagar	Rupee	1982	na	1.8*	1.3	
Indonesia	Jakarta	Rupiah	1979	170	170*	104	
Korea Rep.	National	Won	1979	469	109*	132 (barley)	
			Urban	1980	596	159*	148 (barley)
			Wholesale	1981	742	208*	235 (barley)
Nepal	Katmandu	Rupee	1982	na	3.9	2.6	
Pakistan	Karachi	Rupee	1981	6.5	180*	2.0	
Philippines	National	Pesos	1979	216	4.56*	1.58	
Sri Lanka	National	Rupee	1979	3.5	3.6*	na	
			1980	4.5	5.2*	na	
			1981	6.2	6.6*	na	
<u>Latin America</u>							
Bolivia	La Paz	Peso	1982	na	7.6*	12.1	
Brazil	Sao Paulo	Cruzeiro	1979	15.6	5.2*	5.8	
Colombia	Bogota	Pesos	1979	21.9	22.9*	16.1	
			1980	28.0	28.4*	na	
Dominican Rep.	Sto. Domingo	Peso	1982	na	40*	40	
Ecuador	Imbabura	Sucres	1982	na	6.4*	15.4	
Guatemala	Guat. City	Quetzal	1982	na	25*	10	
Haiti	Les Cayes	Gourdes	1982	na	59*	26	
Honduras	Tegucig.	Lempira	1982	na	48*	22	
Mexico	National	Pesos	1979	14.2	7.1**	4.2* (tortilla)	
			Urban	1980	18.8	7.1**	5.5* (tortilla)
			1981	20.4	7.1**	5.5* (tortilla)	
			1982	22.6	14.3**	11.9* (tortilla)	
Peru	Lima	Soles	1979	68	83*	40 (potato)	
			1980	94	105*	89 (potato)	
			1981	144	104*	110 (potato)	
			1982	227	227*	186 (potato)	

a/ \* = Flour, and \*\* = Bread

na = not available

Source: CIMMYT Economics Survey.



TABLE C.3 Price of Bread in 1979, 1980 or 1981 and Change in the Real Bread Price, 1970 to 81.

	<u>Recent Price</u> <u>of Bread</u>		<u>Change in Real</u> <u>Price of Bread</u>	
	<u>Year</u>	<u>US¢/kg</u>	<u>Period</u>	<u>percent/year</u>
<u>Sub-Saharan Africa</u>				
Benin	1981	56	na	na
Botswana	1981	50	na	na
Burundi	1980	83	1970-81	-0.8
Cameroon	1981	104	1970-80	-1.3
Central Africa Rep.	1979	130		na
Ethiopia		na	1973-78	-10.6
Gambia	1981	70	1974-81	-4.3
Ghana	1981	484	1970-81	-4.2
Ivory Coast	1981	82	1970-81	2.0
Kenya		na	1971-78	-4.6
Lesotho	1981	58	1974-81	4.8
Liberia	1980	118		na
Malawi	1981	43	1972-81	-1.4
Mali	1979	76		na
Mauritius	1981	39	1970-81	1.1
Niger	1979	79		na
Rwanda	1980	183		na
Senegal	1981	75	1970-80	9.7
Somalia	1979	73	1970-79	-0.8
Sudan	1981	45	1970-80	-1.9
Tanzania	1981	72	1970-81	-4.4
Upper Volta	1981	71	1970-81	2.1
Zaire		na	1972-78	-9.4
Zambia	1981	76	1970-81	1.0
Zimbabwe	1981	47		na
<u>Middle East/North Africa.</u>				
Afghanistan	1981	24		na
Algeria	1981	na	1970-78	-5.9
Egypt	1981	9		na
Iran	1981	45	1973-81	-6.2
Iraq		na	1970-78	-11.0
Jordan	1980	29	1970-81	-7.1
Kuwait	1980	19		na
Libya	1979	34	1970-78	-2.5
Morocco	1980	25	1970-80	-2.6
Saudi Arabia	1981	30		na
Tunisia	1981	23	1970-81	-2.8
Turkey	1980	30	1970-80	2.1
<u>South Asia</u>				
Bangladesh	1981	58	1973-81	8.4
India	1981	41	1973-81	-0.6
Nepal	1981	73		na
Pakistan	1981	46	1970-81	-1.6
Sri Lanka	1981	31	1970-81	9.5

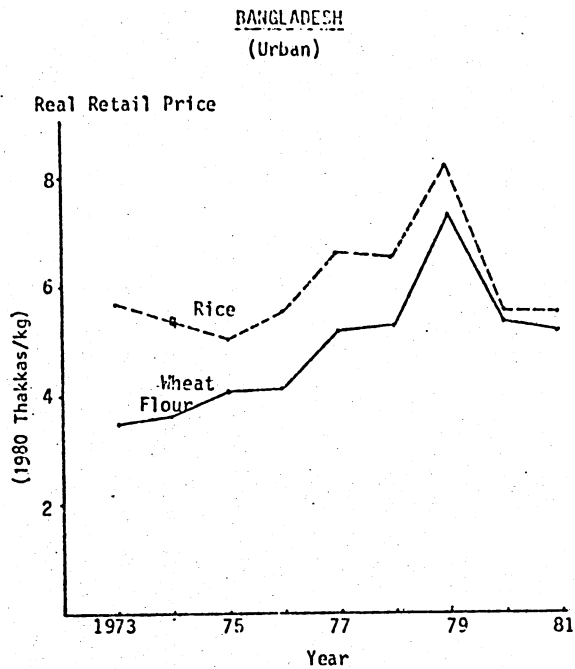
Table C.3 (continued)

	<u>Recent Price</u>		<u>Change in Real</u>	
	<u>Year</u>	<u>US\$/kg</u>	<u>Period</u>	<u>percent/year</u>
<u>Southeast and East Asia</u>				
Burma	1980	106	1970-80	7.6
Hong Kong	1980	85	1970-80	1.0
Indonesia	1980	98	1971-80	12.8
Korea Rep.	1981	118	1970-81	2.2
Malaysia	1981	109	1970-81	6.9
Philippines	1980	116	1971-80	6.7
Singapore	1981	75	1970-81	1.0
Thailand	1983	122	1970-77	4.7
<u>Latin America</u>				
Argentina		na	1970-78	5.4
Bolivia	1980	47	1973-80	-6.9
Brazil	1980	39	1970-80	-4.6
Chile	1981	78	1970-81	3.3
Colombia	1981	151	1971-81	3.8
Costa Rica	1981	53	1970-81	3.6
Dominican Rep.	1981	84	1970-81	-3.3
Ecuador	1981	91	1970-81	-1.7
El Salvador	1979	96	1970-79	-4.7
Guatemala	1981	104	1970-81	-5.6
Honduras	1981	99		na
Mexico	1981	31	1970-81	-5.9
Nicaragua	1980	111		na
Panama	1981	86	1970-81	-1.6
Paraguay	1980	59	1970-80	-3.0
Peru	1981	53	1970-81	9.5
Uruguay	1981	66	1970-81	1.5
Venezuela	1981	154	1970-81	3.4
<u>Developed Countries</u>				
Australia	1981	98	1970-81	1.6
Belgium	1981	94	1970-81	1.7
Canada	1981	120	1970-81	2.5
France	1981	124	1970-81	1.6
Germany Fed. Rep.	1981	167	1970-81	2.1
Greece	1981	51	1970-81	0.5
Israel	1981	23		na
Italy	1981	130	1970-81	1.9
Japan	1981	169	1970-81	0.9
Netherlands	1981	98	1970-81	1.0
South Africa	1981	54	1971-81	2.7
United Kingdom	1981	93	1973-81	0.2
USA	1981	115	1970-81	-1.7
Yugoslavia	1981	52		na

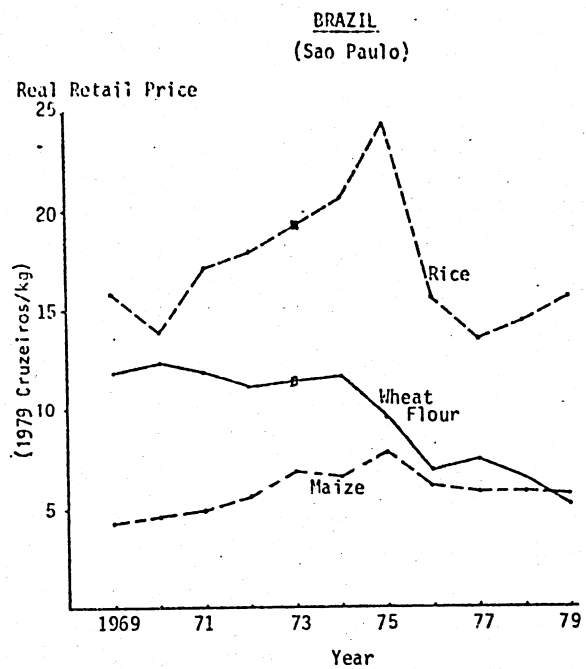
a/ Beginning and ending periods reflect the availability of data.

Source: Data based on ILO, Bulletin of Labor Statistics (various issues) edited and supplemented by CIMMYT. Official exchange rates were used to convert to US\$. The Consumer Price Index of IMF, International Financial Statistics, was used to calculate the change in real bread prices.

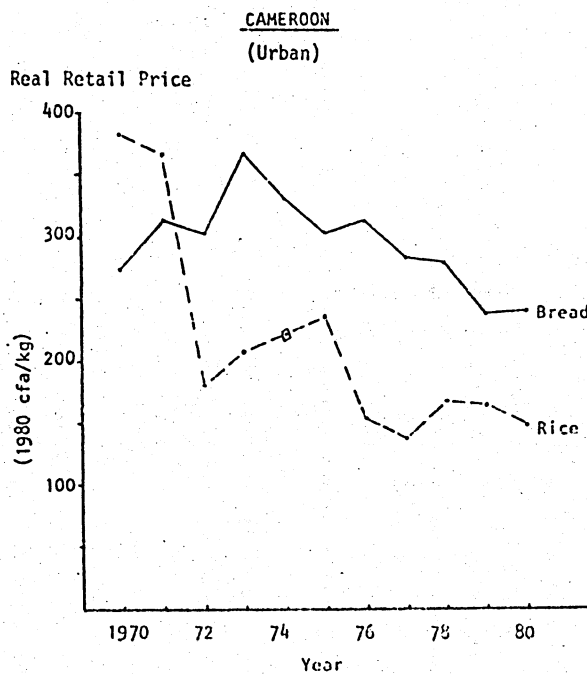
Figure C.1. Real Consumer Prices for Wheat Products and Competing Food Staples.



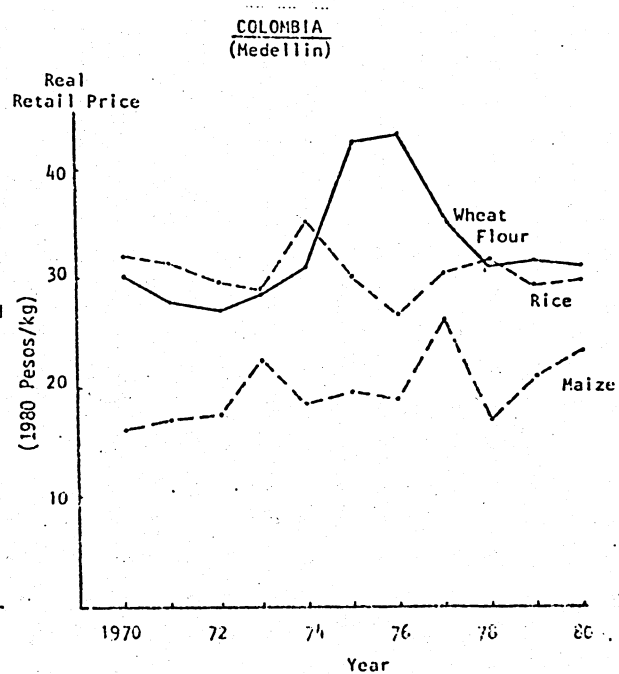
Source: ILO, Monthly Bulletin of Statistics.



Source: Generos Alimentos: Inquérito Nacional de Precios.

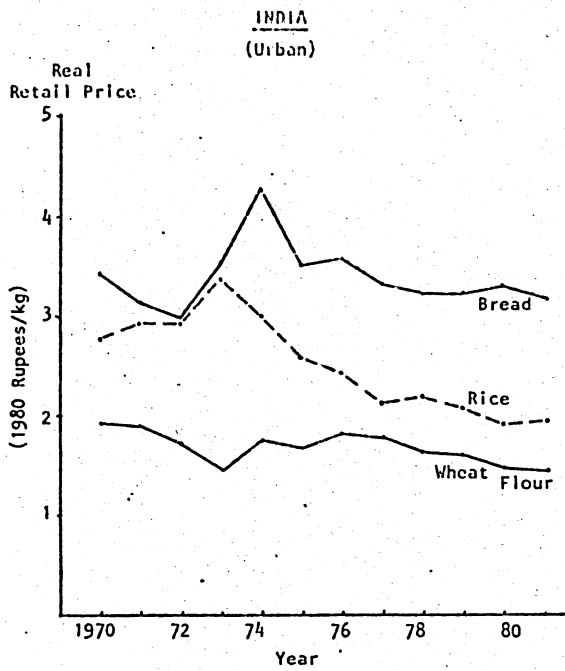


Source: ILO, Monthly Bulletin of Statistics.

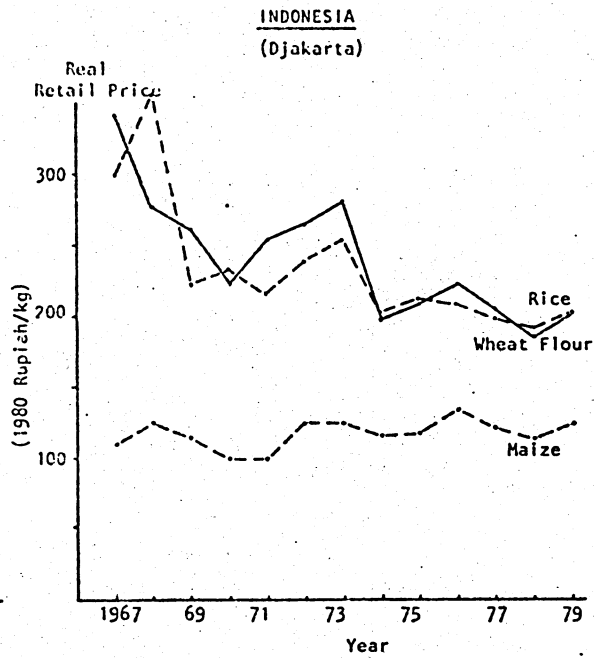


Source: John Lynam (personal communication).

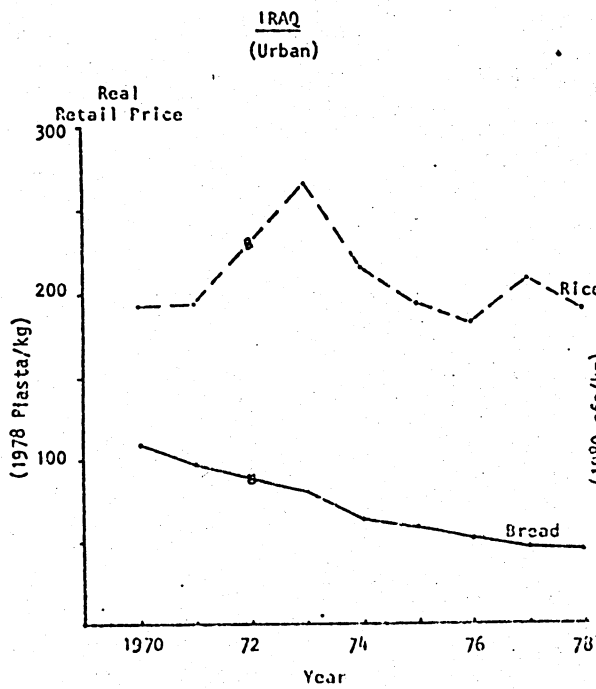
Figure C.1 (Continued)



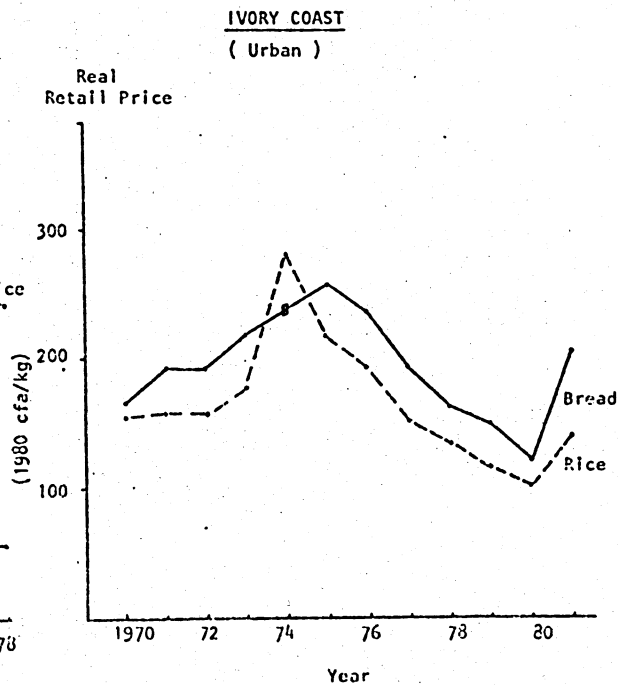
Source: ILO, Monthly Bulletin of Statistics.



Source: Magiera (1981).



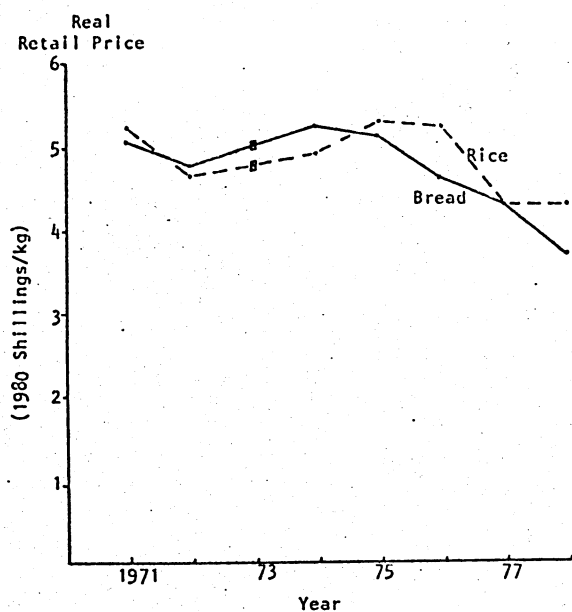
Source: ILO, Monthly Bulletin of Statistics.



Source: Bread - ILO, Monthly Bulletin of Statistics.  
Rice - WARDA (1980).

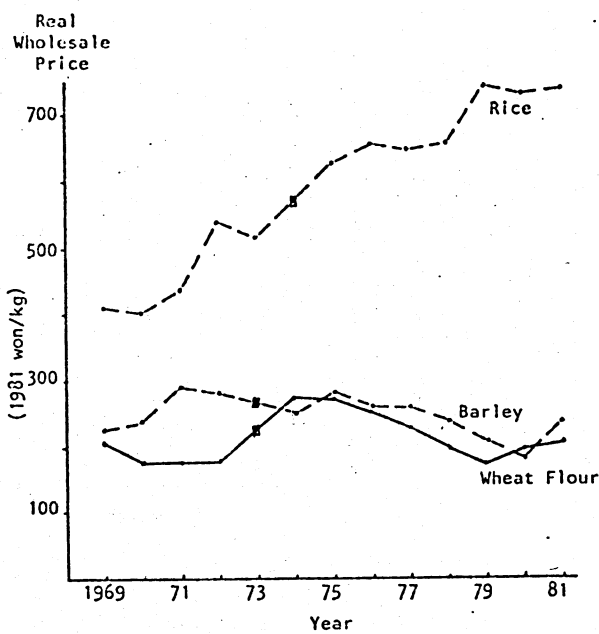
Figure C.1 (Continued)

KENYA  
(Urban)



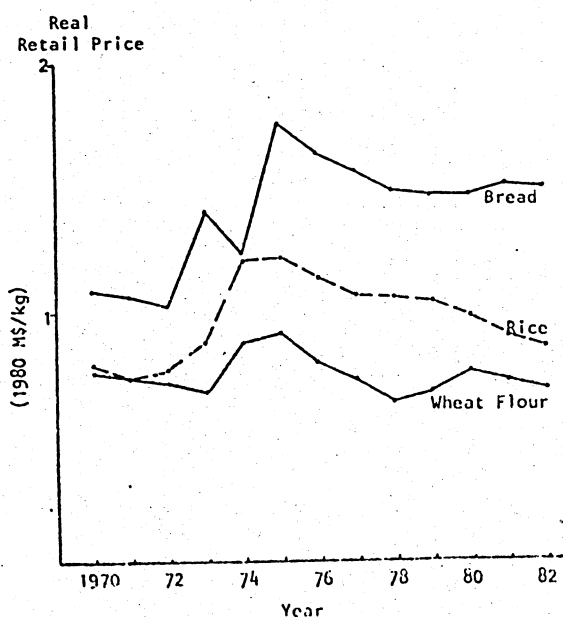
Source: ILO, Monthly Bulletin of Statistics.

KOREA REP.  
(Urban)



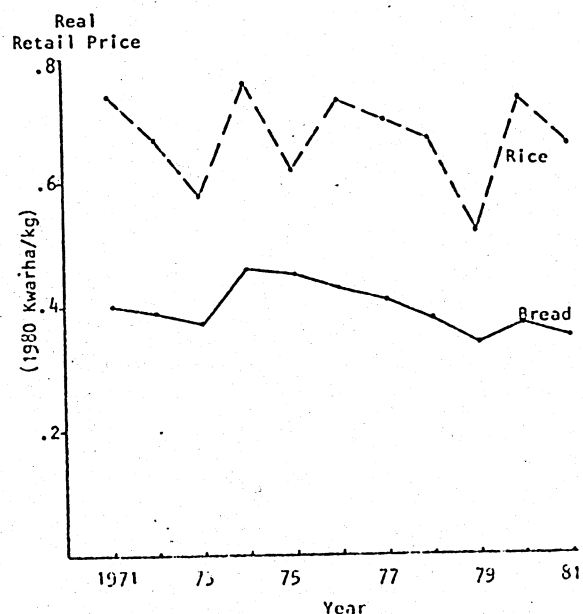
Source: J. Whang (personal communication).

MALAYSIA



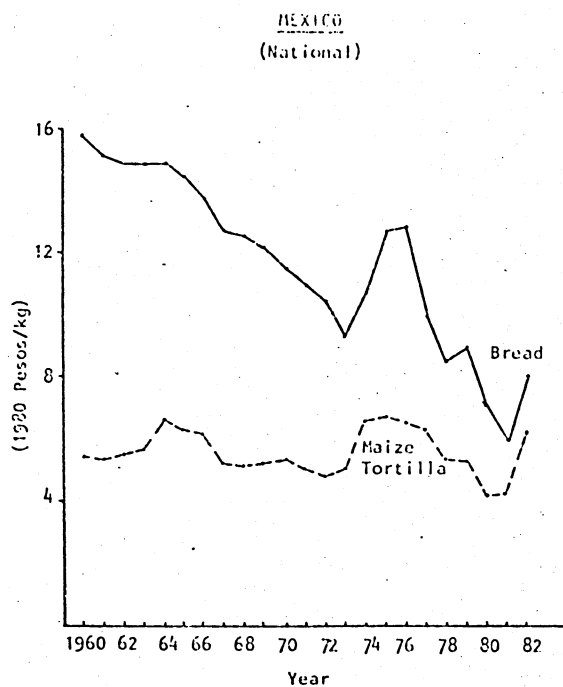
Source: Monthly Statistical Bulletin of West Malaysia, Dept. of Statistics.

MALAWI  
(Urban)

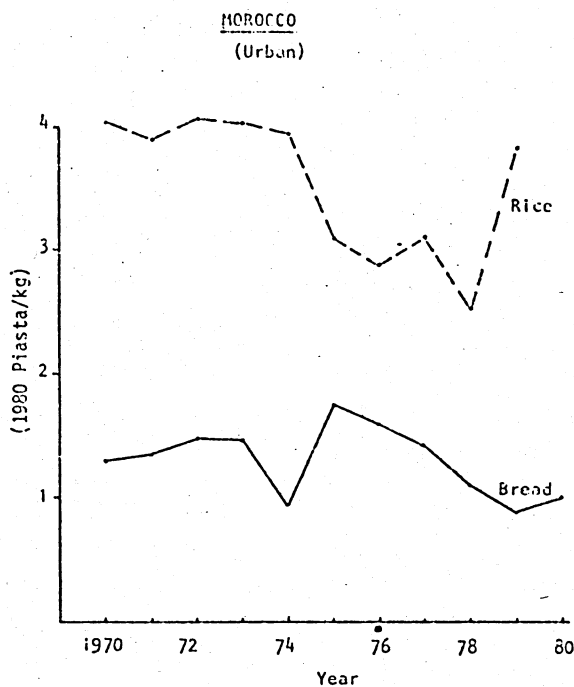


Source: ILO, Monthly Bulletin of Statistics.

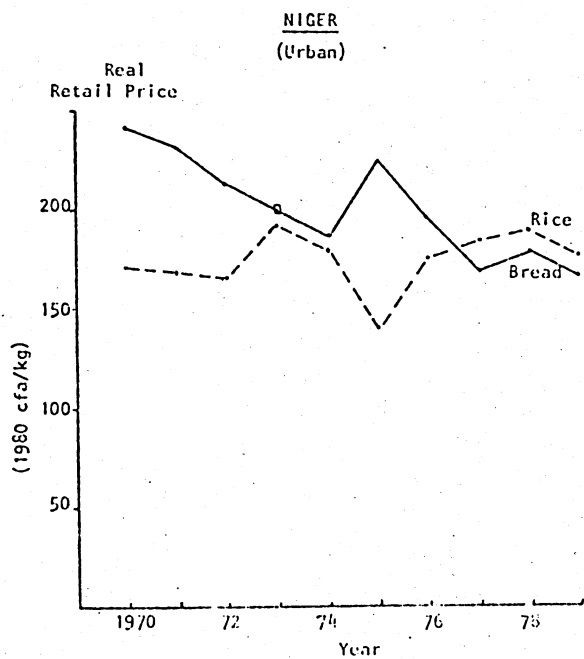
Figure C.1 (Continued)



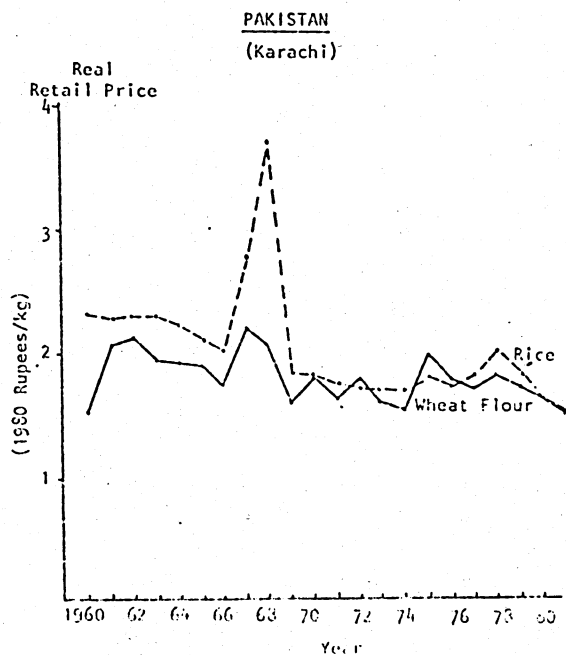
Source: R. García Mata (personal communication)



Source: ILO, Monthly Bulletin of Statistics.

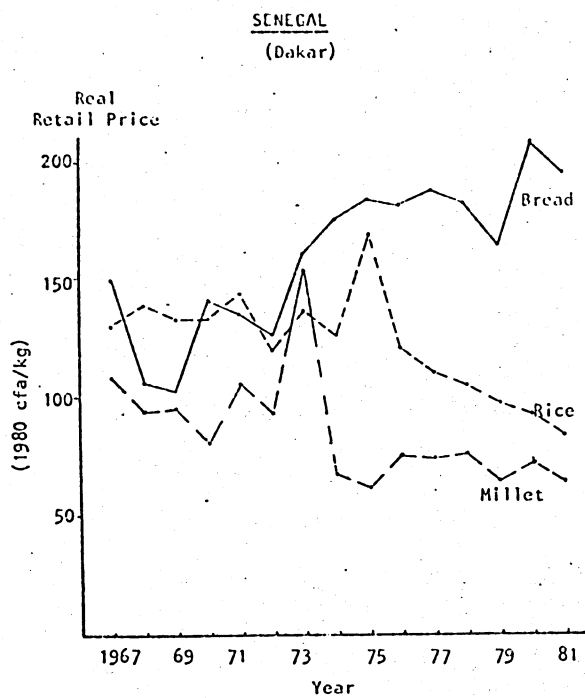


Source: Bread - ILO, Monthly Bulletin of Statistics.  
Rice - WAKDA (1980).

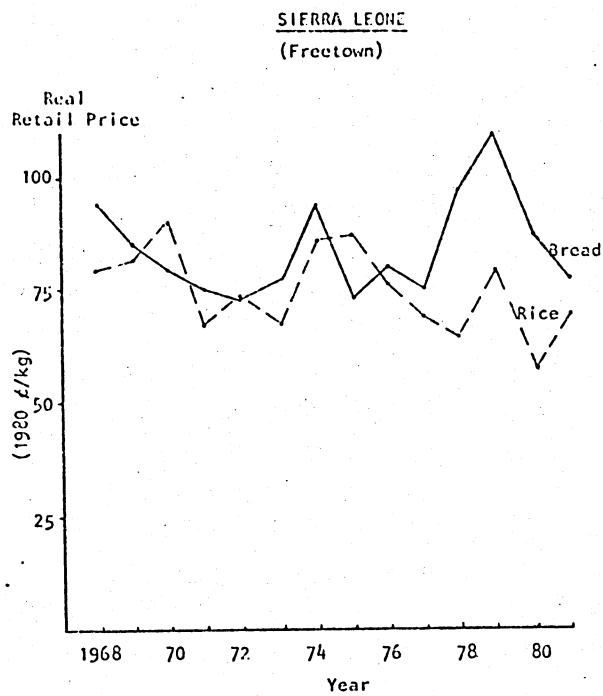


Source: Government of Pakistan Twenty-Five Years of Statistics, 1957-72 and Pakistan Statistical Yearbook (various issues).

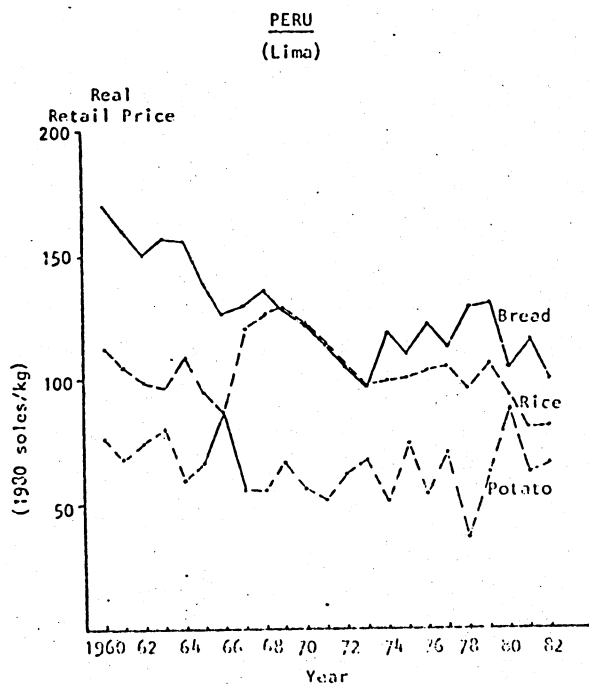
Figure C.1 (Continued)



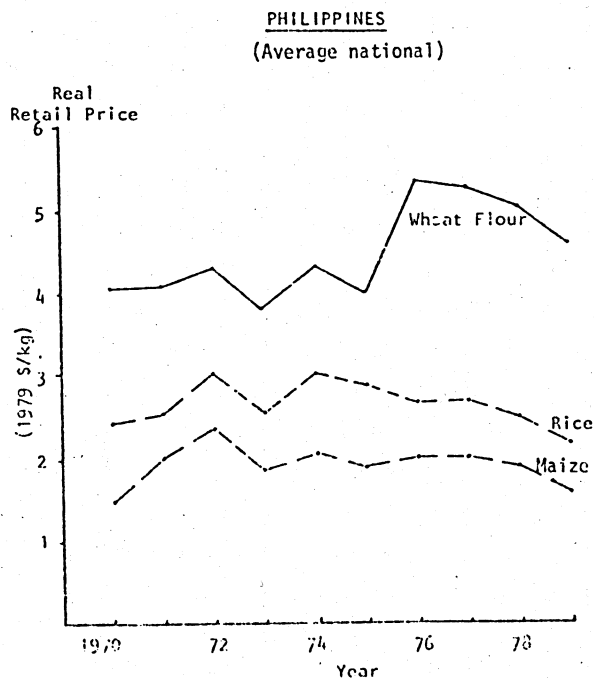
Source: Jim Bingen (personal communication).



Source: Ola Roberts (personal communication).

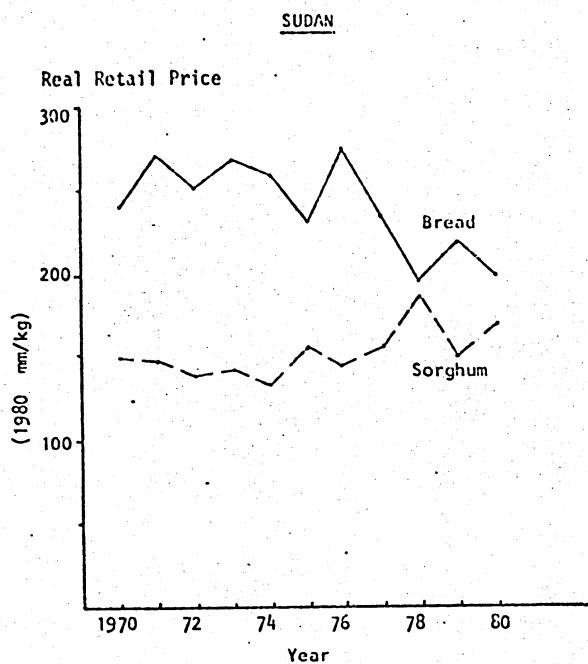


Source: Instituto Nacional de Estadística  
Boletines de Índice de Precios al  
Consumidor de Lima Metropolitana

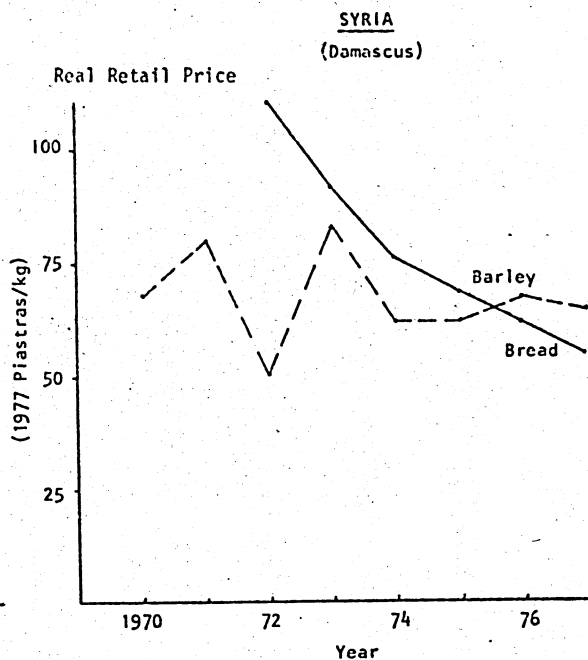


Source: Bennagen (1982).

Figure C.1 (Continued)

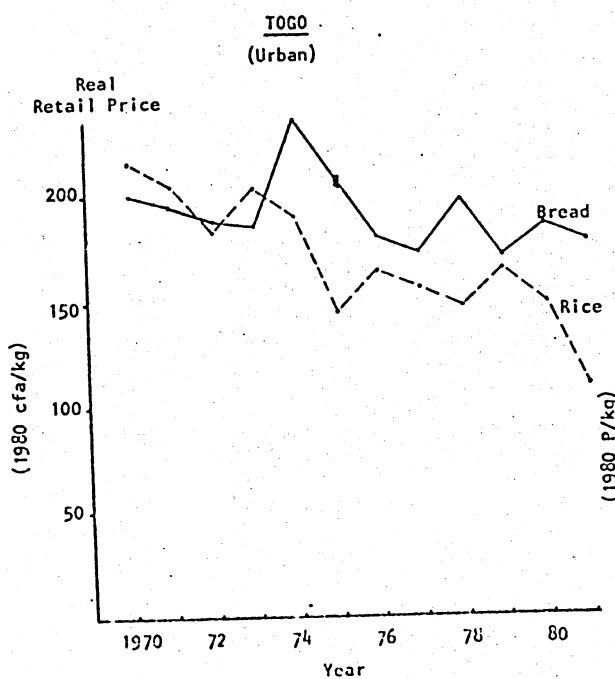


Source: Franklin (1982).

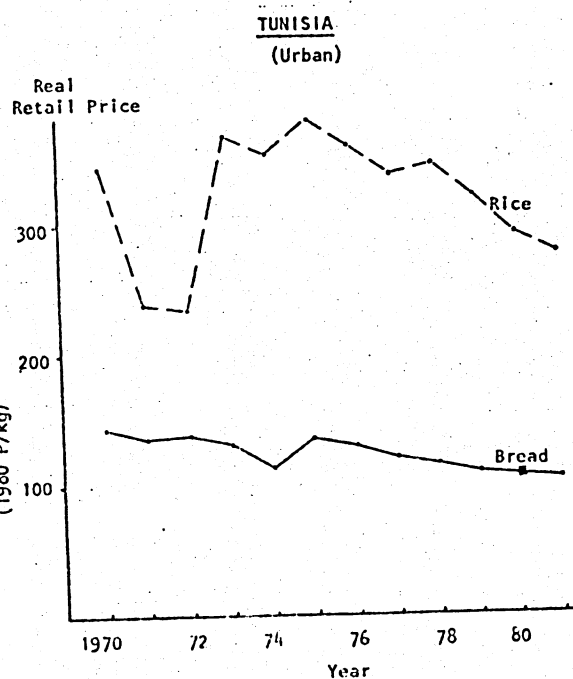


Source: Statistical Abstracts, Syria.

Note: Bread Retail Price.



Source: Bread-IL0, Monthly Bulletin of Statistics.  
Rice - WAFDA (1980)



Source: IL0, Monthly Bulletin of Statistics.



### Additional Notes and Sources for Appendix C.

Middle East/North Africa. In this region where wheat is a staple food but where imports are also high in most countries, wheat consumption is heavily subsidized in almost all countries. Prices of wheat products have also generally declined in real terms. Except in Egypt and perhaps Turkey which have low producer prices, subsidies for domestically produced wheat are even higher than for imported wheat. Saudi Arabia is an extreme case of having the highest producer price in the world (over US\$1,000/ton) together with one of the lowest consumer prices (about US\$0.30/kg bread). Consumer subsidies are usually wheat specific although a number of countries also subsidize rice (also imported). There has been substantial substitution of wheat for coarse grains (barley, maize and sorghum) which do not benefit from the subsidies. For more information see Scobie(1981) and Alderman(1982) on Egypt, Gotsch(1977) on Jordan, Stevens(1979) on Tunisia, and Hodges and Roe(1982) on Morocco.

Sub-Saharan Africa. Only a few countries in this region had consumer subsidies for wheat products. Sudan and Mauritania were both large recipients of wheat as food aid and there has been a significant consumer shift to wheat away from sorghum (and millet) resulting from favorable prices for wheat products [see Franklin et al., (1982) for data on the Sudan and Martin(1982) for Mauritania]. Several other countries had modest bread subsidies although there is a tendency to reduce these subsidies (e.g. in Senegal).

Trade and exchange rate policies have been more important in reducing the real price of wheat products. Wheat has generally been imported at low duties and often at an overvalued exchange rate. Local food staples may not be traded (e.g. cassava) or will be imported with a significant import duty (e.g. Nigeria which recently raised the duty on maize imports to 55%). This combination of policies has often led to low prices for wheat products relative to local staples. Some countries, however, (e.g. Sierra Leone) have placed significant tariffs or import controls on wheat leading to high prices relative to local staples.

Wheat Producers of South and East Asia. China, Pakistan and India, are all large wheat producers which import only a small share of their consumption. Wheat consumption is increasing rapidly in these countries, usually by substitution for coarse grains but also for rice in India. The cost of consumer subsidies has reached quite a high level in Pakistan [see Khan(1982)] and China [Lardy(1983)].

Non-wheat Producers of South, Southeast, and East Asia. Price policies in this group of countries are quite variable. Sri Lanka which has the largest per capita wheat consumption has had high subsidies and food aid has helped to maintain low prices even after the elimination of subsidies (see Steinberg et al., 1982). Indonesia has subsidized wheat but high milling margins reduced its effect [see Magiera(1982)]. Other countries of Southeast Asia maintain high wheat prices through tariff protection or import controls (e.g. Thailand, Philippines). In East Asia the protection of domestic rice production has led to low wheat prices relative to rice.

Latin America. Many countries in this region have had policies which favored wheat consumption. As early as the 1950s and 1960s significant substitution of wheat for local staples (especially maize) was taking place. For example, in Venezuela exchange rate subsidies and duty free imports of wheat significantly reduced the price of wheat relative to maize (Carbonell and Rothman, 1977). In Peru, wheat products received the bulk of subsidies until their removal in 1978 (Alvarez, 1980). Wheat subsidies in Brazil were major factor leading to increased bread consumption in the 1970s (Gray, 1982). However, the general trend is toward removal of subsidies and only Mexico, Brazil and Cuba currently have large explicit subsidies (for information on Mexico, see Byerlee, 1983). Other countries, particularly Ecuador, maintain low wheat prices through exchange rate policy. In a few cases such as Colombia policy has been reversed leading to high domestic wheat prices.

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