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CHANGING PATTERNS OF CONSUMPTION UNDERLYING CHANGES IN TRADE AND AGRICULTURAL DEVELOPMENT

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The patterns of food consumption have changed significantly in many countries during the past 10-20 years. These changes influence and are influenced by patterns of production and trade and, if continued at current rates, will result in considerable changes in future demand patterns.

This paper provides an empirical overview of recent and expected future changes in consumption patterns for food and discusses the factors expected to be most important in influencing these changes.

Several factors influence consumption patterns. The most important are changes in incomes, income distribution, relative prices, and the rate of urbanization. Changes in the opportunity cost of women's time, intrahousehold budget control, and tastes, as well as increasing commercialization of semisubsistence agriculture may also contribute.

Long-Term Changes in Food Consumption Patterns: A Statistical Overview

The change in food consumption patterns during the sixties and seventies differs among regions and level of development (table 1). The well-known shift from foods of vegetarian origin to animal products is common to all regions. The rate of change is strongest in Eastern Europe and the USSR. With about two-thirds of all calories coming from vegetarian sources and one-third from animal origin, the developed market economies appear to have reached a level where no further substitution between the two groups is desired. The developing countries are just entering into the phase of rapid substitution and are still in the phase of relatively large increases in the consumption of both categories of food.

Although the relative importance of the two food groups has changed little during the 20-year period under study, except for the East European countries and USSR, significant changes have occurred within each of the two food groups in all country groups. The most striking changes in the developed market economies were large increases in the consumption of meat, alcohol, and vegetable oils and fats and decreases in animal oils and fats, cereals, and roots and tubers. Similar changes occurred in the East European countries and USSR, except consumption of animal oils and fats increased. Sugar consumption, which increased only slightly in the developed market economies, showed a very marked increase in Eastern Europe and USSR. Sugar consumption increased in all regions of the developing world, as did vegetable oils and fats, eggs, and fish. The largest reductions were found in the consumption of roots and tubers, pulses, nuts, and seeds.

Regional averages cover large differences among countries. The most important reason for such differences is the level of income. Table 2 shows the change in calorie sources for 85 developing countries by income level and income growth rate for a 10-year period. A very clear relationship emerges between the per capita income level and the consumption patterns as well as changes in these patterns. Low-income countries rely heavily on cereals and roots and tubers, and the importance of these foods increased during the seventies. Higher income countries, on the other hand, obtain a smaller and decreasing proportion of their calories from these foods. The opposite change occurred for sugar and animal products--that is, their

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relative importance decreased for the poor and increased for the higher income developing countries. Thus, an increasing discrepancy in the diet composition between low- and high-income developing countries is evident during the 10-year period.

Countries with low-growth rates during the seventies tend to increase their reliance on cereals, while reducing the relative importance of animal products. High-growth countries, on the other hand, show large increases in the consumption of animal products and sugar, while reducing the relative importance of cereals and root crops (table 2). Changes in consumption patterns tend to be more strongly associated with income levels than with growth in income. No apparent relationship was found between changes in consumption patterns and the degree of food self-sufficiency.

Table 1--Share of major food groups in total calorie consumption by region and economic group

| Food group | Developed market economies | | | Eastern Europe and USSR | | | Developing market economies | | | Africa | | |
|-------------------------|----------------------------|---------|---------|-------------------------|---------|---------|-----------------------------|---------|---------|-----------------------------------|---------|---------|
| | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 |
| | Percent | | | | | | | | | | | |
| Vegetable products | 69.2 | 68.4 | 68.3 | 77.6 | 75.0 | 72.9 | 91.9 | 91.9 | 91.4 | 93.7 | 93.5 | 93.5 |
| Cereals | 31.1 | 27.4 | 26.4 | 47.2 | 41.4 | 37.5 | 58.1 | 57.9 | 57.7 | 46.4 | 45.8 | 46.7 |
| Pulses, nuts, and seeds | 2.6 | 2.4 | 2.4 | 1.6 | 1.5 | 1.4 | 8.1 | 7.0 | 5.6 | 8.1 | 7.9 | 7.0 |
| Roots and tubers | 4.9 | 4.2 | 3.7 | 7.9 | 7.3 | 6.0 | 7.1 | 7.3 | 6.2 | 21.7 | 21.7 | 19.8 |
| Sugar | 12.6 | 13.5 | 13.0 | 10.0 | 12.0 | 13.0 | 8.5 | 9.2 | 9.7 | 3.6 | 4.1 | 5.2 |
| Vegetables and fruits | 4.6 | 5.0 | 4.8 | 2.7 | 3.0 | 3.6 | 4.1 | 4.3 | 4.4 | 5.4 | 5.2 | 4.8 |
| Vegetable oils and fats | 7.9 | 9.7 | 11.3 | 4.5 | 5.0 | 6.0 | 4.6 | 5.1 | 6.3 | 5.6 | 6.1 | 7.6 |
| Stimulants and spices | .7 | .8 | .8 | .2 | .3 | .4 | .5 | .4 | .4 | .8 | .6 | .5 |
| Alcohol beverages | 4.8 | 5.4 | 5.9 | 3.5 | 4.5 | 5.0 | .9 | 1.0 | 1.1 | 2.1 | 2.1 | 1.9 |
| Animal products | 30.8 | 31.6 | 31.7 | 22.4 | 25.0 | 27.1 | 8.1 | 8.1 | 8.6 | 6.3 | 6.5 | 6.5 |
| Meat and offal | 12.8 | 14.3 | 15.3 | 7.1 | 8.2 | 9.9 | 3.0 | 3.0 | 3.1 | 3.1 | 3.0 | 2.8 |
| Milk | 9.1 | 8.6 | 8.5 | 8.6 | 9.3 | 8.5 | 3.1 | 2.9 | 3.1 | 1.8 | 1.9 | 2.0 |
| Animal oils and fats | 6.0 | 5.6 | 4.7 | 4.9 | 5.2 | 5.8 | 1.3 | 1.3 | 1.3 | .6 | .7 | .7 |
| Eggs | 1.6 | 1.7 | 1.6 | .9 | 1.1 | 1.5 | .2 | .3 | .4 | .2 | .2 | .2 |
| Fish | 1.3 | 1.4 | 1.6 | .9 | 1.2 | 1.4 | .5 | .6 | .7 | .6 | .7 | .8 |
| | Far East | | | Latin America | | | Near East | | | Asian centrally planned economies | | |
| | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 | 1961-63 | 1969-71 | 1979-81 |
| | Percent | | | | | | | | | | | |
| Vegetable products | 94.6 | 94.6 | 94.2 | 83.5 | 83.8 | 82.9 | 90.0 | 90.2 | 89.3 | 91.7 | 91.2 | 90.0 |
| Cereals | 66.7 | 67.6 | 67.4 | 40.4 | 39.6 | 40.2 | 64.9 | 61.7 | 58.2 | 63.5 | 66.2 | 66.9 |
| Pulses, nuts, and seeds | 9.2 | 7.4 | 5.9 | 6.4 | 6.3 | 4.9 | 4.8 | 4.4 | 3.8 | 6.6 | 4.5 | 3.5 |
| Roots and tubers | 3.3 | 3.3 | 3.0 | 7.4 | 7.9 | 5.6 | 1.6 | 1.6 | 1.8 | 15.6 | 14.3 | 12.0 |
| Sugar | 7.8 | 8.4 | 8.4 | 16.0 | 15.6 | 17.2 | 6.5 | 8.5 | 9.9 | 1.1 | 1.4 | 1.8 |
| Vegetables and fruits | 3.0 | 3.0 | 3.3 | 5.5 | 5.7 | 5.4 | 6.9 | 6.7 | 6.4 | 2.4 | 2.2 | 2.2 |
| Vegetable oils and fats | 4.0 | 4.1 | 5.3 | 5.2 | 6.0 | 6.7 | 4.8 | 6.7 | 8.4 | 1.6 | 1.8 | 2.6 |
| Stimulants and spices | .5 | .5 | .5 | .3 | .3 | .3 | .3 | .3 | .4 | .1 | .. | .. |
| Alcoholic beverages | .1 | .3 | .4 | 2.3 | 2.4 | 2.6 | .2 | .3 | .4 | .8 | .8 | 1.0 |
| Animal products | 5.4 | 5.4 | 5.8 | 16.5 | 16.3 | 17.1 | 10.0 | 9.8 | 10.7 | 8.3 | 8.8 | 10.0 |
| Meat and offal | 1.0 | 1.1 | 1.2 | 8.4 | 7.8 | 8.1 | 3.6 | 3.6 | 4.0 | 6.0 | 6.4 | 7.4 |
| Milk | 2.7 | 2.3 | 2.5 | 5.0 | 5.2 | 5.5 | 3.8 | 3.4 | 3.7 | .5 | .4 | .5 |
| Animal oils and fats | 1.0 | 1.1 | 1.1 | 2.2 | 2.1 | 2.0 | 2.2 | 2.3 | 2.3 | .7 | .8 | .9 |
| Eggs | .1 | .2 | .3 | .5 | .6 | .8 | .2 | .3 | .4 | .7 | .7 | .7 |
| Fish | .6 | .7 | .7 | .4 | .5 | .7 | .2 | .2 | .3 | .4 | .5 | .5 |

Source: (11).

Shifts in food consumption patterns can be very rapid, as exemplified by Japan during the rapid growth period of 1955-78 and, to a lesser extent, by the Organization for Economic Cooperation and Development (OECD) during the same period (table 3). In Japan, the proportion of calories coming from cereals and starchy foods dropped from three-fourths to less than half, while consumption of meats and eggs increased 8.5 percent. Cultural differences may play an important role in consumption patterns, but it is realistic to expect that changes of similar magnitudes will occur in many developing countries as they move toward higher income levels.

Table 2--Sources of calories consumed in various groups of developing countries

| Item | Countries | Share of total consumption from -- | | | | | | | | | | | |
|--|-----------|------------------------------------|---------|------------------|---------|-----------------|---------|-----------------|---------|---------|---------|-------------|---------|
| | | Cereals | | Roots and tubers | | Pulses and nuts | | Animal products | | Sugar | | Other Foods | |
| | | 1969-71 | 1979-81 | 1969-71 | 1979-81 | 1969-71 | 1979-81 | 1969-71 | 1979-81 | 1969-71 | 1979-81 | 1969-71 | 1979-81 |
| | | <u>Number</u> | | | | | | <u>Percent</u> | | | | | |
| Average | 85 | 51.4 | 51.0 | 10.2 | 9.4 | 5.7 | 5.2 | 10.7 | 11.0 | 8.3 | 8.8 | 13.7 | 14.6 |
| Grouped by 1980 per capita income 1/ | | | | | | | | | | | | | |
| Less than \$250 | 11 | 54.4 | 56.3 | 13.7 | 14.3 | 9.0 | 8.0 | 7.4 | 6.4 | 3.9 | 3.8 | 11.6 | 11.4 |
| \$250-\$499 | 20 | 54.4 | 55.3 | 15.2 | 13.8 | 7.0 | 6.6 | 7.6 | 7.1 | 5.2 | 5.1 | 10.7 | 12.1 |
| \$500-\$1,999 | 39 | 50.3 | 49.7 | 9.5 | 8.3 | 4.9 | 4.5 | 10.7 | 11.0 | 9.6 | 10.8 | 15.0 | 15.7 |
| \$2,000 and over | 15 | 48.4 | 44.8 | 2.7 | 2.5 | 3.7 | 3.2 | 17.2 | 19.3 | 12.4 | 12.5 | 15.5 | 17.7 |
| Grouped by 1961-80 income growth 2/ | | | | | | | | | | | | | |
| Less than 1 percent | 18 | 49.8 | 51.1 | 15.4 | 14.5 | 5.8 | 5.4 | 9.8 | 9.0 | 6.5 | 6.6 | 12.6 | 13.3 |
| 1.0-2.9 percent | 32 | 48.4 | 48.5 | 12.8 | 12.1 | 6.5 | 5.8 | 9.9 | 10.0 | 7.7 | 8.1 | 14.7 | 15.6 |
| 3.0-4.9 percent | 23 | 54.1 | 52.9 | 6.2 | 5.3 | 5.3 | 5.0 | 11.2 | 11.8 | 9.7 | 10.3 | 13.5 | 14.6 |
| 5.0 percent and over | 12 | 56.7 | 53.9 | 3.0 | 2.1 | 4.2 | 3.7 | 13.0 | 15.0 | 10.2 | 11.2 | 12.9 | 14.1 |
| Grouped by food self-sufficiency in 1976-80 3/ | | | | | | | | | | | | | |
| Less than 75 percent | 28 | 52.6 | 50.9 | 3.3 | 2.9 | 4.4 | 4.1 | 14.1 | 14.8 | 11.5 | 11.6 | 14.1 | 15.6 |
| 75-94 percent | 24 | 47.0 | 48.6 | 18.3 | 16.4 | 6.0 | 5.3 | 7.8 | 7.9 | 6.2 | 7.0 | 14.7 | 14.8 |
| 95-104 percent | 17 | 54.2 | 53.9 | 13.5 | 12.7 | 6.7 | 6.1 | 8.6 | 8.6 | 5.9 | 6.0 | 11.1 | 12.7 |
| 105 percent and over | 16 | 53.2 | 51.7 | 6.4 | 6.5 | 6.4 | 5.9 | 11.4 | 11.5 | 8.5 | 9.6 | 14.1 | 14.7 |

1/ 1979-81 U.S. dollars.

2/ Average annual growth rate of real GNP per capita, 1961-80.

3/ Ratio of domestic production to total consumption of major crops during 1976-80.

Source: The country groupings are based on Paulino (17). Data on sources of calories by country are Agriculture Organization of the United Nations (11).

Table 3--Sources of calories consumed in the OECD and Japan,

| Food groups | OECD | | Japan | |
|---------------------------|---|---------|---------|---------|
| | 1955-57 | 1976-78 | 1955-57 | 1976-78 |
| | <u>Percent of total calorie consumption</u> | | | |
| Cereals and starchy foods | 40.3 | 30.1 | 74.9 | 49.3 |
| Meats and eggs | 13.9 | 19.4 | 2.1 | 10.6 |
| Oils and fats | 15.4 | 18.0 | 3.4 | 12.4 |
| Sugar | 12.4 | 13.0 | 5.9 | 10.6 |
| Milk | 11.0 | 11.7 | 0.9 | 3.5 |
| Fruits and vegetables | 4.0 | 4.9 | 3.2 | 4.7 |
| Pulses and nuts | 1.8 | 1.6 | 6.2 | 4.8 |
| Fish | 1.1 | 1.2 | 3.4 | 4.1 |

Source: (3).

Average figures for cereals shown in earlier tables cover large differences among the various cereal types. While the annual growth rate for cereals used for food in developing countries during 1961-83 was 3.3 percent, wheat consumption grew at an annual rate of 5.2 percent (table 4). Similarly, maize consumption for food in developed countries grew 2.2 percent annually, compared with an average growth rate of 0.5 percent for all cereals for food. Consumption of cereals by animals grew at very high rates, reaching 11.5 percent for maize in Asia.

Considerable differences were also found within animal products. Beef and pig meat each accounted for 30-40 percent of total meat consumption in both developed and developing countries. The relative importance of beef and buffalo fell significantly in developing countries from the early sixties to the midseventies, while pig meat gained (table 5). The most significant development was the rapid increase in the importance of poultry meat in all regions. The annual average growth rates for poultry meat were 9.8 percent in North Africa and the Middle East and 7.8 percent for all developing countries (table 6).

Table 4--Annual growth rates in the consumption of various grains by region, 1961-83 average

| Region | Wheat | | Rice | | Maize | | Other coarse grain | | Total cereals | |
|------------------------------|---------|------|------|------|-------|------|--------------------|------|---------------|------|
| | Feed | Food | Feed | Food | Feed | Food | Feed | Food | Feed | Food |
| | Percent | | | | | | | | | |
| Developing economies | 6.00 | 5.23 | 3.36 | 3.31 | 7.52 | 2.88 | 4.18 | 0.72 | 5.55 | 3.34 |
| Asia | 6.58 | 5.88 | 3.35 | 3.24 | 11.53 | 2.84 | 1.53 | .30 | 6.00 | 3.37 |
| North Africa and Middle East | 5.46 | 4.31 | 1.04 | 4.53 | 7.92 | 2.66 | 3.38 | .96 | 4.68 | 3.65 |
| Sub-Saharan Africa | 7.66 | 6.23 | 3.20 | 5.06 | 5.27 | 3.27 | 1.60 | 1.40 | 3.86 | 2.85 |
| Latin America | 4.87 | 3.45 | 4.32 | 3.46 | 4.20 | 2.77 | 9.10 | 3.36 | 5.36 | 3.19 |
| Developed economies | 4.06 | .45 | 1.46 | .40 | 2.90 | 2.16 | 2.11 | .31 | 2.81 | .5 |
| North America | 2.17 | 1.19 | 1.36 | 2.92 | 1.68 | 1.94 | -.01 | 2.41 | 1.04 | 1.54 |
| Eastern Europe | 5.68 | .20 | 9.84 | 7.15 | 5.30 | -.01 | 4.43 | -.01 | 4.99 | .19 |
| Western Europe | 2.18 | .09 | 5.25 | 1.55 | 3.67 | 1.20 | 1.37 | .99 | 2.25 | .33 |

Source: (11).

Table 5--Percentage of total meat consumption by region

| Region | Beef and buffalo | | Mutton and goat | | Pig meat | | Poultry meat | |
|--------------------------|-----------------------------------|---------|-----------------|---------|----------|---------|--------------|---------|
| | 1961-65 | 1973-77 | 1961-65 | 1973-77 | 1961-65 | 1973-77 | 1961-65 | 1973-77 |
| | Percent of total meat consumption | | | | | | | |
| World | 39.2 | 37.6 | 8.2 | 6.0 | 38.1 | 37.6 | 14.5 | 18.8 |
| Developed economies | 39.3 | 39.6 | 6.6 | 4.4 | 38.6 | 36.2 | 15.5 | 19.8 |
| Developing economies | 39.1 | 33.7 | 11.2 | 9.0 | 37.1 | 40.5 | 12.7 | 16.8 |
| Asia | 35.6 | 33.4 | 19.8 | 17.2 | 31.1 | 31.9 | 13.5 | 17.5 |
| North Africa/Middle East | 38.3 | 35.8 | 48.9 | 41.9 | 0.5 | 0.7 | 12.3 | 21.6 |
| Sub-Saharan Africa | 59.8 | 57.9 | 24.4 | 20.6 | 5.9 | 7.6 | 10.0 | 14.0 |
| Latin America | 70.8 | 63.9 | 5.1 | 3.4 | 16.4 | 17.0 | 7.7 | 15.7 |

Source: (23).

Table 6--Annual growth rates of meat consumption by type and region, 1961-77

| Region | Total | Beef and buffalo | Mutton and goat | Pig meat | Poultry meat |
|------------------------------------|----------------|------------------|-----------------|----------|--------------|
| | <u>Percent</u> | | | | |
| Asia | 2.9 | 2.3 | 1.6 | 3.2 | 5.4 |
| North Africa and Middle East | 4.1 | 3.2 | 2.8 | 3.0 | 9.8 |
| Sub-Saharan Africa | 2.0 | 1.7 | .7 | 4.4 | 4.8 |
| Latin America | 3.3 | 2.4 | NA | 3.3 | 9.2 |
| Developing countries ^{1/} | 3.2 | 2.4 | 1.7 | 3.3 | 7.8 |

NA = Not available.

^{1/} Includes 104 countries

Source: (23).

The Impact of Income Growth

Much of the change in consumption patterns can be explained by changes in incomes. Income elasticities are generally much higher for animal products than for cereals and other staples. As shown in table 7, income elasticities for meats and eggs may be close to 1 in regions with low consumption of these commodities, while it is generally around 0.2 for cereals used for food. In Latin America, meat consumption is relatively high and income elasticities are relatively low. In most developed countries, increased incomes cause the consumption of cereals for food to decline, as expressed by the negative income elasticity (table 7).

The strong effect of income on meat consumption is reflected in very large differences in meat consumption among developing countries at various income levels (table 8). Developing countries with annual per capita incomes of \$1,250 or more consume almost nine times the amount of meat that is consumed in countries with incomes below \$250.

Table 7--Income elasticities of demand for livestock products and cereals, 1975

| Region | Meat | Milk | Eggs | Cereals |
|------------------------------------|------|-------|------|---------|
| Developed economies | 0.25 | -0.05 | 0.27 | 0.22 |
| Developing economies ^{1/} | .63 | .57 | 1.00 | .16 |
| Africa | .79 | .68 | 1.05 | .21 |
| Asia and Far East | .97 | .52 | 1.07 | .22 |
| Near East | .72 | .53 | .83 | .13 |
| Latin America | .37 | .49 | .60 | .16 |

^{1/} Grouped according to the classification system of the Food and Agriculture Organization of the United Nations.

Source: (23).

Table 8--Average annual per capita consumption of meat for 1973-77, by per capita income group in 1977

| Region | Per capita income group | | | |
|------------------------------|---------------------------|-------------|---------------|-----------------|
| | Less than \$250 | \$250-\$499 | \$500-\$1,249 | \$1,250 or more |
| | <u>Kilograms per year</u> | | | |
| Asia | 2.8 | 6.9 | 10.2 | 56.8 |
| North Africa and Middle East | 8.9 | 12.4 | 14.6 | 18.3 |
| Sub-Saharan Africa | 10.2 | 7.5 | 14.1 | 27.4 |
| Latin America | 10.6 | 19.2 | 22.8 | 38.5 |
| All study countries | 4.0 | 8.1 | 15.9 | 35.0 |

Source: (23).

Table 9--Income elasticities for calorie intake from various foods by income groups, Brazil, 1974/75

| Food group | Lowest 30 percent | | Highest 20 percent | |
|---------------------------|-------------------|-----------------|--------------------|-----------------|
| | Urban areas | Rural areas | Urban areas | Rural areas |
| Cereals | 0.649 | 1.00 | 0.071 | 0.121 |
| Rice | .852 | 1.99 | -.224 | .173 |
| Maize | <u>1/</u> .329 | 1.18 | <u>1/</u> -.043 | <u>2/</u> -.088 |
| Wheat bread | 1.09 | 1.47 | .145 | <u>2/</u> .127 |
| Roots, tubers, and pulses | -.709 | <u>2/</u> -1.09 | <u>1/</u> .088 | -.411 |
| Cassava flour | -2.09 | -3.50 | <u>1/</u> .330 | -.356 |
| Sugar | .652 | 1.25 | -.033 | <u>1/</u> .077 |
| Legumes | <u>1/</u> -.202 | <u>2/</u> -.343 | -.178 | .079 |
| Vegetables | 1.27 | <u>2/</u> 1.52 | .102 | <u>2/</u> .266 |
| Fruits | -.027 | .380 | .399 | .078 |
| Meat and Fish | .413 | <u>1/</u> .363 | .238 | .075 |
| Beef | 1.45 | <u>1/</u> 1.22 | .149 | <u>2/</u> .154 |
| Dairy products | .809 | 1.52 | .373 | .055 |
| Milk | <u>1/</u> .727 | 2.27 | .061 | <u>2/</u> -.172 |
| Eggs | 1.15 | 1.93 | .100 | <u>2/</u> .114 |
| Oils and fats | 1.56 | 2.53 | -.040 | <u>2/</u> -.315 |
| Total calories | -.280 | .465 | .039 | <u>2/</u> .057 |

1/ This is not significantly different from zero at the 0.05 level using a two-tailed test.

2/ This is not significantly different from the urban estimate at the 0.05 level using a two-tailed test.

Source: (32).

The effect of income on consumption of the various foods within a given country is illustrated in table 9, using data from Brazil. Income elasticities for cereals are high for the poor, particularly the rural poor, while they are generally negative for the urban rich and low for the rural rich. Among the cereals, only wheat consumption increases when incomes among the urban rich increase. This reflects a strong desire to substitute wheat bread for other cereal-based foods, a phenomenon found in most higher income developing countries.

Another feature illustrated by the Brazilian data, which is common to most developing countries, is the high-income elasticity for sugar, vegetables, oils and fats, and meat and fish among the poor, together with low-income elasticities for roots, tubers, and pulses. The implications for future demand of various commodities in a situation of rapid income growth among the poor are obvious.

The strong desire of the poor to change their diet toward high-elasticity commodities is reflected in large differences between calorie and food expenditure elasticities. As shown in table 10, it is not uncommon for food expenditure elasticities to be twice the calorie elasticities. This implies rapidly increasing calorie costs of the diet with increasing incomes. While this is a well-known phenomenon, it is surprising to find that the poor, including many households with insufficient but nutritionally well-balanced food consumption to meet nutritional needs, choose to modify their dietary composition at such a rapid rate.

Table 10--Calorie and food expenditure elasticities for low-income families

| Country | Urban areas | | Rural areas | |
|--------------------|-------------------|------------------|-------------|------------------|
| | Calorie | Food expenditure | Calorie | Food expenditure |
| | <u>elasticity</u> | | | |
| Sri Lanka | 0.41 | 0.72 | 0.60 | 0.86 |
| Thailand | .26 | .62 | .29 | .65 |
| Egypt | .20 | .71 | .34 | .68 |
| Sudan | .30 | .74 | .33 | .84 |
| Indonesia | .55 | .88 | .61 | .98 |
| Brazil | .28 | .83 | .47 | .83 |
| Bangladesh | .40 | 1.06 | .40 | 1.06 |
| Phillippines | -- | -- | .32 | .66 |
| India, North Arcot | -- | -- | .41 | .87 |

-- = Not available.

Note: Low income is defined as the average income of families that consume 1,750-2,000 calories per capita per day.

Sources: (1,15,20,32).

The Effect of Relative Prices

The magnitudes of the income and price elasticities (in absolute values) among commodities and population groups are usually positively correlated. Both income and price elasticities (in absolute values) usually fall when incomes increase. While there is a direct relationship between the income effect of a price change, income elasticity, and the budget share, it also appears that the substitution effect decreases with increasing income, thus reinforcing the negative correlation between income level and the absolute value of the price elasticity (1, 28). There are two important implications of this finding. First, food price subsidies are less effective than expected in increasing calorie consumption, and second, the poor are more able and willing to cope with increasing food prices by substituting lower priced calories.

The variation of direct price elasticities among income strata and food commodities is illustrated in table 11. Large demand adjustments are made by the poor in response to price changes for rice, bread, beef, and milk, while the price elasticity for many foods is not significantly different from zero among the richest 20 percent of the population. This implies that price subsidies for unlimited quantities targeted to the poor are likely to result in relatively large demand increases for the subsidized commodities, even if they are financed by excise taxes on these commodities for the rich.

As mentioned above, consumers--particularly urban middle- and upper-income ones--in many developing countries view wheat bread as a preferred commodity. This is reflected in high-income and price elasticities. The natural environment is not well suited for wheat production in many of these countries. Price subsidies for wheat are common in many of these countries. The results are: 1) low prices for wheat bread relative to both international wheat prices and domestic prices of other staples (table 12), 2) rapidly increasing demand for wheat bread and associated increases in wheat import, and 3) a weakening of the demand for competing commodities.

This point is illustrated for Brazil in figure 1. Heavy and increasing consumer subsidies on wheat resulted in large reductions in the price of wheat relative to rice and bean prices, associated rapid increases in wheat consumption and imports, stagnation in the demand for rice and beans, and a reduction in the demand for roots and tubers. Similarly, heavy price subsidies for wheat bread and flour in Egypt resulted in dramatic increases in the consumption of wheat flour in rural areas and wheat bread in urban areas during the sixties and seventies (table 13). Tables 14 and 15 attempt to generalize this finding to a larger number of

Table 11--Own-price elasticities for calories from different foods by income group, Brazil, 1974/75

| Food group | Income group | | |
|----------------|--------------------|--------------------|--------------------|
| | Lowest 30 percent | Middle 50 percent | Highest 20 percent |
| Cereals | -0.804 (.254) | -0.173 (.142) | 1/ 0.163 (.205) |
| Rice | -4.31 (.482) | -2.95 (.352) | -1.15 (.243) |
| Maize | -1.77 (.198) | -1.09 (.130) | -.584 (.141) |
| Wheat bread | -1.96 (.197) | -.845 (.171) | -.731 (.181) |
| Roots | -1.36 (.187) | -.758 (.197) | 1/ -.231 (.179) |
| Cassava flour | -1.26 (.580) | -1.05a (.606) | 1/ -.319 (.772) |
| Sugar | -1.39 (.257) | -.962 (.202) | -.588 (.167) |
| Legumes | -.600 (.236) | -.457 (.176) | -.628 (.250) |
| Vegetables | 1/ -.410 (.339) | 1/ -.234 (.183) | 1/ -.267 (.173) |
| Fruits | -.895 (.409) | -.566 (.210) | -.378 (.168) |
| Meat and Fish | -.553 (.228) | 1/ -.140 (.130) | 1/ -.108 (.160) |
| Beef | -2.35 (.195) | -1.29 (.215) | -.819 (.209) |
| Dairy products | 1/ -.270 (.398) | -.636 (.269) | -.845 (.295) |
| Milk | -2.87 (1.00) | 1/ -.095 (.651) | 1/ -.468 (.518) |
| Eggs | -(.770) (.322) | -.451 (.163) | 1/ -.124 (.178) |
| Oils and fats | 1/ -.337 (.604) | 1/ .375 (.388) | 1/ .356 (.494) |

Note: Numbers in parentheses are standard errors.

1/ This is not significantly different from zero at the 0.05 level, using a one-tailed test.

Sources: (32).

countries for the period 1970-80. The relationships between the change in real bread prices and the relative bread/rice price and net wheat import, is striking.

The principle implication for foreign trade and production is that price policy may cause very severe changes in consumption patterns and, thus, the composition of demand.

The Effect of Urbanization

The population growth rate in urban areas is very high in virtually all developing countries. It is expected that the proportion of the population of developing countries living in urban areas will increase from 30.8 percent in 1980 to about 43.8 percent by year 2000 (table 16). As illustrated in tables 17-18, urban and rural consumption patterns differ very significantly. Data for Tunisia show some of the differences commonly found in developing countries. The share of the diet coming from coarse grains and roots and tubers is generally much higher in

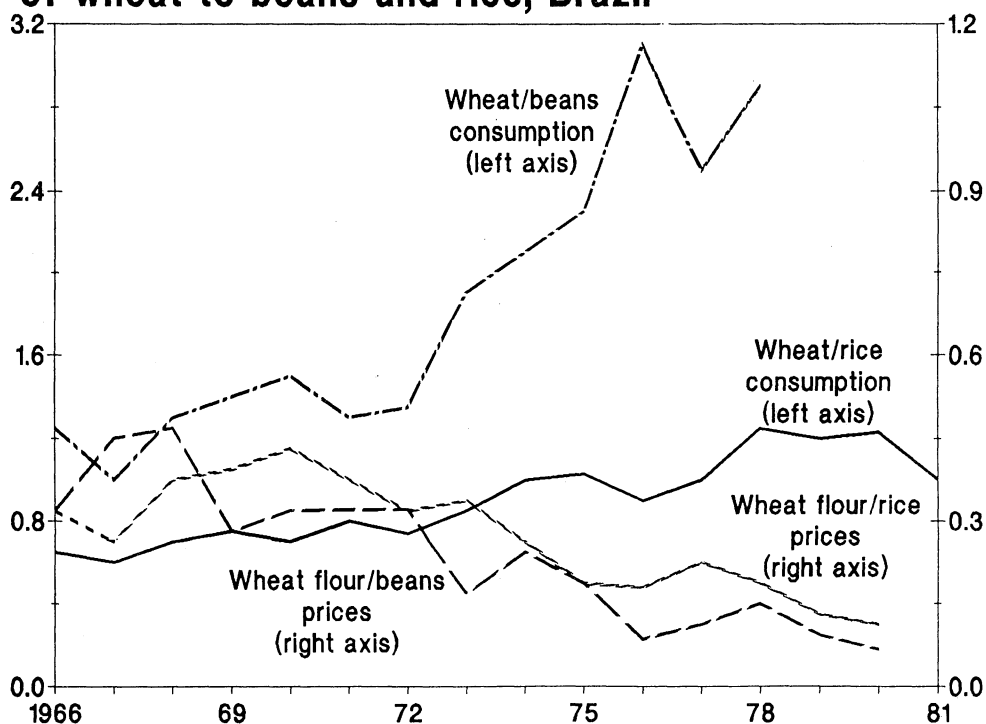
Table 12--Consumer prices of bread and rice in selected developing countries, 1980

| Country | Bread price | Rice price | Price ratio bread/rice |
|---------------------------------|-------------|------------|------------------------|
| <u>US\$ per kilogram</u> | | | |
| With bread subsidies: | | | |
| Egypt | 0.09 | 0.20 | 0.45 |
| Iraq | .20 | .64 | .29 |
| Syria | .22 | -- | -- |
| Morocco | .25 | -- | -- |
| Sri Lanka | .26 | .29 | .89 |
| Turkey | .30 | 1.28 | .23 |
| Mexico | .31 | 1.00 | .31 |
| Poland | .31 | -- | -- |
| Israel | .31 | .92 | .33 |
| India | .39 | .24 | 1.63 |
| Brazil | .39 | .66 | .54 |
| Sudan | .40 | 2.25 | .18 |
| Pakistan | .45 | .56 | .80 |
| Cuba | .46 | .61 | .46 |
| Bolivia | .47 | 1.01 | .46 |
| Ivory Coast | .57 | .47 | 1.21 |
| Without bread subsidies: | | | |
| Zambia | .65 | .68 | .96 |
| Tanzania | .72 | 1.47 | .49 |
| Panama | .82 | .55 | 1.49 |
| Hong Kong | .85 | .66 | 1.28 |
| Burma | 1.06 | .31 | 3.36 |
| Costa Rica | 1.11 | .49 | 2.26 |
| Cameroon | 1.13 | .70 | 1.60 |
| Korea | 1.14 | 1.11 | 1.03 |
| Philippines | 1.16 | .34 | 3.41 |
| Liberia | 1.18 | .62 | 1.90 |
| Rwanda | 1.83 | .89 | 2.06 |

-- = Not available.

Source: (5).

Figure 1
Ratios of per capita consumption and retail prices of wheat to beans and rice, Brazil



rural than urban areas, while the opposite is true for wheat (and rice in some countries), vegetables, meat, oils and fats, and dairy products. Thus, increasing urbanization contributes to increasing demand for the latter, while the demand for the former is expected to be adversely affected.

One of the key questions is whether the difference between urban and rural consumption patterns can be explained by differences in incomes and relative prices. While the answer is likely to vary among countries and population groups, it appears that incomes and relative prices generally explain only part of the difference. Other factors that appear to be important are differences in: 1) the opportunity cost of women's time, 2) the cost of other basic needs, such as housing, and 3) the demonstration effects. This is an area where additional research on household behavior is likely to contribute to our ability to predict future commodity demand.

Table 13--Per capita food consumption in urban and rural Egypt

| Food group | Rural areas | | | | Urban areas | | | |
|--------------------------------------|-----------------------------|---------|---------|---------|-------------|---------|---------|---------|
| | 1958/59 | 1964/65 | 1974/75 | 1981/82 | 1958/59 | 1964/65 | 1974/75 | 1981/82 |
| | <u>Kilograms per capita</u> | | | | | | | |
| Wheat grain | 69.7 | 69.9 | 59.5 | 43.7 | 13.1 | 12.3 | 7.7 | 4.6 |
| Maize | 75.9 | 66.8 | 45.2 | 47.5 | 12.5 | 13.5 | 5.8 | 5.0 |
| Rice | 23.8 | 24.6 | 21.1 | 33.4 | 19.5 | 21.2 | 25.0 | 26.2 |
| Wheat flour | 16.1 | 22.5 | 40.7 | 143.0 | 33.4 | 8.0 | 25.4 | 44.5 |
| Bread ^{1/} | 6.0 | 14.6 | 18.8 | 20.4 | 96.7 | 115.8 | 137.9 | 170.7 |
| Beans | 5.3 | 6.9 | 4.5 | 4.0 | 4.0 | 4.6 | 4.3 | 2.3 |
| Lentils | 3.2 | 4.5 | 3.1 | 3.6 | 3.3 | 4.2 | 4.1 | 1.8 |
| Meat, poultry, and fish | 12.5 | 13.2 | 13.6 | 30.5 | 19.4 | 19.9 | 19.0 | 35.3 |
| Vegetables, oils, fats ^{2/} | 2.7 | 5.0 | 7.8 | 5.8 | 6.6 | 8.7 | 8.1 | 7.9 |
| Sugar | 10.0 | 11.6 | 13.4 | 23.5 | 11.4 | 12.2 | 13.0 | 25.1 |

^{1/} Bread is approximately 30-percent moisture by weight.

^{2/} 1981/82 oil only.

Source: (2).

Table 14--Changes in real price of bread and net wheat imports in selected developing countries

| Annual average change in real price of bread, 1970.80 | Country | Average rise in net wheat imports from 1961-65 to 1979-81 |
|---|---|---|
| <u>Percent</u> | | <u>Kilograms per capita</u> |
| -11. to -3.1 | Algeria, Bolivia, Brazil, Dominican Republic, Egypt, El Salvador, Ethiopia, Ghana, Iran, Guatemala Iraq, Jordan, Kenya, Mexico, Tanzania, Zaire | 28 |
| -3. to -.1 | Burundi, Cameroon, Ecuador, India, Libya, Malawi, Morocco, Pakistan, Panama, Paraguay, Somalia Sudan, Tunisia | 21 |
| 0 to 4.9 | Chile, Colombia, Costa Rica, Hong Kong, Ivory Coast, Korea (Republic), Lesotho, Singapore, Thailand, Turkey Upper Volta, Uruguay, Venezuela, Zambia | 13 |
| 5 or more | Argentina, Bangladesh, Indonesia, Malaysia, Peru, Philippines, Senegal, Sri Lanka | 6 |

Source: (5).

The nature of the difference in urban and rural consumption patterns varies with income level. In general, the difference is more pronounced among the poor than the rich (table 18). For example, in Indonesia, the urban poor consumed three times the rice and only one-half the sugar consumed by rural poor, while the urban and rural rich do not show much difference in the quantity consumed of each of these two commodities. The relative importance of a given commodity, such as cereals in Brazil, to urban versus rural consumers may be reversed between the poor and the rich (table 18).

Table 15--Relative prices of bread and wheat imports in selected developing countries

| Ratio of price of bread to price of rice in 1980 | Country | Average rise in wheat imports from 1961-65 to 1979-81 |
|--|--|---|
| | | <u>Kilograms per capita</u> |
| 0.00 to 0.49 | Boliva, Egypt, Iraq, Mexico, Sudan, Tanzania, Turkey | 25 |
| 0.50 to 1.49 | Brazil, Hong Kong, Ivory Coast, Korea, Pakistan, Panama, Sri Lanka, Zambia | 10 |
| 1.50 or more | Burma, Cameroon, Costa Rica, Liberia, Philippines, Rwanda | 3 |

Source: (5).

Table 16--Percentage of population living in urban areas

| Region | 1960 | 1980 | 2000 |
|----------------------|------|------|----------------|
| | | | <u>Percent</u> |
| World | 33.9 | 41.1 | 51.2 |
| Developed countries | 60.2 | 71.3 | 79.4 |
| Developing countries | 22.0 | 30.8 | 43.8 |
| Africa | 18.4 | 28.9 | 42.4 |
| East Asia | 19.3 | 27.8 | 41.4 |
| South Asia | 18.4 | 24.8 | 37.1 |
| Latin America | 49.1 | 65.4 | 75.7 |

Source: (11).

Table 17--Food consumption patterns in rural and urban areas of Tunisia and Brazil

| Food group | Tunisia (1975) | | | Southern Brazil (1974/75) | | |
|-----------------------|----------------|-------------|--------------|---------------------------|-------------|------------------------------------|
| | Rural areas | Urban areas | Major cities | Rural areas | Urban areas | Major cities |
| | | | | | | <u>Calories per person per day</u> |
| Cereals | 1,662 | 1,307 | 1,129 | 1,057 | 910 | 897 |
| Trad. staples | 1,250 | 498 | 222 | 637 | 405 | 431 |
| Bread and wheat flour | 246 | 607 | 764 | 405 | 426 | 434 |
| Roots and tubers | 24 | 40 | 40 | 183 | 101 | 75 |
| Vegetables | 62 | 87 | 80 | 21 | 23 | 28 |
| Fruits | 34 | 34 | 35 | 33 | 39 | 46 |
| Meat | 42 | 63 | 90 | 178 | 214 | 227 |
| Fish | 3 | 11 | 14 | 8 | 12 | 8 |
| Milk | 68 | 50 | 108 | 139 | 120 | 152 |
| Oils and fats | 400 | 447 | 431 | 252 | 307 | 328 |

Source: (12).

The above findings may imply that the urban-rural differences are due primarily to resource constraints. Another interpretation may be that higher mobility of the rural rich and frequent interaction with urban areas make their consumption behavior less dependent on where they reside. Irrespective of the interpretation, however, the findings further amplify the need for income-specific analyses of changes in consumption patterns to derive better estimates of the impact of commodity-specific policies on the composition of demand.

Demand for Feed Grains

Rapidly increasing demand for feed grains is likely to be the most important source of change in future demand patterns in developing countries. Although still at a low level in many

Table 18--Rural and urban consumption patterns for poor and rich in selected countries

| Country and commodity | Poor | | Rich | |
|----------------------------------|-------|-------|-------|-------|
| | Urban | Rural | Urban | Rural |
| <u>Percent of total calories</u> | | | | |
| Brazil: | | | | |
| Cereals | 34.7 | 27.9 | 34.8 | 37.0 |
| Rice | 19.6 | 15.1 | 16.8 | 17.9 |
| Maize | 3.3 | 8.3 | 1.2 | 5.4 |
| Wheat | 8.3 | 1.9 | 10.7 | 3.3 |
| Root crops | 16.9 | 24.6 | 3.8 | 8.3 |
| Sugar | 13.5 | 11.9 | 13.3 | 12.4 |
| Vegetables | .6 | .5 | 1.5 | .9 |
| Fruits | 1.3 | 1.0 | 3.2 | 2.0 |
| Meat and fish | 8.1 | 6.5 | 11.5 | 9.5 |
| Dairy products | 2.9 | 2.8 | 8.9 | 8.0 |
| Oil and fats | 9.0 | 5.2 | 14.8 | 11.9 |
| Thailand: | | | | |
| Cereals | 80.7 | 93.4 | 55.9 | 67.9 |
| Rice | 70.0 | 91.2 | 44.0 | 56.1 |
| Meat and fish | 7.0 | 3.7 | 14.5 | 11.8 |
| Dairy and eggs | 1.5 | .2 | 3.9 | 2.9 |
| Oils and fats | 3.0 | .6 | 5.2 | 4.6 |
| Fruits and nuts | .6 | .1 | 4.1 | 3.1 |
| Vegetables | 1.9 | 1.0 | 4.1 | 3.1 |
| Sugar | 2.6 | .8 | 3.8 | 3.7 |
| <u>Kg per capita per month</u> | | | | |
| Indonesia: | | | | |
| Rice | .8 | .5 | 2.2 | 3.3 |
| Cassava | .07 | .5 | .1 | .8 |
| Sugar | .1 | .4 | 3.6 | 23.4 |
| Vegetables | .2 | .2 | .9 | 4.9 |
| Beef and Buffalo meat | 0 | .001 | .1 | .6 |
| Mutton and Lamb | 0 | .007 | .1 | |
| Pork | 0 | .001 | .02 | .07 |
| Poultry | 0 | 0 | .2 | .1 |
| Pakistan: | | | | |
| Wheat | 9.9 | 12.2 | 9.2 | 17.1 |
| Rice | .7 | .8 | 1.7 | 1.7 |
| Potatoes | .9 | .7 | .9 | 102.0 |
| Sugar | .8 | .3 | 1.4 | 1.6 |
| Beef | .5 | .2 | .5 | .7 |
| Mutton | .06 | .03 | .9 | .5 |
| Poultry | 0 | .02 | .3 | .2 |

Sources: (25,32).

developing countries, large income elasticities (table 19) signify large future increases in demand, particularly in higher income developing countries and centrally planned economies with large economic growth. For developing countries as a whole, Paulino projects that feed grain consumption will grow at an annual rate of 4.6 percent, compared with 2.1 percent for food grain (table 20) (11). The rate of growth in feed grain consumption is expected to be largest in North Africa and the Middle East, while the projected rate of growth in food grain consumption is highest in Sub-Saharan Africa.

The differential growth rates will result in a rapidly increasing importance of feed as a source of grain use. It is projected that feed will account for about one-fourth of all cereals consumed in the developing countries by year 2000, up from 16 percent in 1980. This is a dramatic increase that is likely to put a very significant burden on the supply capacity in higher income developing countries. If domestic supply is unable to keep up, rapid increases in import demand are likely to occur. Such increases have already occurred for many of the high-income developing countries in the Middle East and elsewhere.

As illustrated by the high-income elasticities of demand, the rate of growth in feed grain is strongly correlated with income growth (table 21). The demand for feed grain is derived from the demand for livestock products. Substitutions among types of livestock toward poultry and pig meat tend to amplify the importance of grain relative to other feeds and, thus, further increase feed grain demands. It may be expected that efforts to increase yields in dairy production and expand herd and flock sizes of pig and poultry production units will result in

Table 19--Income elasticities of demand for cereals used for food and feed 1/

| Region | Countries | Total demand 2/ | Food | Feed |
|----------------------|-----------|-----------------|------|------|
| Developing economies | 90 | 0.20 | 0.14 | 0.74 |
| Africa | 37 | -.11 | .00 | .94 |
| Latin America | 24 | .36 | .18 | .74 |
| Near East | 14 | .26 | .17 | .39 |
| Asia and Far East | 15 | .17 | .20 | 1.32 |
| Developed economies | 34 | .35 | -.06 | .53 |
| Market | 26 | .17 | .03 | .14 |
| Centrally planned | 8 | .37 | -.12 | .77 |

1/ Income elasticities have been estimated from the equation $e = [(I) - N]/y$, where the numerator is the annual rate of growth in per capita demand and y is the per capita GDP growth rate.

2/ Total demand also includes residual uses such as industrial, seed, and waste.

Source: (33)

Table 20--Growth in cereal consumption for food and feed grains

| Region | Average annual growth rate | | | | Share of total for feed | | |
|------------------------------|----------------------------|-----------|---------|-----------|-------------------------|------|------|
| | Food | | Feed | | 1966-70 | 1980 | 2000 |
| | 1966-80 | 1980-2000 | 1966-80 | 1980-2000 | | | |
| | Percent | | | | | | |
| Developing economies | 3.1 | 2.1 | 4.6 | 4.6 | 14.0 | 16.0 | 23.0 |
| Asia | 3.0 | 1.9 | 4.2 | 4.4 | 11.0 | 12.0 | 17.0 |
| North Africa and Middle East | 3.6 | 2.5 | 4.8 | 6.1 | 24.0 | 26.0 | 39.0 |
| Sub-Saharan Africa | 2.6 | 3.5 | 3.1 | 5.5 | 6.0 | 6.0 | 9.0 |
| Latin America | 3.3 | 2.3 | 5.0 | 4.0 | 34.0 | 40.0 | 47.0 |

Source: (18).

an increasing dependence on grains. On the other hand, research, breeding, selection, and improved management practices are likely to increase feed efficiency. The net result is likely to be rapidly increasing feed grain demands in countries with high rates of growth in incomes and livestock production.

To further analyze the development of feed grain demands in high-income developing countries with high rates of economic growth, data for 1961-85 were analyzed for Brazil, Korea, Philippines, and Taiwan. The growth in feed grain demand in response to income growth is impressive and much larger than growth in food grain demand for all four countries (figs. 2-5).

In addition to providing a visual image of the relationship, attempts were made to statistically test the hypothesis advanced by Mellor and Johnston that at some income level, rapidly increasing demand for feed will result in an inflection point in the Engel curve (total consumption function) for cereals (16). The statistical approaches used were inappropriate for such testing and lack of time did not permit more appropriate approaches to be applied. Instead, as a first approximation, "free-hand" curves were drawn (figs. 2-5). Based on this approach, it appears that rapid increases in feed grain demand result in increasing marginal propensities to consume cereals at some income level. Formal statistical testing is needed to determine whether an inflection point is present in the consumption functions for Brazil, Korea, and Taiwan. However, the graphs shown in figures 2-5 clearly illustrate the potential magnitude of the increase in cereals demand in response to income growth in higher income developing countries.

Table 21--Estimated annual growth rate in the consumption of feed and livestock products in 104 developing countries.

| Item | Countries | Percentage of population in 1977 | Growth rate | |
|-----------------------------------|-----------|----------------------------------|--------------------|------|
| | | | Livestock products | feed |
| <u>Percent</u> | | | | |
| Level of per capita income, 1980: | | | | |
| Less than \$250 | 32 | 52 | 2.43 | 2.62 |
| \$250-\$499 | 20 | 21 | 3.51 | 4.59 |
| \$500-\$1,249 | 29 | 13 | 3.99 | 5.82 |
| \$1,250 or more | 23 | 15 | 3.60 | 4.98 |
| Total | 104 | 100 | 3.36 | 4.63 |
| 1961-80 growth rate of-- | | | | |
| Per capita income | | | | |
| Less than 1.0 percent | 30 | 16 | 1.76 | 2.73 |
| 1.-2.9 percent | 36 | 49 | 3.02 | 4.02 |
| 3.-4.9 percent | 20 | 13 | 3.47 | 4.56 |
| 5. percent or more | 8 | 22 | 4.91 | 6.02 |
| Total | 104 | 100 | 3.36 | 4.63 |
| Livestock output: | | | | |
| Less than 1.0 percent | 13 | 5 | -0.01 | 0.83 |
| 1. - 2.9 percent | 23 | 15 | 1.81 | 3.16 |
| 3. - 4.9 percent | 44 | 62 | 3.68 | 4.09 |
| 5. percent or more | 24 | 18 | 5.92 | 7.74 |
| Total | 104 | 100 | 3.36 | 4.63 |

Source: (22)

Figure 2
Annual per capita cereal consumption and per capita real GNP (1970 cruzeiros), Brazil, 1961-85

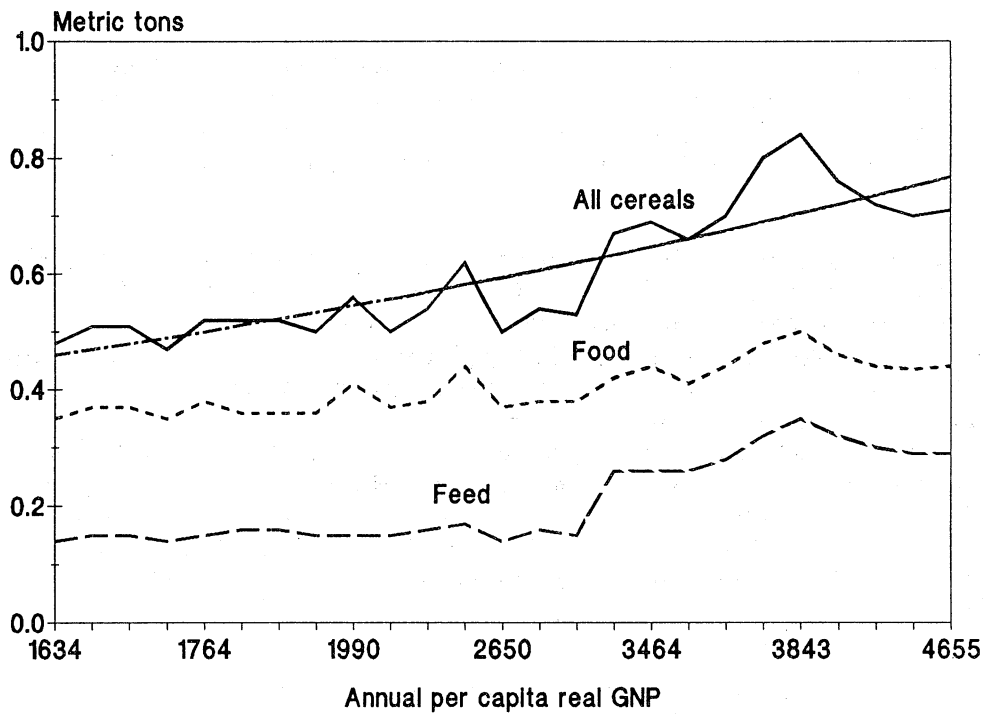


Figure 3
Annual per capita cereal consumption and real GNP 1000's (1975 won), Korea, 1961-85

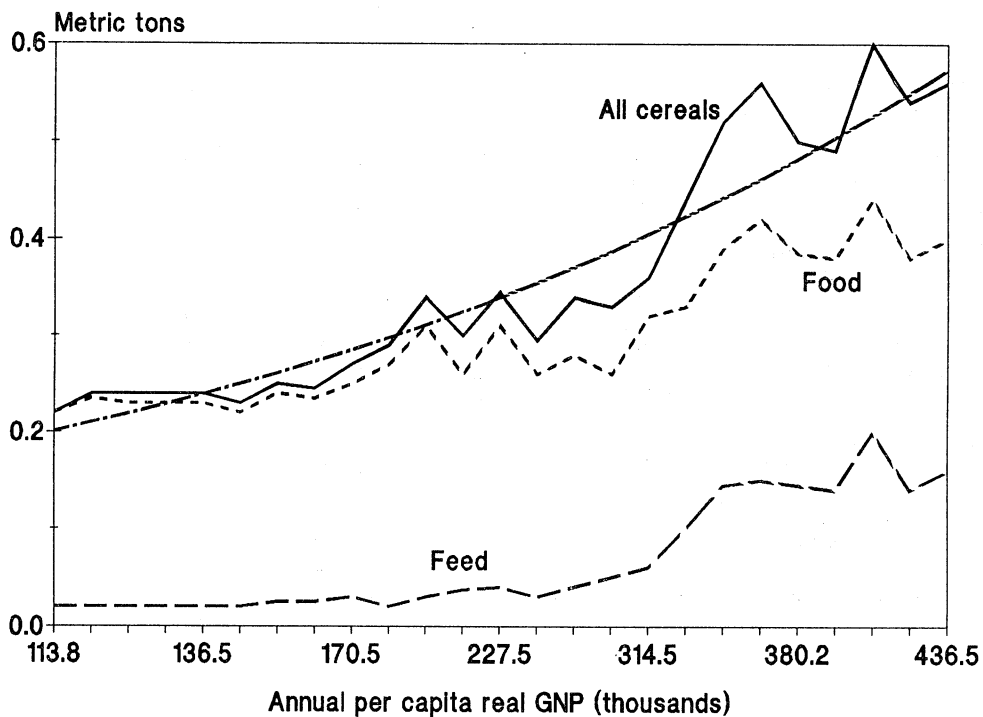


Figure 4
Annual per capita cereal consumption and per capita real GNP (1972 pesos), Philippines, 1961-85

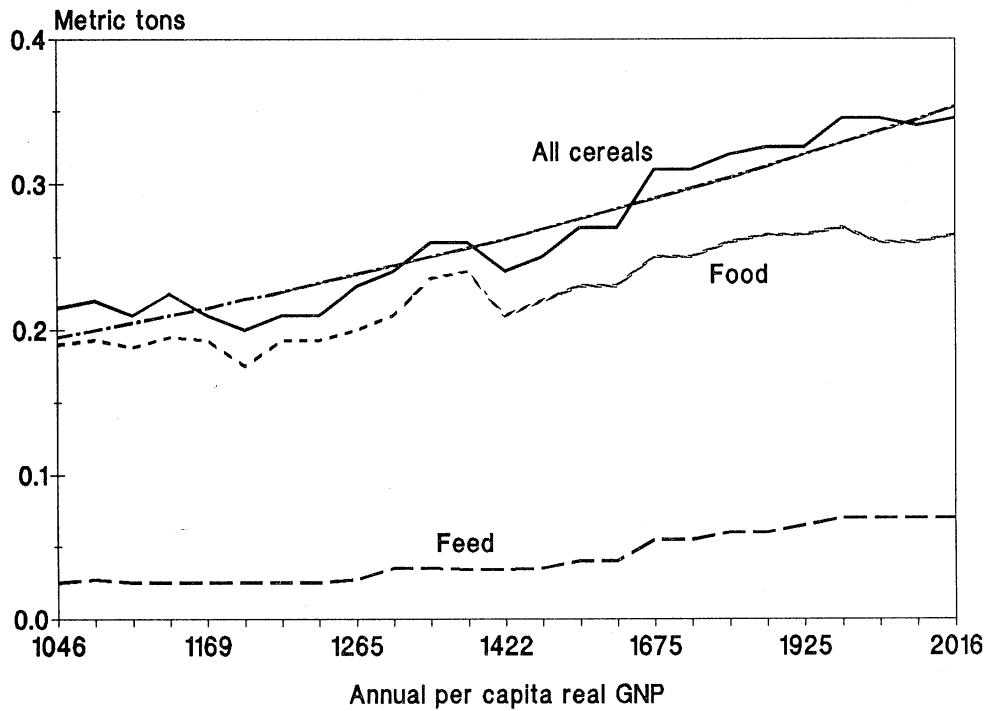
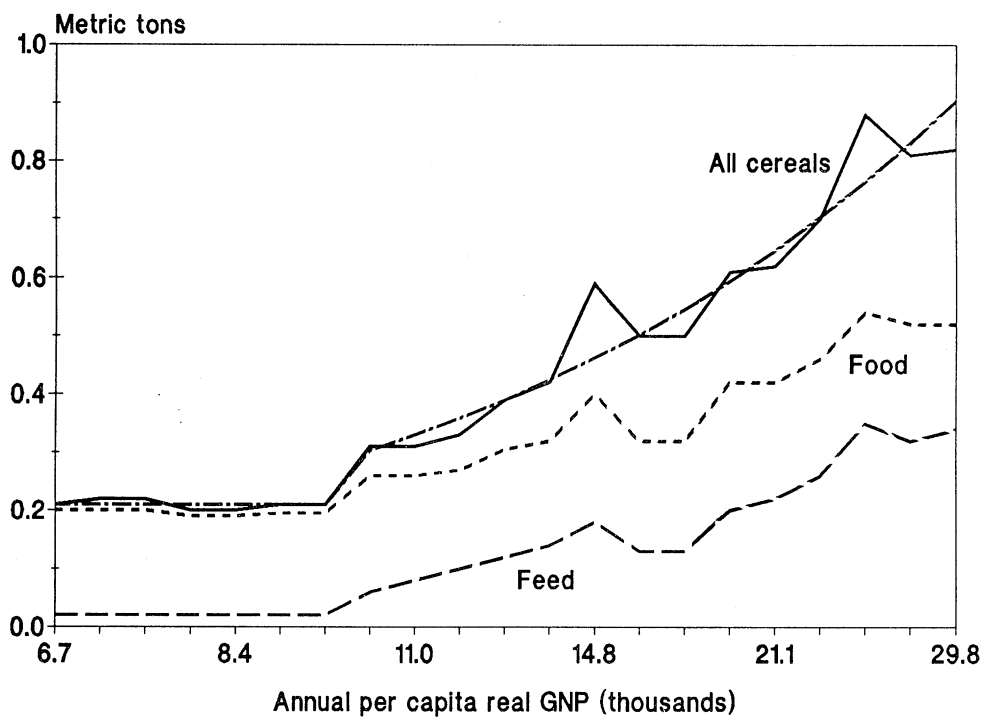


Figure 5
Annual per capita cereal consumption and real GNP (1976 new dollars), Taiwan, 1961-82



Substitution Among Food Grains In Africa

We are currently witnessing a widespread and rapid rate of substitution among cereals in the African diet. A continuation will result in very significant changes in the composition of cereals demand and corresponding repercussions for production and foreign trade. Table 22 illustrates these changes in the consumption pattern for Africa. As a general rule, rice and wheat consumption increases at a rapid rate, while the consumption of coarse grains and roots and tubers--the traditional staples in Africa--decreases. The importance of rice in the diet increased from 6 to 9 percent (a 50-percent increase) in less than 20 years, while sorghum dropped from 16 to 12 percent. Annual growth rates in west Africa were about -2 percent for sorghum and millet, close to zero for maize, and 5 and 8 percent for rice and wheat, respectively. The rates of growth for rice and wheat in Nigeria (the most important economy of the region) were about 11 and 15 percent, respectively, double the region's growth rates (table 23). Rice and wheat are now responsible for more than 25 percent of total cereal food consumed in west Africa, compared with 14 percent 20 years ago (table 24). However, west Africa only accounts for 8 percent of cereal production.

The natural environments in most west African countries are not favorable for the production of wheat and rice. Virtually all the wheat and a large share of the increase in rice consumption are imported. Although efforts to expand rice production through irrigation and other technological change could accelerate its growth rate, the costs involved in expanding rice production at the rate of the current consumption increase are likely to be extremely high. Import requirements are likely to continue to increase. Whether they will be converted to effective import demand will depend on the foreign exchange situation, but it is likely that a large part of the import requirements will have to continue to be met by food aid.

Four factors are expected to be of principal importance in determining future demand patterns for cereals in west Africa: 1) income changes, 2) relative prices, 3) rate of urbanization, and 4) opportunity costs of women's time. As shown in table 25, income elasticities for rice and wheat are close to 1 for the Sahel, between 0.65 and 0.87 for west Africa, and 0.1 for millet in both areas. Thus, it is very clear that income increases are associated with large increases in the demand for rice and wheat but only very small increases in the demand for millet.

Income growth in most of west Africa is not expected to be large over the next decade. Relative prices appear to have changed in favor of rice and wheat during the past 10 years, although not for all countries in the region (table 26 and fig. 6). Reliable direct and cross-price elasticities for food grains are not available for west Africa, but in view of the large income elasticities, they may be expected to be large. The effect of the other two factors--urbanization and changes in the opportunity cost of women's time--is unknown. Research aimed at the estimation of the effects of each of the four, and possibly other, factors on the demand for the various cereals is urgently needed.

Summary of Implication for Future Production and Trade

Data presented in this paper confirm the strong relationship between consumption patterns and incomes both at the national and household level. Therefore, the implications of income growth for demand and trade depend heavily on the distribution of the growth among income strata within a country and among countries with different income levels. During the past 10 years, the difference in the consumption patterns of low- and high-income developing countries has increased, and average figures for developing countries are becoming less useful for the projection of future demand patterns.

This issue is particularly pronounced in the future demand for livestock products and feed grains. Most developing countries are still experiencing relatively large demand increases for staple food. High-income developing countries, however, are rapidly reaching a situation of

low growth in staple food demand but rapidly growing feed grain demand. Continued rapid income growth in these countries is likely to result in strong increases in cereal demand. A large share of the new demand will probably be met by imports and international cereal prices are likely to be affected, although probably not to the extent that the current downward trend in real cereal prices will be halted. Much will depend on future cereal production in USSR, which is in a phase of rapidly increasing consumption of livestock products and feed grains.

Table 22--Consumption of staple foods in Africa

| Commodity | 1961/65 | 1978/82 |
|-----------|----------------|---------|
| | <u>Percent</u> | |
| Rice | 6 | 9 |
| Sorghum | 16 | 12 |
| Maize | 18 | 19 |
| Cassava | 20 | 19 |

Source: (18).

Table 23--Annual growth rates in the production and consumption per capita of major cereals in West Africa and Nigeria

| Cereal | West Africa, 1961/65-1979/83 | | Nigeria, 1961/65-1976/80 | |
|---------|---------------------------------|-------------|-----------------------------|-------------|
| | Production | Consumption | Production | Consumption |
| | <u>Percent</u> | | | |
| Millet | -2.2 | -1.7 | -2.0 | 1.9 |
| Sorghum | -3.3 | -2.3 | -3.7 | -1.4 |
| Maize | -.8 | .4 | -.6 | 1.9 |
| Rice | 2.4 | 4.5 | 3.2 | 10.7 |
| Wheat | -- | 7.7 | -- | 14.7 |

-- = Not available.

Sources: (8,9,10).

Table 24--Share of rice and wheat in total cereal consumption and production, Sahel and West Africa

| Country | Share of consumption | | Share of production, 1979-83 |
|--------------|-------------------------|---------|------------------------------------|
| | 1961-65 | 1979-83 | |
| | <u>Percent</u> | | |
| Burkina Faso | 4 | 7 | 2 |
| Cape Verde | 16 | 40 | 0 |
| Chad | 4 | 11 | 6 |
| Gambia | 44 | 57 | 35 |
| Mali | 12 | 20 | 11 |
| Mauritania | 18 | 66 | 21 |
| Niger | 2 | 9 | 2 |
| Senegal | 45 | 52 | 12 |
| Sahel | 13 | 22 | 6 |
| West Africa | 14 | 24 | 8 |

Source: (10).

High-income developing countries that choose to restrict cereal imports may be faced with real price increases. The implications may be severe for low-income consumers who spend a large share of their budget on cereals for direct consumption. The competition between poor cereal consumers and rich consumers of grain-fed livestock may become an important policy issue.

Price elasticities for most foods are relatively high among the poor. This implies that price policy may be effective in altering consumption patterns among that group. Since low-income households frequently consume close to the subsistence level, price policy for food should be handled with extreme care to avoid severe hardships among consumers. On the other hand, the ability of the poor to cope with increases in the price of individual foods appears to be greater than previously believed, as reflected in relatively high substitution effects of price changes.

Table 25--Income elasticities of demand for millet, maize, rice, and wheat in the Sahel and West Africa ^{1/}

| Crop | Sahel | West Africa |
|--------|-------|-------------|
| Millet | 0.15 | 0.09 |
| Maize | .46 | .15 |
| Rice | .93 | .65 |
| Wheat | .92 | .87 |

^{1/} Estimated from annual time-series data, 1965-79.
Source: (11).

Table 26--Ratio of wheat to coarse grains prices in major urban markets in Francophone West Africa, 1969-83 (5-year averages of annual ratios of per kilogram prices)

| Year | Ratio of world prices of wheat and sorghum ^{1/} | Bread to-- | | |
|--|--|--|---|-------------------------------------|
| | | Maize ratio, Ivory Coast ^{2/} | Sorghum ratio, Burkino Faso ^{3/} | Millet ratio, Senegal ^{4/} |
| 1969-73 | 1.20 | 2.86 | 1.92 | 0.84 |
| 1974-78 | 1.26 | 2.03 | 1.75 | 1.66 |
| 1979-83 | 1.25 | 1.55 | 1.33 | 1.74 |
| Average annual percentage change ^{5/} | .4 | -6.0 | -3.6 | +7.6 |

^{1/} World prices are for U.S. No. 1 Soft Red Winter wheat to U.S. No. 2 Yellow milo, f.o.b. gulf ports from World Bank, "Commodity Trade and Price Trends," 1983/84 edition.

^{2/} Averages from Treichville and Adjame markets, from France, Ministère des Relations Exterieures (1983). Data from 1974 and 1975 are missing.

^{3/} Averages from Ouagadougou Markets from Haggblade (1984). Data from 1969 to 1971, 1982, and 1983 are missing.

^{4/} Averages from Dakar Markets from Jammeh (1984).

^{5/} Annual percentage change between 5-year averages based on a 10-year interval between midpoints.

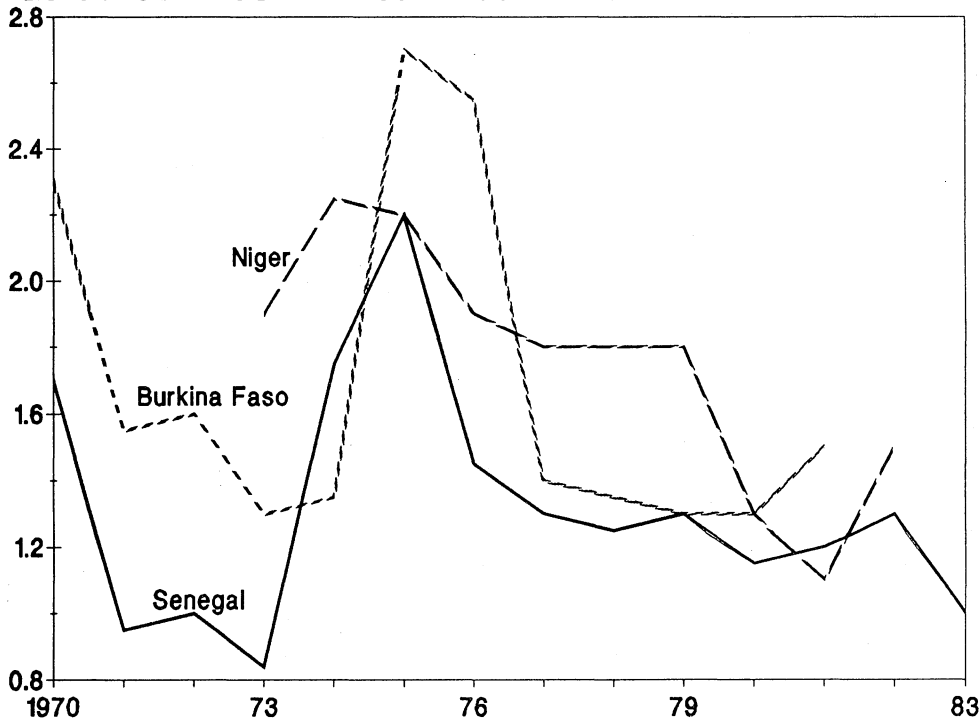
Source: (8).

Rapid substitution of wheat and rice for sorghum, millet, and maize in parts of Africa is a topic that deserves serious attention. More research is urgently needed to explain the relative contribution of changes in incomes, relative prices, urbanization, opportunity costs of women's time, and other factors, in order to assist in the design of appropriate policies. A continuation of the current rate of substitution is likely to have very serious implications for import demand. As long as increased demand is met by concessional imports, foreign exchange implications may not be severe. Pending more research, the effect of reduced imports and higher prices for wheat and rice on domestic demand and real incomes of the poor is unclear, not to mention the repercussions for political stability. It is possible that current developments are creating long-term structural changes in the consumption patterns, which will not be easily reversed in response to changes in relative prices. This also implies that the demand for sorghum, millet, and maize is unlikely to respond greatly to reduced prices brought about by domestic production expansions. An early indication of such a situation is presented by relatively large surpluses of maize in Malawi, Kenya, and Zimbabwe at prices below export parity and attempts to barter these surplus for imported wheat and rice.

If cereal substitution is at least in part irreversible, rather than merely a response to changes in relative prices, opportunities for changes in the production patterns should be explored.

Experience to date indicates that massive expansions of rice production in Africa, excluding those areas currently in rice, generally require very large investments. Furthermore, efforts to develop or adapt high-yielding rice varieties have not been very successful, and production costs are generally large. Although prospects may not be bright, further exploration is needed on this matter.

Figure 6
Ratios of rice to millet/sorghum retail prices,
selected West African countries



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