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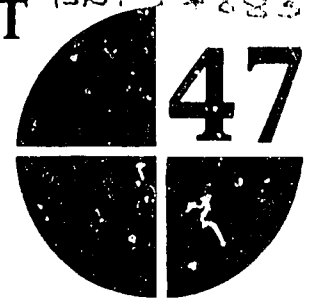

EVOLVING FOOD GAPS IN THE MIDDLE EAST/NORTH AFRICA: PROSPECTS AND POLICY IMPLICATIONS

Nabil Khaldi

December 1984

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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The International Food Policy Research Institute was established to identify and analyze alternative national and international strategies and policies for meeting food needs in the world, with particular emphasis on low-income countries and on the poorer groups in those countries. While the research effort is geared to the precise objective of contributing to the reduction of hunger and malnutrition, the factors involved are many and wide-ranging, requiring analysis of underlying processes and extending beyond a narrowly defined food sector. The Institute's research program reflects worldwide interaction with policymakers, administrators, and others concerned with increasing food production and with improving the equity of its distribution. Research results are published and distributed to officials and others concerned with national and international food and agricultural policy.

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FOREWORD

The International Food Policy Research Institute (IFPRI) is culminating several years of analysis of underlying trends in world food production, consumption, and trade. This work has been carried out as a basis for defining IFPRI's own research priorities, for increasing its awareness of the winds of change on the global food scene, for sharpening its ability to utilize the wealth of data from FAO, and for helping to service its sister institutions in the Consultative Group on International Agricultural Research. The work, which is now reaching completion, includes a soon-to-be-published overview on developing-country trends; this work on the Middle East/North Africa; smaller pieces published in compendia on Sub-Saharan Africa and Latin America; and an in-depth study of livestock and concentrate feed for livestock. These analyses have helped underline the massive trade flow in food from developed to developing countries and provided an explanation of this phenomenon in the shifting of food demand and supply relationships.

In the course of these studies the tendency for rapid growth of livestock production was noted, and more importantly, the tendency for concentrate feed use to grow even more rapidly than livestock consumption. These latter phenomena are particularly noteworthy in the Middle East/North Africa and are a major element in Nabil Khaldi's report. Khaldi notes the sharp distinctions between the oil-exporting countries, the labor-exporting countries, and the dominant agricultural producers in the region. He uses this distinction as a central basis of his analysis.

IFPRI's trends research has been based on the extremely rapid growth that took place during the 1970s. Thus food supply-demand relationships are analyzed in a highly dynamic environment. It is in those circumstances that policy choices enlarge, become complex, and require in-depth policy analysis. The extent to which the high growth rates of the 1970s are maintained in the future depends on oil prices and production and the effectiveness in engendering new growth of the huge investments that have been made in these economies. These investments should become an increasingly important force in future years. The effects of income growth on the demand for food could continue in the face of lower growth if the extraordinarily high savings of the past were to be reduced.

Khaldi's calculation of the accelerated growth in demand for livestock feed raises a particularly important question about the relative emphasis to be placed on coarse grain crops and the allocation of food production resources generally and research resources specifically.

John W. Mellor

Washington, D.C.
December 1984

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Finally, he wishes to thank the Commodities and Statistics Division of FAO for providing much of the data base.

1

SUMMARY

Spurred by the rapid rise in oil revenues and the surge in demand for food that has accompanied them, a widening gap between food supply and demand has led to huge increases in imports in the Middle East/North Africa since 1973. At the same time, changing food preferences have altered the composition of the foods consumed.

In this report the countries of the Middle East/North Africa region are divided into three groups: the oil-exporting countries, which include Algeria, Iran, Iraq, Kuwait, Libya, Oman, and Saudi Arabia; the labor-exporting countries, Egypt, Jordan, Lebanon, the People's Democratic Republic of Yemen, and the Yemen Arab Republic; and the major food-producing countries, Afghanistan, Cyprus, Morocco, the Sudan, Syria, Tunisia, and Turkey.

The oil-exporting countries have experienced the most dramatic increase in income, but by employing large numbers of workers from the labor-exporting countries, the effects of their increased income and demand have been passed on to the labor-exporting countries. In the food-producing countries, which have not gained from oil revenues directly, agriculture remains the major sector of their economies.

In the study, data for 1966-80 are examined and divided into two equal periods, 1966-73 and 1973-80, in order to analyze the trends. To compare average consumption, production, and trade before and after 1973, the periods 1966-70 and 1976-80 are used. Then projections of consumption and production of basic staples and the primary livestock products—meat, milk, and eggs—are made for the three groups of countries to 1990 and 2000. In addition to these trend projections, two scenarios, one with higher-than-expected and one with lower-than-expected income growth, are projected.

During the overall period 1966-80, consumption of staple foods in the region increased by 3.9 percent a year, but the annual average for the years after 1973 was greater, 4.8 percent. Annual growth of meat consumption jumped from 4.1 percent in 1966-73 to 6.8 percent in 1973-80.

Both consumption and population grew more rapidly in the oil-exporting countries. Because of its larger population, the major food-producing group still consumed the most food in absolute terms, but its share of the regional total declined. Although the infusion of income in the poverty-stricken labor-exporting countries fostered a rise in demand, the slowdown in population growth as a result of migration held the annual growth in the consumption of staples to 3.3 percent, compared with 5.5 percent for the oil exporters and 3.4 percent for the food producers. The demand for livestock products grew most rapidly in the oil-exporting countries, and the demand for staple foods for human consumption was as strong as the demand for meat in the labor-exporting countries.

On the production side, the performance of agriculture in the region as a whole has not kept pace with the increased demand. Because wheat is the preferred staple cereal for direct consumption, agricultural policy has concentrated on increasing wheat production more than any other food staple. In recent years, however, higher demand for primary livestock products has led to increased output, especially of poultry and eggs. This has greatly increased the demand for coarse grains to be used as feed for livestock. As a result, the gap between demand and supply of feedgrains is expected to widen to become the largest deficit by the year 2000.

Differences in the amounts of food the three groups of countries produce have become pronounced in recent years. For example, meat production increased 4.0 percent annually after 1973 in the region as a whole, but it rose by 5.5 percent in the oil-exporting countries, by 4.0 percent in the major food-producing countries, and by only 1.3 percent in the labor-exporting countries. By the year 2000 these differences may be even more marked.

Regional growth in production shifted from increases in area sown to increases in yield in the later period as land became scarcer. Even in the major food-producing countries, where area expansion was possible,

gains in wheat yields from applications of new technology overshadowed gains from area expansion.

As the food gap widened in the late 1970s, imports of basic staples rose 17 percent in the oil-exporting countries and 9 percent in the labor-exporting countries. Imports of meat rose by 22 percent in the oil-exporting countries and 11 percent in the labor-exporting countries. Exports of livestock products increased in the food-producing countries, but they were offset by even larger increases in imports.

To close the projected regional gap in basic staples of 52 million metric tons by 2000, staple food production would have to increase 4.7 percent annually, but its projected growth is only 2.7 percent a year. Of this amount, 48 million tons are for consumption in the oil- and labor-exporting countries. About 35 million tons of the 52-million ton deficit are expected to be in coarse grains. The region is also expected to face deficits of 5.6 million tons in meat, 25 million tons in milk, and 0.5 million tons in eggs. With the possible exception of the major food-producing countries, closing the gap with domestic production appears to be an unattainable goal.

A shift in crop emphasis, however, could narrow the gap considerably for the region as a whole. At present, coarse grain prices are low and labor costs are high, but new technology that is purported to raise yields of barley by at least 40 percent is now available. With this new technology, coarse grain production in the major food-producing countries might be increased by 16 million tons more than the trend projection by the year 2000, which would meet the projected demand in those countries. Eventual surpluses might lead to a widening of intra-regional trade and greater food security for all of the countries in the region.

2

INTRODUCTION

In the mid-1970s the Middle East/North Africa region had almost the lowest growth in the production of major food commodities among the developing economies (only exceeding that of Sub-Saharan Africa) and the highest growth in GNP per capita. Moreover, the region's per capita consumption of staples was the highest among the developing countries, and it was a close second to Latin America in per capita consumption of livestock products. The region comprised more than 11 percent of the Third World's population, and produced about 13 percent of its basic staple crops and 13-15 percent of the primary livestock products—meat, milk, and eggs.

Unlike other developing regions, however, the striking disparity of wealth that has recently evolved between the oil-exporting and the agriculturally dominated economies of the region has substantially altered the food situation. Much of the surge in food demand has been fueled by rising oil revenues, and these revenues have also induced higher rates of urbanization and labor migration, which have resulted in large capital transfers to the labor-exporting countries.

The new dynamics of demand are expected to greatly alter the patterns of domestic utilization of staple crops through the links between livestock and feed and the phenomenal growth in their consumption. These changes will not only make it less probable that the region will become self-sufficient in major food commodities, but they will deepen the food imbalance and affect production and trade policies in the region. Therefore, an objective of this study is to plan a new direction for policy, which by being more sensitive to the dynamics of demand may provide a more favorable composition of crop production to help alleviate the gap between the supply and demand of basic staples in the region and to widen intraregional trade.

This study is also designed to develop a regional and subregional perspective on current and future food deficits on the basis of the new dynamics of demand and to lay the groundwork for an in-depth examination of food policy options. Analyses of trends and projections are made for three intraregional groupings: the oil-exporting and the labor-exporting countries, which have been directly affected by rising oil revenues and their dissemination through worker remittances, and a third group—the major food-producing countries, which have gained little or no direct benefit from the oil boom. For them agriculture has remained an important source of income and employment. Figure 1 shows the location of the countries of the Middle East/North Africa.

The categories are not mutually exclusive. Although oil revenues dominate the economies of the oil-exporting countries, some, Iran and Iraq, for example, also have large agricultural sectors. The labor-exporting countries, which except for Egypt have neither large quantities of oil nor rich agricultural resources, nevertheless derive substantial national income and employment from agriculture, particularly Egypt and the Yemen Arab Republic. And although the economies of the labor-exporting countries have been affected more deeply by worker remittances, workers have also migrated from many of the food-producing countries to other countries, not only within the region but also to European countries. In this report, however, only the migration of labor to the oil-exporting countries and the intraregional transfer of income that this has precipitated are considered.

For both the oil- and the labor-exporting countries, demand for food commodities, induced by increased oil revenues, rose at a much higher rate during 1973-80 than during 1966-80, the complete period covered by the report. Meanwhile, scarcity of resources; the predominance of marginal, poorly rainfed cultivation; and low growth or even a decline of productivity continued to constrain food production. The result has been a widening gap between demand and supply of basic staples (Figure 2).

The oil-exporting countries—which include Algeria, Iran, Iraq, Kuwait, Libya, Oman, and Saudi Arabia—had the lowest growth in production of basic staples per

Figure 1—Middle East/North Africa, by country group

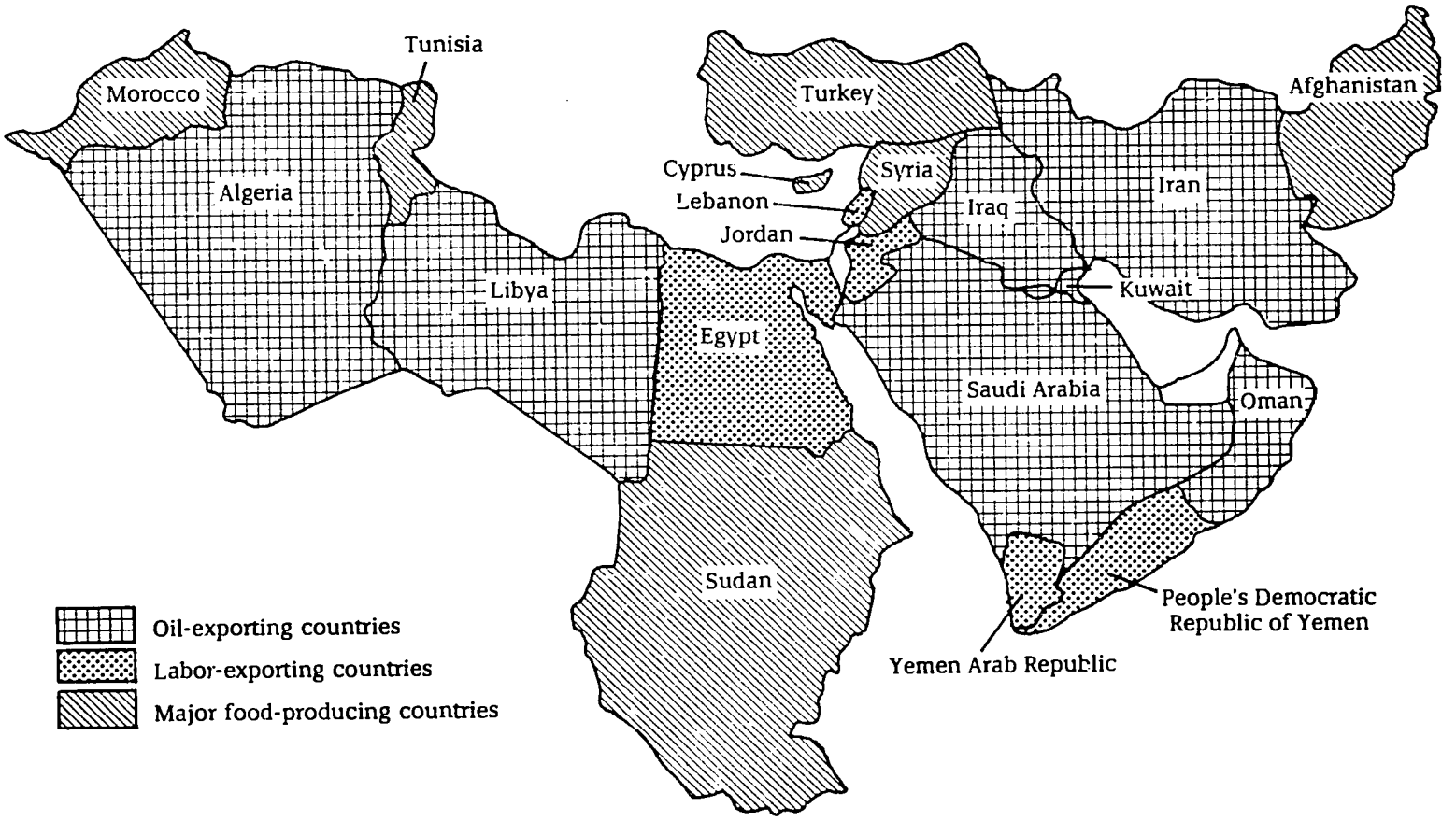
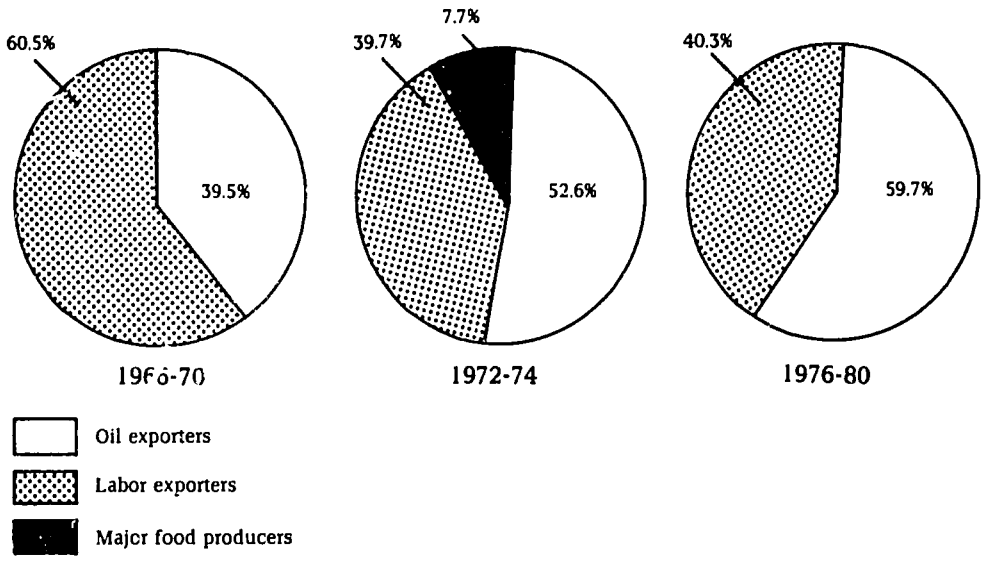


Figure 2—Distribution of the gap between supply and demand of staple food crops among country groups, 1966-70, 1972-74, and 1976-80



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome 1981 (computer printout).

capita. Only per capita production of poultry and dairy products has increased in response to greater demand.

Among the labor-exporting countries—which include Egypt, Jordan, Lebanon, the People's Democratic Republic of Yemen, and the Yemen Arab Republic—the decline in the growth of food output may have been additionally affected by the loss of manpower, particularly in Jordan and the Yemen Arab Republic. About a fourth of Jordan's labor force and a third of the Yemen Arab Republic's have migrated. As average per capita food output declined after 1966, the resulting decline in agricultural income has been compensated for by the rise in remittances.[1] Thus, in view of the projected food deficit of more than 48 million tons, the oil- and labor-exporting countries could become the largest Third World importers of basic staples by the end of the century.

In contrast, the major food-producing countries—Afghanistan, Cyprus, Morocco, the Sudan, Syria, Tunisia, and Turkey—have been much less affected by a rapid rise in demand; their dependency on domestic agricultural production has remained fairly strong. In an environment of moderate economic growth, the agricultural sector continues to generate substantial income, employment, and export earnings. Consequently, with production growing considerably faster than population, and rates of per capita output among the highest in Third World countries, food surpluses are common among the group, particularly in the Sudan, Syria, and Turkey (see Table 1).

The commodities included in this study are basic staple crops such as cereals, roots and tubers, pulses, groundnuts, bananas, and plantains, measured in metric tons of wheat equivalent based on caloric content, and primary livestock products, including meat (beef, veal, buffalo, mutton, goat meat, pig, and poultry) and milk (cow, buffalo, sheep, goat, and camel), together with milk products expressed in metric tons of whole milk equivalent and eggs measured in metric

[1] As estimated, labor migration from the labor-exporting countries rose to more than 1.5 million in 1980, an increase of two-thirds over 1973. The largest migrations were from Egypt (803,000), the Yemen Arab Republic (336,000), and Jordan (251,000). About 89,000 migrated from the People's Democratic Republic of Yemen and 62,000 from Lebanon.

Table 1—Population, income, and the food situation by country group, 1980

Category	Region	Oil-Exporting Countries	Labor-Exporting Countries	Major Food-Exporting Countries
Population (million)	261.3	83.4	56.2	121.7
Percent of region	100	32	21	47
Per capita GDP (U.S. $)	2,020	4,600	616	900
Percent of region				
Agriculture	10	5	20	23
Oil	37	49	16	3
Per capita production				
Staples (kilograms/year)	259	159	168	370
Self-sufficiency ratio (percent)	80	57	58	100
Meat (kilograms/year)	13	12	10	16
Self-sufficiency ratio (percent)	80	60	74	99
Milk (kilograms/year)	62	52	41	79
Self-sufficiency ratio (percent)	77	56	71	94
Eggs (kilograms/year)	3.2	2.6	2.5	4.8
Self-sufficiency ratio (percent)	74	44	91	100

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout); U.S. Central Intelligence Agency, *Handbook of Economic Statistics* (Washington, D.C.: Government Printing Office, various years); Arab Petroleum Research Center, *Arab Oil and Gas Directory* (Paris: APRC, 1979); Arab Petroleum Research Center, *Arab Oil and Gas Directory* (Paris: APRC, 1980); and World Bank, "GNP Data Tape, 1979-81," Washington, D.C., 1982.

tons.[2] The data base for staple crops and primary livestock products, together with estimates of the income elasticities of food commodities for each country, were provided by the Food and Agriculture Organization of the United Nations (FAO). Population estimates came from the United Nations Department of Economic and Social Affairs, and the annual country data on GNP came from the World Bank.[3]

The 1966-80 annual data that are used in the analysis of past trends in food production, consumption, and trade are based on the 1966-70 and 1976-80 averages. The data are divided into two periods, 1966-73 and 1973-80 to compare trends. These periods are also used to highlight the effects of rising incomes on consumption and the shift toward higher value products. The year 1973 is used to divide the period into equal seven-year segments.

Assuming that these growth rates will continue, the projections of consumption and production of food commodities are extrapolated from logarithmic trend equations, which are fitted to the 1966-80 country data on basic staples and primary livestock products.[4] Crop data are aggregated to obtain figures for cereals and noncereals and a total for basic staple foods, and the totals for meat, milk, and eggs are aggregated to obtain a total for primary livestock products. Finally, the resulting extrapolation for each product for each country is aggregated by country group and the region for the years 1990 and 2000.

Consumption averages for 1966-70 and 1976-80 are computed for each country. Then total domestic utilization—direct human

[2] This report is part of an assessment of the future food situation in the Third World by the International Food Policy Research Institute. Other studies include Leonardo Paulino, "Food in the Third World: Past Trends and Projections to 2000," International Food Policy Research Institute, Washington, D.C., 1983 (mimeographed); and J. S. Sarma, "An Analysis of Livestock and Poultry Products in the Third World," International Food Policy Research Institute, Washington, D.C., 1984 (mimeographed).

[3] Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman," Rome, 1981 (computer printout); United Nations, Department of Economic and Social Affairs, "World Population Prospects as Assessed in 1973 (1970-2000)" (ST/ESA/SER.A/60), 1977; and World Bank, "GNP Data Tape, 1979-81," Washington, D.C., 1982.

[4] To the extent that projections are predicated on the continuation of past trends, without taking into account price effects, they are important as an indication of the likely size of future import requirements, rather than as an accurate prediction of exact amounts.

consumption, animal feed, seed, waste, and nonfood uses—is aggregated for the country groups and for the total region. Staple crop projections to 1990 and 2000 are based on the trend for growth in per capita income between 1966 and 1980 and the corresponding income elasticity of demand, which is applied to the 1980 per capita figures for direct human consumption and feed. To complete the projection, seed (based on seeding rates applied to the projected cropped area), allowance for waste (based on the percentage of the production of basic staples in 1976-80), and nonfood uses (based on their 1976-80 share in total domestic utilization) are added to both direct consumption and animal feed.

To allow for alternatives in future consumption patterns, two additional scenarios are considered in the projection analysis. The first, the high-income scenario, is based on the hypothesis that per capita income will increase at the average trend growth rate for the interval with the higher growth for each country group, which was 1973-80 for the oil- and labor-exporting countries but 1966-73 for the major food-producing countries.

In the second, the low-income scenario, projections are based on the lower growth intervals—1966-73 for the oil- and labor-exporting countries and 1973-80 for the major food-producing countries. For further details on the methodology, see Appendix 1.

3

TREND ANALYSIS OF FOOD CONSUMPTION

High population growth in the region, which averaged 2.7 percent during the period 1966-80, combined with the increase in per capita income, has helped to bring about a substantial rise in urbanization, labor migration, and food consumption throughout the Middle East/North Africa. The increase in the demand for major food commodities has also been a result of the gains in income. Consequently, as rising per capita income has induced higher rates of consumption in primary livestock products, it has expanded the use of basic staples for animal feed.

The growth of consumption of basic staples in the region, which averaged 3.1 percent during the period 1966-73, shifted upward after 1973 to an average rate of 4.8 percent annually between 1973 and 1980. Shifts were even more dramatic in the consumption of primary livestock products, especially meat, with the annual growth rates shifting from 4.1 percent in the earlier period to 6.8 percent in the later for all meats. Poultry consumption rose from 9.6 percent to 14.0 percent.

The patterns of food consumption of the country groups appear to have varied considerably. The share of the major food-producing countries in the food consumed in the region declined; their income and population grew relatively slowly. For the oil-exporting countries, the rapid growth in consumption resulted in substantial gains in their share of the region's total in almost all food commodities, while the growth of consumption of basic staples in the labor-exporting countries was the lowest in the region (see Table 2).

Basic Food Staples

In comparing data for staple foods, changes in the composition of consumption clearly emerge. Regional demand increased from about 53 million metric tons in 1966-70 to 79 million metric tons in 1976-80.[5] The annual growth rate of demand between 1966 and 1980, 3.9 percent, was substantially higher than the annual growth rate of population, 2.7 percent. Animal feed comprised more than a fourth of the total domestic utilization of cereals, which constitute the bulk of the regional diet for humans.

Wheat and coarse grains remained the most important cereal crops. Wheat consumption expanded the most, from about 28 million tons during the 1966-70 period to 43 million tons during the 1976-80 period, and wheat was the only crop that increased its share of the region's staples. Coarse grain consumption expanded least, from about 20 to 27 million tons (see Figure 3). Coarse grains used for animal feed, however, increased by about 60 percent compared to an increase of only 18 percent for direct consumption (see Table 2 and Appendix 2, Table 21; the consumption of staple crops by country is given in Appendix 2, Table 22).

Although the major food-producing countries continued to consume the largest amount of staple crops, the group's share in the region's total declined between the 1966-70 and 1976-80 periods. The growth of consumption of animal feed was higher than that of direct consumption by humans. As a result, the shares of almost all the countries of the group in the region's direct consumption declined. The group's share of animal feed, however, stayed about the same. Turkey, for example, in 1976-80 still accounted for 8 percent of the coarse grains consumed directly in the region and 40 percent of the coarse grains fed to animals. Throughout the entire period 1966-80, the food-producing countries had the lowest growth rate for direct human consumption of both wheat and coarse grains: 2.9 percent for wheat and 2.5 percent for coarse grains. Because these rates of increase are only slightly greater than the growth rate of population, there was little if any increase in per capita consumption.

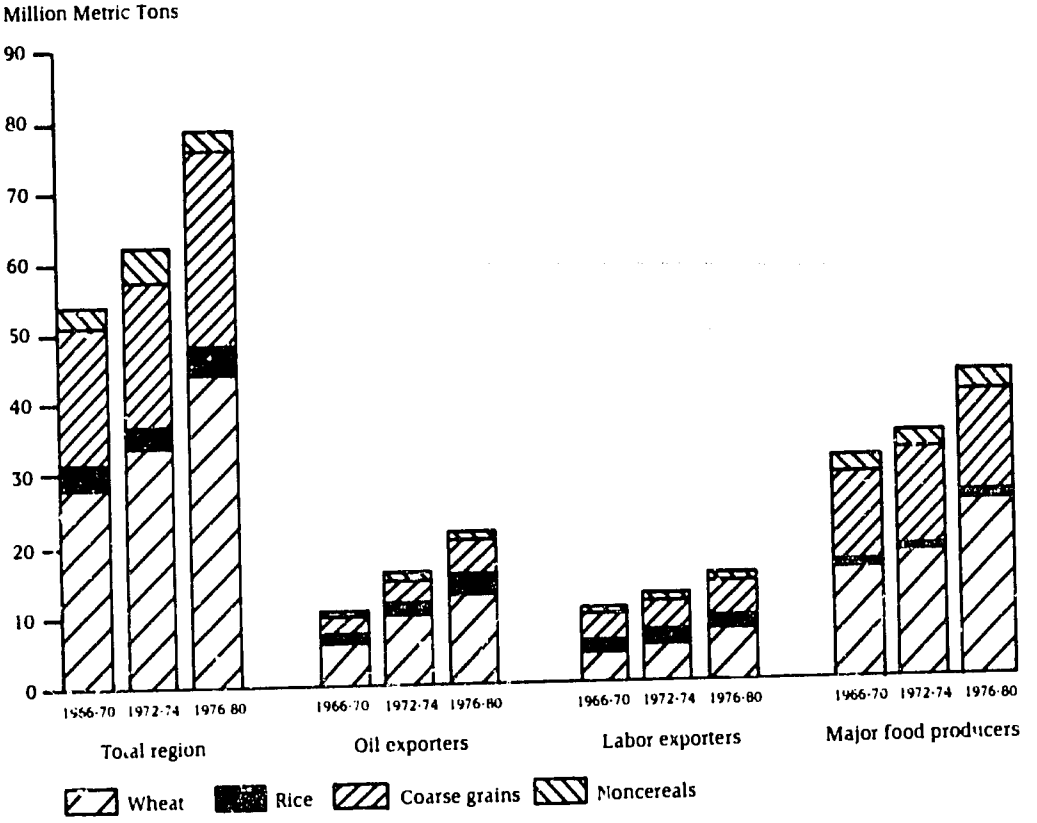
[5] For the purposes of this report, all tons are metric.

Table 2—Average annual growth of consumption of staple crops used for food and feed, by country group, 1966-80, 1966-73, and 1973-80

Country Group/Period	Total Staples			Total Cereals			Wheat			Rice			Coarse Grains			Total Noncereals		
	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed
									(percent)									
Region																		
1966-80	3.9	3.6	4.7	3.9	3.6	4.7	4.5	4.2	5.0	4.4	4.8	-0.1	3.2	1.8	4.5	4.5	4.2	4.7
1966-73	3.1	3.1	2.8	3.1	3.2	2.5	4.2	3.9	4.3	3.6	3.6	2.0	2.4	2.1	2.7	4.1	3.4	3.4
1973-80	4.8	3.6	6.8	4.9	3.6	6.9	4.7	3.9	5.1	5.1	2.0	0.2	5.3	1.7	7.5	3.3	3.8	-3.2
Oil-exporting countries																		
1966-80	5.5	5.6	6.8	5.5	5.6	6.7	5.4	5.9	4.0	6.5	7.1	1.7	5.4	1.6	7.5	6.6	6.2	9.7
1966-73	4.5	4.8	4.8	4.5	1.6	4.8	5.7	6.0	5.3	4.1	4.2	2.0	2.9	1.4	4.9	6.8	6.5	-0.1
1973-80	6.2	5.1	9.4	6.2	5.1	9.4	4.2	4.5	2.9	8.2	8.0	1.8	11.5	2.7	12.4	4.8	4.2	-14.1
Labor-exporting countries																		
1966-80	3.3	2.9	5.2	3.4	2.9	5.3	5.5	4.7	9.5	2.6	3.0	-1.9	2.0	0.5	4.6	2.2	2.4	-1.3
1966-73	1.4	1.5	1.3	1.4	1.4	1.4	4.0	2.8	6.1	3.3	3.4	2.0	0.2	0.2	-0.1	1.9	1.5	0.8
1973-80	4.5	3.3	8.1	4.7	1.6	8.3	6.4	5.7	7.9	2.4	2.1	-1.8	3.6	0.4	8.6	1.3	1.3	-3.1
Major food-producing countries																		
1966-80	3.4	2.9	3.8	3.3	3.0	3.8	3.7	2.9	4.5	2.7	2.8	2.1	3.0	2.5	3.6	4.6	4.2	5.3
1966-73	2.9	3.0	2.5	2.9	3.1	2.5	3.5	3.0	3.6	3.4	3.2	2.7	3.0	3.3	2.6	3.9	3.0	3.8
1973-80	4.2	2.8	5.4	4.3	2.7	5.6	4.5	2.8	5.4	2.6	-6.0	2.4	4.1	2.3	5.6	3.5	4.7	1.0

Source: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982.

Figure 3—Consumption of staple food crops by country group, 1966-70, 1972-74, and 1976-80 averages



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

In contrast, the oil-exporting countries had the most dramatic rise in the consumption of staple crops, leading to a substantial increase of their share in the regional total. Wheat consumption expanded at the annual rate of 5.4 percent between 1966 and 1980, and wheat made up 55 percent of total utilization of basic staples. Coarse grain consumption was also affected by the growth of direct and indirect consumption, as almost all countries of the group managed to increase their share in the regional total, particularly Iran and Saudi Arabia.

At 7.5 percent annually, consumption of coarse grains for animal feed expanded more rapidly in the oil-exporting countries than in the rest of the region during the 1966-80 period. All the countries except for Iraq realized a substantial increase in their regional share of total consumption. Iran's share, which accounted for 9 percent of the region's total in 1966-70, grew the most.

The growth of staples consumption was less rapid among the labor-exporting countries. Wheat remained the most important crop, with Egypt accounting for 12-13 percent of the region's consumption in 1976-80. In contrast, coarse grain consumption grew the slowest. This was largely due to the increased preference for wheat rather than coarse grains in the diet, especially in Egypt and the Yemen Arab Republic.

Rice consumption in the oil-exporting countries reached the highest level in the region by the late 1970s. The major food-producing group consumed the least rice in the region. Consumption of rice among the labor exporters was almost completely dominated by Egypt, which accounted for 94 percent of the rice consumed in the region.

During the whole period 1966-80 the major food producers consumed the most noncereals, with the oil-exporting countries having the highest consumption growth, and the labor-exporting group the lowest.

Primary Livestock Products

Meat

Regional meat consumption increased from 2.4 million tons in 1966-70 to 4.0 million tons in 1976-80. Its average annual rate of growth for the whole 1966-80 period, 5.2 percent, was faster than the growth rate of population. Among the different meats the consumption of mutton and goat meat, traditionally the most preferred meats, grew most slowly, while consumption of poultry increased sharply (see Table 3, Figure 4, and Appendix 2, Table 23; consumption of livestock products by country is given in Appendix 2, Table 24).

All of the country groups showed changes in the pattern of meat consumption. At 9.5 percent, the annual growth of meat consumption was highest in the oil-exporting countries between 1966 and 1980. Of those countries, Iran's meat consumption, particularly of mutton and goat meat, grew fastest. Iran, with 19 percent, and Saudi Arabia, with 12 percent, experienced the fastest growth in poultry consumption in the region in the late 1970s.

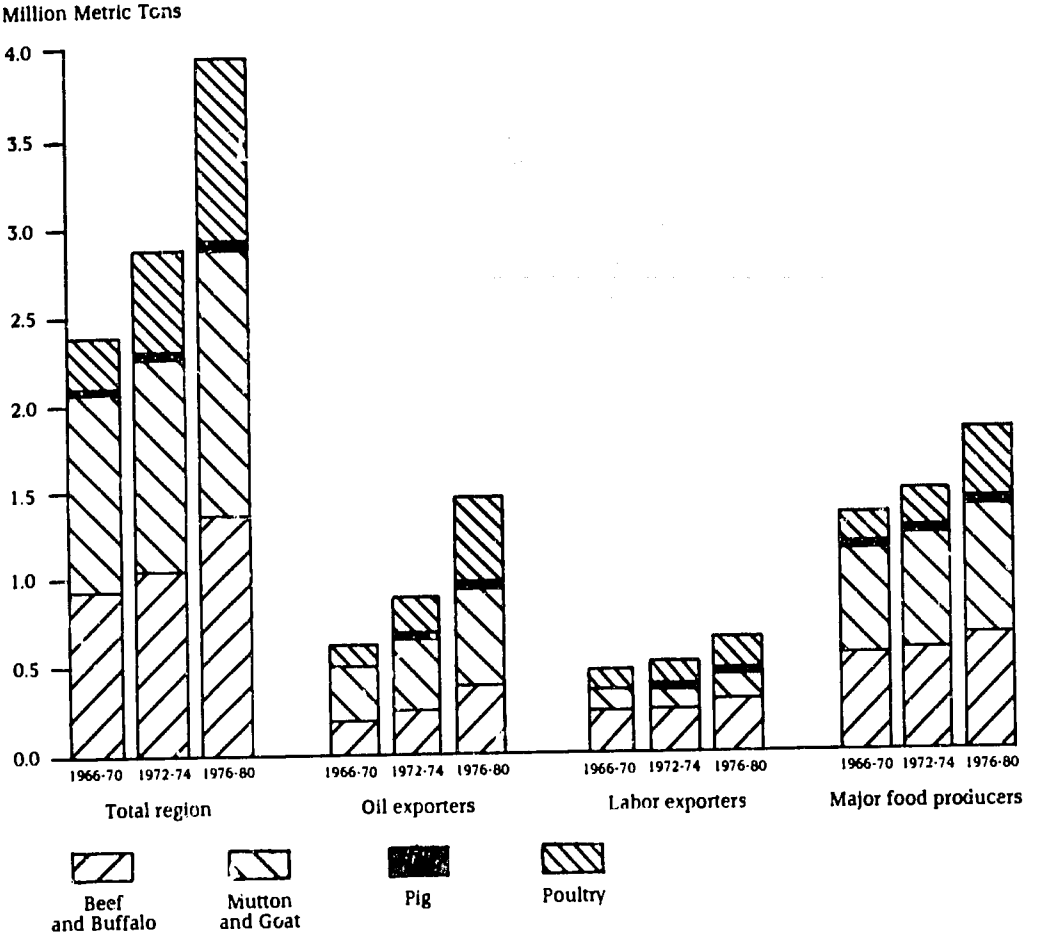
Although the major food-producing countries consumed more meat than the other two groups, their annual growth rate was low, and the group's share of the region's meat consumption declined to 46 percent in the late 1970s, compared to 56 percent in the late 1960s. Poultry consumption, however, grew much faster. Turkey consumed 20 percent of the region's poultry and 15 percent of beef and buffalo meat in the late 1970s.

Table 3—Average annual growth of consumption of meat, milk, and eggs, by country group, 1966-80, 1966-73, and 1973-80

Country Group/ Period	Meat					Milk						Eggs
	Total	Beef and Buffalo	Mutton and Goat	Pig	Poultry	Total	Cow	Buffalo	Sheep	Goat	Camel	
	(percent)											
Region												
1966-80	5.2	3.9	3.2	4.1	11.4	3.8	4.9	2.3	2.4	1.0	1.5	7.8
1966-73	4.1	2.7	3.4	36.7	9.6	2.3	2.9	3.7	1.3	0.2	2.3	6.3
1973-80	6.8	5.1	3.6	2.7	14.0	5.1	6.5	1.8	3.3	1.7	1.0	8.5
Oil-exporting countries												
1966-80	9.5	9.8	5.5	1.5	17.5	7.1	9.1	-1.8	3.5	1.3	2.1	10.6
1966-73	7.9	7.8	6.4	-3.9	15.1	4.8	6.4	-1.2	3.6	1.2	3.0	9.7
1973-80	12.7	13.8	6.2	19.8	20.8	9.3	11.9	0.0	3.6	1.7	0.7	7.8
Labor-exporting countries												
1966-80	3.4	2.4	1.0	8.3	6.6	3.9	5.3	3.2	1.5	0.8	0.8	3.8
1966-73	2.7	1.6	3.4	54.5	4.6	4.3	4.2	5.4	1.9	0.4	1.1	1.6
1973-80	4.6	2.9	1.6	9.5	8.8	4.6	7.5	2.1	1.6	1.0	0.6	6.4
Major food-producing countries												
1966-80	3.4	2.1	2.2	3.1	9.1	2.0	2.5	-0.3	1.8	0.9	1.1	7.5
1966-73	2.2	1.1	1.5	11.7	7.7	0.5	1.0	-2.2	0.0	-0.3	1.9	6.1
1973-80	4.1	2.5	2.4	-0.6	10.1	3.1	3.6	1.1	3.3	1.7	1.2	9.8

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Figure 4—Consumption of meat by country group, 1966-70, 1972-74, and 1976-80 averages



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

The regional share of the labor-exporting countries also declined between 1966-70 and 1976-80. Even though consumption of poultry nearly doubled, the group's share of poultry consumption in the region declined considerably. Egypt consumed the most meat, particularly beef and buffalo meat, accounting for 20 percent of the region's total by the late 1970s.

Milk

The milk consumption of the region as a whole increased from 13.2 million tons in 1966-70 to 19.4 million tons in 1976-80, at an average annual growth rate of 3.8 percent for the whole period. Consumption of cow milk rose much faster than consumption of the other kinds of milk, accounting for two-thirds of all milk consumed in the region by the late 1970s (Table 3 and Appendix 2, Tables 23 and 24).

Milk consumption grew much more slowly in the major food-producing countries. This led the group's share of the region's milk consumption to fall to 50 percent in the late 1970s. Per capita consumption also declined, from 89 kilograms in the late 1960s

to 84 kilograms in the late 1970s. Although Turkey remained the country with the highest consumption, its share of the region's total milk consumption declined by the late 1970s.

The oil-exporting countries had the highest growth rate in milk consumption in the region, particularly of cow milk, which increased by 9.4 percent annually. Consequently, the oil exporters' share of total milk consumption rose to 34 percent, with Iran accounting for 15 percent, followed by Algeria with 7 percent.

Eggs

Consumption of eggs in the Middle East/North Africa in 1966-80 increased at an average annual rate of 7.8 percent. This increase was from an average of 0.4 million tons in 1966-70 to 0.8 million tons in 1976-80. With a 10.6 percent growth rate, the oil-exporting countries nearly tripled their consumption of eggs by the late 1970s. The major food-producing countries still consumed the most eggs, more than doubling their consumption to 0.4 million tons. Their share in the region's consumption, however, declined to 49 percent by the late 1970s. Meanwhile, egg consumption in the labor-exporting countries almost doubled to 0.13 million tons, with these countries consuming 16 percent of the eggs in the region.

Oil Revenues and the Consumption Shifts

It is clear that the considerable gains in income during the 1973-80 period not only generated much of the rapid increase in demand, but also brought about substantial shifts in the foods consumed in the Middle East/North Africa.

The oil-exporting group benefited the most. Largely because of oil revenues, average per capita income increased rapidly at an annual rate of 10.5 percent between 1973 and 1980, exceeding U.S. $4,600 by 1980. As a result of worker remittances, per capita income in the labor-exporting countries also increased at a much higher rate than in the earlier period, reaching U.S. $657 by 1980.[6] Despite this rapid growth, per capita income in the labor-exporting countries remained the lowest in the region, leading to much less dramatic increases in food consumption. The average annual per capita growth in GNP between the two periods is shown below. The growth rates are calculated on the basis of constant 1980 U.S. dollars.[7]

Country Group/Period	GNP Per Capita (percent)
Oil exporters	
1966-73	6.9
1973-80	10.5
Labor exporters	
1966-73	2.7
1973-80	6.4
Major food producers	
1966-73	3.6
1973-80	2.4

In the labor-exporting countries, direct human consumption of basic staple crops, particularly wheat and rice, grew rapidly. By the late 1970s, however, the situation began to change. Increases in the consumption of meat, particularly poultry, resulted in a higher utilization of feed, which, in turn, began to compensate for the decline in direct consumption of coarse grains, which are consumed primarily by the poor. But the rises in both income and consumption were considerably higher in the oil-exporting countries. Consumption of all commodities increased significantly.

The additional revenue seems to have played a role in both the growth of consumption and the changes in its composition. First, as shown in Table 4, the per capita increment from oil revenues, which was about U.S. $1,663 in 1980, accounted for more than one-third of the estimated per capita income in the oil-exporting countries. This increment alone has contributed an additional 1.6 million tons, about 7 percent, to the group's total consumption of staples. Sim-

[6] Per capita income varied significantly among the oil-exporting countries from a low of about U.S. $2,000 in Algeria to a high of U.S. $20,000 in Kuwait in 1980. Although there was much less variation among the labor-exporting countries, per capita income ranged from a low of U.S. $469 in the People's Democratic Republic of Yemen to about U.S. $1,900 in Lebanon.

[7] World Bank, "GNP Data Tape, 1979-81."

Table 4—Per capita GNP and consumption of basic staple foods with and without increments from oil revenues, oil- and labor-exporting countries, 1973 and 1980

Country Group	GNP Per Capita			Consumption[a]		
		1980			1980	
	1973	With Increment	Without Increment	1973	With Increment	Without Increment
	(1980 U.S. $)			(million metric tons)		
Oil-exporting countries	2,855	4,605	2,942	16.1	24.2	22.6
Labor-exporting countries	448	657	582	12.0	16.6	15.7

Sources: World Bank, "GNP Data Tape, 1979-81," Washington, D.C., 1982; Gurushu Swamy, *International Migrant Workers' Remittances :ssues and Prospects* World Bank Staff Working Paper 431 (Washington, D.C.: World Bank, 1981); Ismail Serageldin et al., *Manpower and International Labor Migration in the Middle East and North Africa* (Washington, D.C.: World Bank, 1981); Arab Petroleum Research Center, *Arab Oil and Gas Directory* (Paris: APRC, 1979); and Arab Petroleum Research Center, *Arab Oil and Gas Directory* (Paris: APRC, 1980).

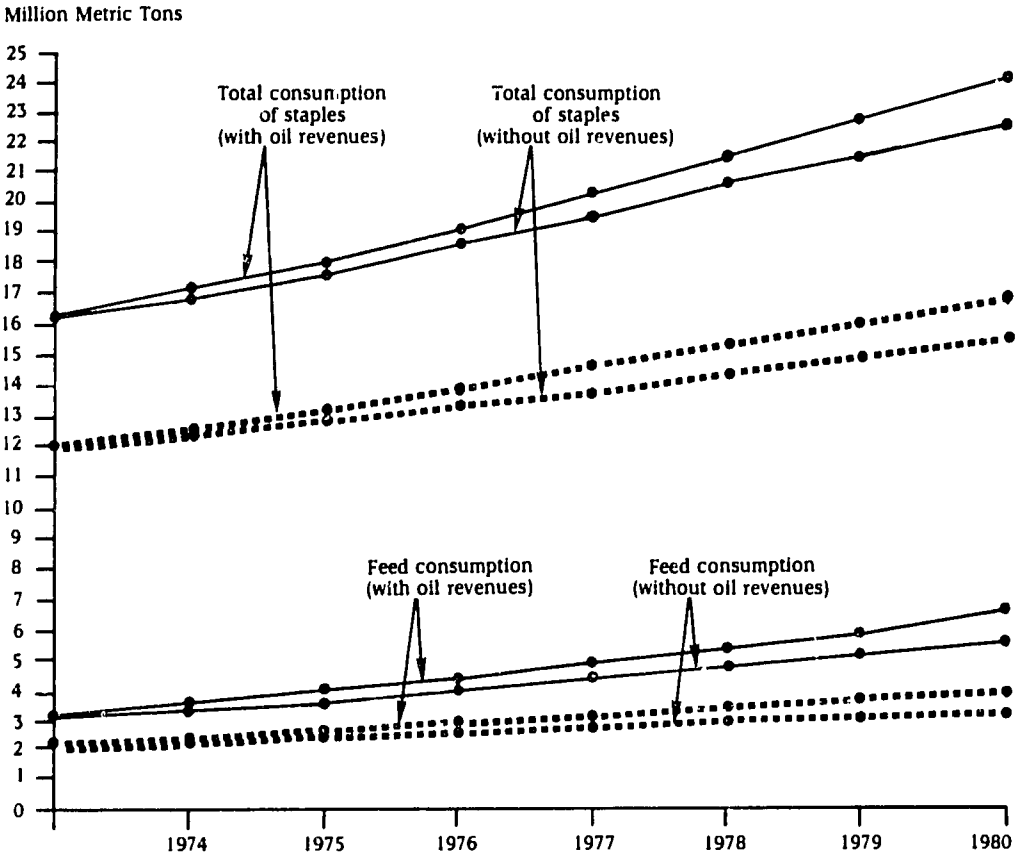
[a] The increases in consumption are measured in wheat equivalents.

ilarly, the increments from worker remittances, which accounted for more than one-tenth of the estimated per capita income in the labor-exporting countries, contributed an additional 0.9 million tons in basic staples, about 5 percent, to the group's total consumption of staples.[8]

Second, with livestock consumption becoming a major force in the utilization of animal feed, the shift in consumption induced by the oil increments has caused a substantial change in the composition of staple food crops. This is shown most clearly in the oil-exporting countries, where feed-grain consumption grew faster than direct human consumption (see Figure 5). For the much less affluent populations of the labor-exporting countries, however, where the income elasticity for human consumption of staple foods is high, increments from worker remittances led to a disproportionate increase in direct consumption.

[8] These contributions were the direct results of revenue increments that accumulated during the 1973-80 period. First, direct revenues from oil and worker remittances were netted out of the 1973 base year and subtracted from the per capita income for the subsequent period, 1974-80. Second, the growth rate of this adjusted income series was used in the consumption function, in order to estimate the level of staple consumption without these increments.

Figure 5—Consumption of total staples and staples used as feed, with and without oil revenues, in the oil- and labor-exporting country groups, 1973-80



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

4

TREND ANALYSIS OF DOMESTIC FOOD SUPPLY

Although agriculture remains the primary source of income for nearly one half of the population in the Middle East/North Africa, the sector's share of the region's economic growth is declining. Its capacity to provide the population with either adequate food or export earnings and to assist in the economic development of the region has been generally inadequate.

Despite the decline in the growth rate of production of domestic staple crops in most of the oil- and labor-exporting countries, production for the region as a whole has kept pace with population growth, thanks to the performance of the major food-producing countries. Production growth of coarse grain crops, however, has lagged considerably in all country groups. The growth of production of meat has stayed just ahead of population growth. Poultry production, which has expanded rapidly, is an exception. Production of all milk except cow milk fell short of population growth.

Despite the pressure of deepening deficits, however, there seems to be little evidence that food supply policy in the region has adapted to the dynamics of demand. Although in some countries resources were moved into primary livestock commodities in response to greater demand, higher production in the region was achieved virtually without a commensurate increase in the domestic supply of feedgrains. This became clear by the late 1970s when most countries were confronted with rapidly rising foodgrain deficits, which led to a fivefold rise in the region's coarse grain imports over those of the late 1960s.

Growth and Composition of Basic Food Staples

Total regional production of basic staples increased from about 50 million tons in 1966-70 to 65 million tons in 1976-80. The average annual rate of growth between 1966 and 1980 was 2.8 percent, which just kept pace with population growth. Of the cereals, wheat was the most important, with production expanding to 34 million tons in the late 1970s, more than half of the total staples produced during that period. Production of coarse grains expanded to about 23 million tons at a rate of 1.7 percent annually. Next to rice, it had the smallest growth increase, which resulted in a substantial decline in the share of coarse grains in total staples (see Table 5, Figure 6, and Appendix 2, Table 25; production of staple crops by country is given in Appendix 2, Table 22).

The major food-producing countries were the major suppliers of food staples. They provided two-thirds of the region's total in the late 1970s, including nearly 40 million tons of cereals.

Wheat produced in the major food-producing countries accounted for 70 percent of the region's output between 1976 and 1980. Except for Afghanistan and Morocco, all countries of the group increased their share of production of wheat in the region, with Turkey's production making up nearly one half of the total. The annual growth rate for coarse grains, 2.3 percent in 1966-80, resulted in a considerably larger share of the region's output. Performance was substantially higher in the Sudan, Syria, and Tunisia, with Turkey producing the largest share—32 percent of the region's total.

In the oil-exporting countries, production of basic staples fell considerably behind population growth. The oil exporters' share of the region's total fell to 20 percent in the late 1970s. The labor-exporting countries had the lowest annual growth rate of all, 1 percent.

Wheat was the most important crop for the oil-exporting countries. Production growth varied widely among the countries of the oil-exporting group, ranging from negative growth rates in Iraq and Saudi Arabia to a high growth rate in Iran, which produced 17 percent of the region's total. Except for the Yemen Arab Republic, which doubled its wheat production during the study period, the growth rates in most of the labor-exporting countries were negative.

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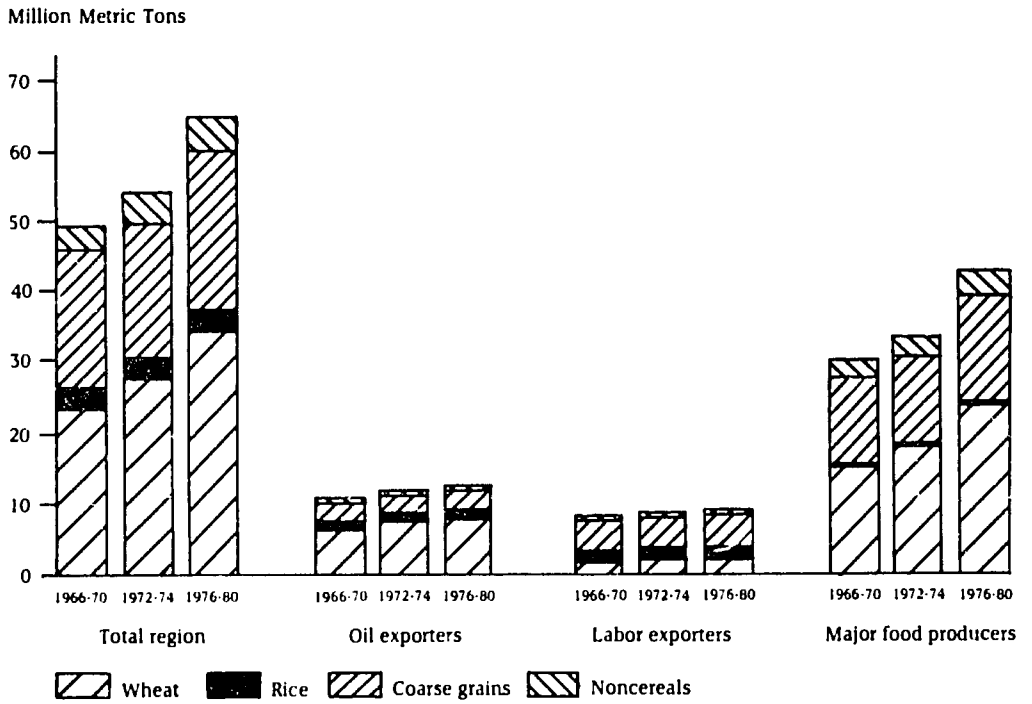
Table 5—Average annual growth rates of production, area, and output per hectare of staple food crops, by country group, 1966-80

Crop	Total Region			Oil-Exporting Countries			Labor-Exporting Countries			Major Food-Producing Countries		
	Production	Area Harvested	Output Per Hectare	Production	Area Harvested	Output Per Hectare	Production	Area Harvested	Output Per Hectare	Production	Area Harvested	Output Per Hectare
	(percent)											
Total staples	2.8	1.2	1.6	1.9	0.5	1.4	1.0	-0.5	1.5	3.5	1.7	1.8
Total cereals	2.8	1.1	1.7	1.8	0.3	1.5	1.0	-0.5	1.5	3.5	1.6	1.9
Wheat	3.8	1.0	2.8	2.4	0.5	1.9	2.3	1.7	0.6	4.4	1.2	3.2
Rice	1.2	0.4	1.6	1.9	-1.2	3.1	0.5	-0.4	0.9	2.0	0.6	1.4
Coarse grains	1.7	1.4	0.3	0.4	0.3	0.0	0.7	-1.2	1.9	2.3	2.1	0.2
Total non-cereals	3.8	3.4	0.4	4.6	3.9	1.3	0.3	0.4	-0.1	4.3	3.6	0.7

Source: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982.

Figure 6—Production of staple food crops by country group, 1966-70, 1972-74, and 1976-80 averages



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

wheat, a major substitute, production growth of coarse grains remained low—less than 1 percent for the entire 1966-80 period—in the oil- and labor-exporting countries. Growth rates were negative except in Algeria, Iran, and Libya of the oil exporters and Egypt and the People's Democratic Republic of Yemen of the labor exporters.

Rice was the cereal produced in the smallest amounts in the region; an average 3.2 million tons were produced each year between 1976 and 1980. It had the smallest growth rate of all cereal crops in the region. Egypt produced half of the rice grown. Iran was the next largest producer, accounting for a third of the region's output. Afghanistan and Turkey dominated the output of the major food-producing countries.

Production of noncereals, including pulses, roots and tubers, groundnuts, bananas, and plantains, increased to 4.8 million tons in the region during the 1970s at an average annual rate for the 1966-80 period of 3.8 percent. The major food-producing countries dominated production, with Turkey and the Sudan together accounting for more than half of the region's total. In the other groups, Iran's output grew rapidly, accounting for 7 percent of the region's output, and Egypt accounted for 13 percent of the region's total production, although there was almost no change in the area harvested.

Primary Livestock Products

Although the successes achieved in the production of primary livestock products on the whole compared favorably to those in basic staples, the region's record was mixed. The subsequent change in the composition of primary livestock products suggests that resources were moved into the production of these commodities in response to growing demand. Poultry and egg production increased rapidly, whereas mutton and goat meat production lagged considerably behind population growth. The production of all milk except cow milk also grew more slowly than population. The production of primary livestock products, like the production of staples, was dominated by the large countries in the region in the late 1970s. Turkey was the major producer, accounting for about a third of the total supply, followed by Iran with 20 percent and Egypt with 15 percent.

Meat production in the region increased between 1966 and 1980 at an average annual growth rate of 3.8 percent. This was an increase from an average of 2.3 million tons in the period 1966-70 to about 3.3 million tons in 1976-80. Among the different meat groups, poultry production grew most rapidly, at an average annual rate of 10.6 percent; its share of the region's meat production increased to 28 percent by the late 1970s. Production of mutton and goat meat expanded less rapidly than population, while production of beef and buffalo barely surpassed it (see Table 6, Figure 7, and Appendix 2, Table 26; production of livestock products by country is given in Appendix 2, Table 24).

During the period as a whole production growth of primary livestock products was highest in the oil-exporting countries. They achieved the highest production growth in most meat categories, particularly poultry. The 15.4 percent gain in poultry production increased poultry's share of total meat output to 37 percent. Beef production also grew rapidly, for this country group. In the major food-producing countries, poultry production grew rapidly, and the growth in production of mutton and goat meat at 2.1 percent was the highest in the region.

The region increased its total milk production, particularly of cow, sheep, and goat milk. Nevertheless, growth of the region's total milk output was slow, largely because Egypt's production decreased considerably.

After 1973, increases in meat production were not able to keep up with the heavy demand, except in the major food-producing countries. Only in the oil-exporting and major food-producing countries did milk output grow more rapidly in the 1973-80 period than in the previous period.

Egg production grew more rapidly in the region after 1973. For the period as a whole the highest rate of growth was in the oil-exporting countries, followed by the major food-producing countries, which remained the dominant producing group at 0.4 million tons, 49 percent of the region's total output.

Sources of Growth

During the earlier period, 1966-73, most of the growth in food crop production could be attributed to the rapid expansion of area (see Appendix 2, Table 27). Later, as land resources became scarcer, yield increases

Table 6—Average annual growth rates of meat, milk, and egg production, by country group, 1966-80, 1966-73, and 1973-80

Country Group/ Period	Meat					Milk						Eggs
	Total	Beef and Buffalo	Mutton and Goat	Pig	Poultry	Total	Cow	Buffalo	Sheep	Goat	Camel	
						(percent)						
Region												
1966-80	3.8	2.9	2.0	4.6	10.6	2.7	2.1	2.4	2.4	1.1	2.1	7.7
1966-73	3.8	3.4	2.6	12.8	11.4	2.1	2.8	4.0	1.9	0.6	2.9	5.9
1973-80	4.0	2.6	1.9	1.4	10.3	3.2	0.2	1.8	3.3	1.8	1.2	9.3
Oil-exporting countries												
1966-80	6.2	6.8	2.1	2.5	15.4	4.4	6.3	-2.0	3.4	1.7	2.8	10.2
1966-73	6.8	8.5	4.2	4.6	16.6	4.0	6.8	-1.5	3.6	1.9	4.1	8.5
1973-80	5.5	5.0	1.0	1.1	13.0	4.5	5.9	0.0	3.4	2.0	0.6	9.4
Labor-exporting countries												
1966-80	1.8	1.5	1.0	6.4	3.7	2.7	2.5	3.3	1.7	1.0	0.9	2.9
1966-73	3.0	2.7	1.9	9.1	7.8	4.7	5.1	5.4	2.0	0.5	0.9	2.0
1973-80	1.3	1.1	0.1	7.5	2.7	1.7	1.2	2.1	1.7	1.2	0.8	4.4
Major food-producing countries												
1966-80	3.2	1.9	2.1	4.6	9.3	1.9	0.1	-0.4	1.9	0.9	1.7	8.0
1966-73	2.5	1.4	1.8	13.7	8.4	0.3	0.6	-2.2	0.7	0.0	2.1	6.0
1973-80	4.0	2.3	2.6	0.3	11.1	3.1	-2.6	0.9	3.3	1.8	1.6	10.9

Source: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982.

became the major factor in the growth performance of food crops, particularly wheat. This is clearly shown in Table 7. As land became more scarce in the latter period, 1973-80, however, the situation changed considerably. Most of the production growth in cereals—88 percent—was dominated by the rise in crop yields induced by advances in technology. This was in contrast to the noncereal crops where area expansion remained the principal contributor to production growth.

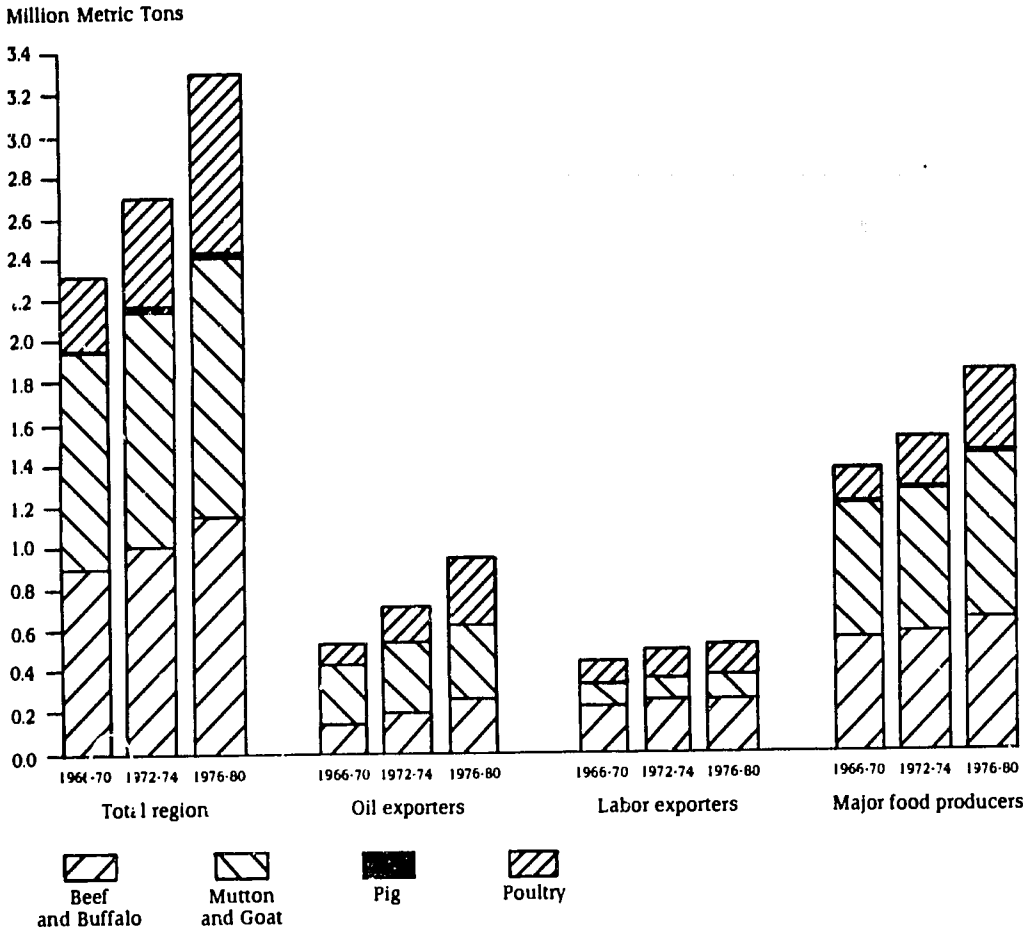
In the oil-exporting countries, area increases in wheat continued to give way to yield increases, finally accounting for all the production growth gains in the 1973-80 period. Whereas increases in coarse grain production before 1973 came largely from area expansion, almost half of the growth after 1973 was due to yield increases.

For the labor-exporting countries, production growth in cereals generally came from yields. In the case of wheat and coarse grains, area expansion completely dominated growth gains during the early period, 1966-73, but yield accounted for the entire contribution in 1973-80.

Although land resources in the major food-producing countries were less scarce than in the other groups, increases in the production of cereals were largely brought about by increases in yields. These yield increases ranged from 94 percent in Turkey to 30 percent in Syria; only in the Sudan did yields decrease. Of all cereal crops, however, wheat appears to have benefited most from the technological advances stemming from the "green revolution." This resulted in a large contribution for wheat from yields—93 percent of the increase in production during the 1973-80 period. During the same period 68 percent of the improvement in production of coarse grain crops was from yield increases.

Finally, area expansion dominated the production of noncereals except in the labor-exporting countries where the yield contribution was high.

Figure 7—Production of meat by country group, 1966-70, 1972-74, and 1976-80 averages



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 7—Relative contribution of area harvested and output per hectare to the growth of production of staple crops, by country group, 1966-80, 1966-73, and 1973-80

Crop/Period	Total Region		Oil-Exporting Countries		Labor-Exporting Countries		Major Food-Producing Countries	
	Area Harvested	Output Per Hectare	Area Harvested	Output Per Hectare	Area Harvested	Output Per Hectare	Area Harvested	Output Per Hectare
	(percent)							
Staple foodcrops								
1966-80	43	57	24	76	a	100	49	51
1966-73	86	14	76	24	a	100	93	7
1973-80	15	85	3	97	a	100	19	81
Cereals								
1966-80	38	62	20	80	a	100	45	55
1966-73	83	17	75	25	a	100	88	12
1973-80	12	88	a	100	a	100	18	82
Wheat								
1966-80	26	74	22	78	76	24	28	72
1966-73	69	31	63	37	100	a	68	32
1973-80	2	98	a	100	a	100	7	93
Rice								
1966-80	a	100	a	100	a	100	31	69
1966-73	42	58	a	100	47	53	81	19
1973-80	a	100	a	100	a	100	43	57
Coarse grains								
1966-80	80	20	80	20	a	100	90	10
1966-73	100	a	83	17	100	a	100	a
1973-80	31	69	53	47	a	100	32	68
Noncereals								
1966-80	89	11	83	17	100	a	84	16
1966-73	100	a	81	19	17	83	100	a
1973-80	87	13	100	a	a	100	56	44

Source: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982.

[a] Production growth was negative during this period.

5

TREND ANALYSIS OF FOOD TRADE

Rapidly rising food demand created a new economic reality in the region. Increases in consumption were facilitated by an easy import policy in the oil-exporting countries, while rising nonagricultural incomes provided for the fast-growing imports of the labor-exporting group. By the late 1970s the region was importing huge amounts of food. And, with the exception of countries in the major food-producing group, there was a sharp decline in the volume of exports, particularly in coarse grains and livestock products. Between the periods 1966-70 and 1976-80, imports of basic staples increased nearly five times in the oil-exporting countries and about two-and-a-half times in the labor-exporting countries (see Table 8). Imports of meat increased more than seven times in the oil-exporting countries and three times in the labor exporting countries (see Table 9). Agricultural earnings in these countries were too low to sustain the acceleration in production needed to meet the rise in food demand. On the other hand, food exports grew rapidly in the major food-producing countries, particularly in Afghanistan, the Sudan, Syria, Tunisia, and Turkey.

Furthermore, the rapid increase in food consumption led to substantial changes in the composition of the import basket. Because of their close links with the rising demand for primary livestock products, imports of coarse grains rose nearly fivefold to 24 percent of total cereals. Although more wheat was imported than any other cereal, the growth in demand for coarse grains began to surpass that of wheat, particularly during the 1973-80 period.

Imports and Exports of Basic Staples

Imports of basic staples increased in the region at an average annual rate of 12 percent between 1966 and 1980. Of the cereal crops, wheat and coarse grains were the most widely imported, imports of the former growing annually about 10 percent and imports of the latter, about 18 percent (Appendix 2, Table 28). The region changed from a net exporter of rice to a net importer of about 1.2 million tons by the late 1970s. It continued to be a net exporter of noncereals, although net exports declined slightly in the latter period.

The oil-exporting countries had the most dramatic rise in net imports of wheat, which caused their share of the region's net imports to rise from 21 percent in 1966-70 to 38 percent in 1976-80. All the countries in this group were net importers of wheat, with Algeria and Iraq, the largest importers, increasing their regional shares to 14 and 9 percent respectively.

Meanwhile, net imports of coarse grains expanded much faster than imports of wheat, 21 percent annually during 1966-80 (Appendix 2, Table 28). The oil exporters, led by Iran and Saudi Arabia, accounted for about two-thirds of the region's net imports of coarse grains in the 1976-80 period.

The oil-exporting countries, led by Iran, Iraq, and Saudi Arabia, accounted for more than 80 percent of the region's total imports of rice. The oil exporters were also the largest net importers of noncereals.

The labor-exporting countries imported more wheat than the other country groups did during the period 1976-80. Net trade increased to more than 5.6 million tons, at an average annual rate of 8.7 percent. More than two-fifths of the group's total imports of wheat (also 5.6 million tons) was accounted for by Egypt. Net imports of coarse grains more than tripled during the period, reaching nearly 1 million tons, with Egypt again the largest net importer. Net imports of noncereals in Egypt also increased tremendously.

The region's trade position on rice changed because exports of rice from Egypt, the largest rice-producing country, declined drastically.

In the major food-producing countries net imports of wheat increased relatively slowly in 1966-80 at an average annual rate of 4.1 percent. Morocco was the main importer of the group, accounting for 20 percent of the region's total. Turkey, the largest producer, was the only country in the region

Table 8—Imports, exports, and net trade of staple food crops and their regional distribution, by country group, 1966-70 and 1976-80

Country Group/ Crop	1966-70					1976-80				
	Imports		Exports			Imports		Exports		
	Amount	Percent	Amount	Percent	Net Trade	Amount	Percent	Amount	Percent	Net Trade
	(1,000 metric tons)									
Region										
Total staples	6,736.2	100	1,888.8	100	4,874.4	19,264.0	100	2,053.8	100	17,209.7
Total cereals	6,[illegible]6	100	1,354.8	100	5,186.8	18,838.4	100	1,397.7	100	17,440.7
Wheat	5,366.4	100	363.5	100	5,002.9	13,533.0	100	909.1	100	12,623.9
Rice	369.9	100	574.2	100	(204.3)	1,340.0	100	158.4	100	1,181.6
Coarse grains	805.3	100	417.1	100	388.2	3,965.4	100	329.7	100	3,635.2
Total noncereals	194.5	100	534.0	100	(339.5)	425.6	100	656.6	100	(231.0)
Oil-exporting countries										
Total staples	1,850.0	27	295.7	16	1,554.3	8,942.2	46	42.3	2	8,899.9
Total cereals	1,767.5	27	270.8	20	1,496.7	8,706.1	46	37.5	3	8,668.6
Wheat	1,229.2	23	166.1	46	1,063.1	5,236.3	38	34.0	4	5,202.3
Rice	227.0	61	0.8	1	226.2	1,097.5	82	2.0	1	1,095.5
Coarse grains	311.3	38	103.9	25	207.4	2,372.3	60	1.5	...	2,370.8
Total noncereals	82.5	42	24.9	5	57.6	236.3	55	4.8	1	231.5
Labor-exporting countries										
Total staples	2,841.2	42	737.3	39	2,103.9	6,940.8	36	293.6	14	6,647.2
Total cereals	2,759.3	42	656.5	48	2,102.8	6,793.2	36	229.2	16	6,564.0
Wheat	2,360.8	44	76.1	21	2,284.7	5,637.7	42	6.1	1	5,631.6
Rice	86.3	23	565.4	98	(479.1)	104.5	8	156.3	99	(51.8)
Coarse grains	312.2	39	15.0	4	297.2	1,051.0	27	66.8	20	984.2
Total noncereals	81.9	43	80.9	15	1.0	147.6	35	64.4	10	83.2
Major food-producing countries										
Total staples	2,044.9	30	855.9	45	1,189.1	3,380.9	18	1,718.4	84	1,662.5
Total cereals	2,014.8	31	427.5	32	1,587.3	3,339.1	18	1,131.0	81	2,208.1
Wheat	1,776.4	33	121.4	33	1,655.0	2,659.0	20	868.9	96	1,790.1
Rice	56.5	15	7.8	1	48.7	138.0	10	0.2	0	137.8
Coarse grains	181.9	23	298.3	72	(116.4)	542.1	14	261.9	79	280.2
Total noncereals	30.1	16	428.3	80	(398.2)	41.8	10	587.4	89	(545.6)

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).
Note: Net trade is imports minus exports. Parentheses indicate that exports were larger than imports.

to export wheat, with net exports of 0.8 million tons.

Except for Morocco, the Sudan, and Turkey which were net exporters of coarse grains, the major food-producing countries as a whole were net importers of these crops. And, except for Syria, rice imports were negligible. Morocco, the Sudan, and Turkey were also net exporters of noncereals.

Imports of Primary Livestock Products

Net imports of meat, milk, and eggs increased dramatically in the region as a whole (see Table 9). By the late 1970s net imports of meat and eggs had increased sevenfold, milk nearly fourfold. The regional trade picture for eggs, however, was somewhat less imbalanced. Although net imports of eggs to the region rose to about 80,000 tons, a number of countries had favorable trade balances.

More than three-fourths of the large increase in net imports of meat were accounted for by the oil-exporting countries (see Figure 8). Those of Saudi Arabia were the highest in the group at 210,000 tons. Iran's imports rose from about 5,000 tons for the period 1966-70 to 155,000 tons in 1976-80.

In the latter period the oil exporters imported two-thirds of the region's net im-

Table 9—Imports, exports, net trade, and self-sufficiency ratios of meat, milk, and eggs, by country group, 1966-70 and 1976-80 averages

Commodity/ Country Group	Exports		Imports		Net Trade[a]		Self-Sufficiency Ratio[b]	
	1966-70	1976-80	1966-70	1976-80	1966-70	1976-80	1966-70	1976-80
	(1,000 metric tons)							
Meat								
Region	45.8	35.4	148.8	763.3	103.0	727.9	96	83
Oil-exporting countries	4.4	4.8	76.6	561.9	72.2	557.1	89	64
Labor-exporting countries	4.0	10.6	54.9	157.1	50.9	146.5	90	79
Major food-producing countries	37.4	20.0	17.3	44.2	(20.1)	24.2	102	99
Milk								
Region	13.1	18.8	1,073.3	3,875.7	1,060.2	3,856.9	92	80
Oil-exporting countries	3.3	7.3	559.7	2,638.8	556.4	2,631.5	83	61
Labor-exporting countries	4.9	4.7	236.3	713.8	231.4	709.1	89	77
Major food-producing countries	4.9	6.8	277.3	523.1	272.4	516.3	96	94
Eggs								
Region	12.6	3.9	25.2	90.2	12.6	86.3	97	90
Oil-exporting countries	0.1	0.1	19.2	79.2	19.1	79.1	81	72
Labor-exporting countries	12.3	3.2	3.5	9.0	(8.8)	5.8	1	99
Major food-producing countries	0.3	0.6	2.5	2.1	2.2	1.5	99	99

Source: Food and Agriculture Organization of the United Nations, "Global Agriculture Programming System Supply Utilization Accounts Tape," Rome, June 1982.

Notes: Figures may not add to total because of rounding.

[a] Net trade is imports minus exports. Parentheses indicate that exports were larger than imports.

[b] Self-sufficiency is defined as production divided by consumption.

ports of milk, with Algeria, at 736,000 tons, and Saudi Arabia, at 620,000 tons, the largest importers.

The oil exporters also dominated net imports of eggs, with Algeria, Iran, and Saudi Arabia importing more eggs than any of the other countries in the region.

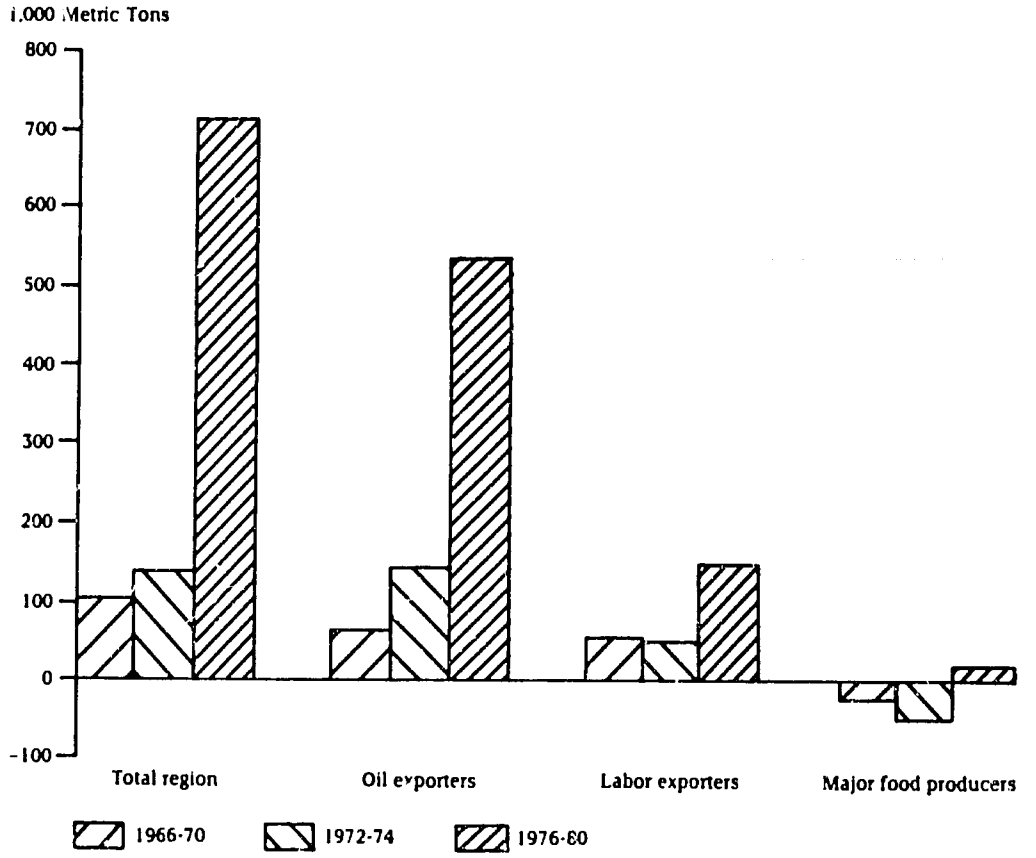
In the labor-exporting countries net imports of meat almost tripled, reaching an average of 146,500 tons during the period 1976-80. Egypt increased its net imports to 62,000 tons and the Yemen Arab Republic, which imported no meat in 1966-70, imported nearly 29,000 tons in the late 1970s. Imports of milk tripled to an average of 713,800 tons in the latter period. Both Egypt and Lebanon were heavy net importers of milk, and the Yemen Arab Republic also increased its imports sharply, to 102,000 tons. The labor-exporting countries switched from being net exporters of eggs to net importers on a minor scale, mainly because of the rapid decline in Lebanon's exports and the changes in Egypt's trade balance.

Net exporters of meat in 1966-70, the major food-producing countries became net importers by 1976-80, with Morocco importing the most meat. Net imports of milk almost doubled, rising to more than 500,000 tons. Syria and Tunisia were the major importers in the group, whereas Turkey's net imports declined sharply to less than 2,000 tons. The net imports of eggs in the major food-producing countries amounted to only 1,500 tons in the later period—two-thirds of what they were in the earlier period.

Composition of the Meat Trade

As income grew in the region and the pattern of consumption changed, the shift in preferences resulted in substantial changes

Figure 8—Net imports of meat by country group, 1966-70, 1972-74, and 1976-80 averages



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

in the composition of the region's meat imports.

As shown in Table 10, the most active trade occurred in poultry. Poultry imports were more than 13 times higher in 1976-80 than in 1966-70. Although mutton and goat meat and poultry each held a 36 percent share of the region's total meat imports in 1976-80, the share of mutton and goat meat declined from the earlier period.

The import patterns of the country groups are similar. In the oil-exporting countries, the increases were greatest in Saudi Arabia, where poultry imports rose sharply to 117,000 tons, and in Kuwait, where they rose to 28,000 tons—almost 20 times the imports of the earlier period. In the labor-exporting countries, poultry's increase in its share of total meat imports of the region was even more dramatic because a lower growth rate of production was combined with a rapid rise in demand. In the major food-producing countries, poultry had the highest share of meat imported by the group—61 percent with Morocco accounting for 18,000 tons in the late 1970s.

The share of mutton and goat meat in total imports declined for all country groups, and the share of beef and buffalo meat increased only in the oil-exporting countries.

Table 10—Imports and exports of meat and regional shares, by country group, 1966-70 and 1976-80

Type of Meat/Period	Total Region		Oil-Exporting Countries		Labor-Exporting Countries		Major Food-Producing Countries	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
Imports								
Beef and buffalo								
1966-70	43,773	29	12,603	16	22,747	41	8,423	49
1976-80	204,049	27	127,785	23	62,052	40	14,212	32
Mutton and goat								
1966-70	82,275	55	46,435	61	29,707	54	6,133	35
1976-80	277,857	36	241,562	43	32,043	20	4,252	10
Pig								
1966-70	2,092	2	778	1	694	1	620	4
1976-80	3,768	...	1,309	...	2,094	1	365	...
Poultry								
1966-70	20,636	14	16,740	22	1,784	4	2,112	12
1976-80	277,602	37	191,274	34	60,919	39	25,409	58
Exports								
Beef and buffalo								
1966-70	16,663	36	1,161	26	261	6	15,241	41
1976-80	2,808	8	262	6	257	2	2,289	11
Mutton and goat								
1966-70	25,539	56	3,088	69	499	13	21,952	59
1976-80	24,718	70	3,120	64	4,866	46	16,732	84
Pig								
1966-70	77	...	...	...	35	1	42	...
1976-80	587	1	1	...	361	3	225	1
Poultry								
1966-70	3,476	8	201	5	3,159	80	116	2
1976-80	7,323	21	1,466	30	5,086	49	771	4

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Note: ... is nil or negligible.

The oil-exporting countries completely dominated regional imports of mutton and goat meat, with Iran, at 100,000 tons, and Saudi Arabia, at 60,000 tons, importing more than any of the other countries. In the major food-producing countries, improved production appears to have resulted in the decline of mutton and goat meat imports.

Meat exports declined in the region, due mostly to the decline in the availability of beef and pork. Poultry exports, in contrast, increased substantially throughout the region. The largest increase of poultry exports was in Kuwait, where they increased sevenfold to 1,400 tons, but more than two-thirds of the region's poultry exports was attributed to Lebanon—nearly 5,000 tons by the late 1970s.

Some countries' exports of mutton and goat meat also increased, notably Kuwait of the oil-exporting countries and Egypt and Jordan of the labor-exporting countries. The major food-producing countries were the largest exporters of mutton and goat meat, accounting for two-thirds of the region's exports (about 17,000 tons in the late 1970s). Syria's exports of mutton and goat meat declined. In Turkey, the region's leading meat-exporting country, resources for meat exports appear to have shifted during the period 1966-73 from beef to mutton and goat meat. Consequently, beef exports declined by 87 percent, whereas mutton and goat meat exports increased by more than 50 percent to about 10,000 tons in the late 1970s.

6

THE PROSPECTS FOR 1990 AND 2000

In this report the trends for production, consumption, and use of basic staples and primary livestock products are extrapolated from the base data to 1990 and to the year 2000. Then these same projections are recomputed separately for the high- and low-income growth scenarios (for further description of the methodology, see Appendix 1).

Unless production of the staple food crops and livestock commodities now in demand accelerates, the gap that emerged in the Middle East/North Africa during the 1970s will increase steadily in future decades. By the turn of the century, the projected net deficit in basic staples will be about 52 million tons—three times greater than in the 1980 base year. (For a discussion of how the deficit has been projected by FAO, the International Food Policy Research Institute, and the Arab Organization for Agricultural Development, see Appendix 3.) The sheer size of this gap suggests that the provisions for meeting food demand from domestic sources may prove inadequate. It would actually require a rate of growth of production substantially higher than the 2.7 percent annual rate that is expected between 1980 and 2000. In fact, production growth in the oil- and labor-exporting countries may have to rise as much as 6-7 percent annually to keep pace with demand.

The only possible exception to this scenario lies in the production of the major food-producing countries, whose per capita production of basic staples is already among the highest of Third World countries. Imports to these countries are projected to remain small; Turkey, the Sudan, and Syria may even become self-sufficient. Because it will incur only a small portion of the region's anticipated shortages in primary livestock products, this group may even be able to produce enough meat, milk, and eggs to close its projected gap.

Although domestic food production is expected to play an important role in food availability in the region, particularly in the major food-producing countries, there is widespread agreement that the gap between supply and demand will continue to widen during the 1980s and on to the turn of the century. The reasons for this are several.

First, the region's average annual population growth is expected to continue to be high through the 1980s, declining from 2.6 percent during 1966-80 to about 2.5 percent during the 1990-2000 period. The rate of growth in the major food-producing countries should be about the same as the regional forecast; that of the labor-exporting countries should slow, with their share of the region's population declining to 20 percent; and the population of the oil-exporting countries is likely to grow faster than the regional average because of urbanization and migration (see Table 11).

Second and perhaps more important is the effect of income on food consumption. If the economic surge engendered in the past decade by oil revenues continues, broader areas of the region will be affected by the spillover of economic development and the accompanying growth in aggregate demand, which would result in a considerable change in the pattern of food consumption. High income growth would promote a rapid increase in the consumption of livestock products and the derived demand for animal feed, particularly in the oil-exporting countries. Meanwhile, in the countries where income is expected to grow slowly, direct human consumption will probably continue to account for a large portion of the total utilization of basic staple crops.

Projections of Food Demand

Trend Projections

Based on the projected trends of growth in population and per capita income and the estimated elasticities of demand for food, consumption of basic staples can be expected to increase at an average annual growth rate of 3.5 percent during the 1980-2000 period. Direct human consumption should have the lowest rate of increase. 2.4 percent annually. In contrast, staples used as animal feed should triple at an annual rate

Table 11—Population projections for 1990 and 2000 and annual average growth of per capita income, by country group, 1980-2000

Country Group	Projected Population			Growth of Per Capita Income 1980-2000[a]
	1980	1990	2000	
	(millions)			(percent/year)
Region	260.3	345.0	440.5	6.4
Oil-exporting countries	83.3	114.6	151.7	7.6
Labor-exporting countries	56.1	71.3	88.8	4.3
Major food-producing countries	121.7	159.1	200.0	3.4

Source: World Bank, "GNP Data Tape, 1979-81," Washington, D.C., 1982; United Nations, Department of Economic and Social Affairs, *World Population Prospects as Assessed in 1973 (1970-2000)* (ST/ESA/SER. A/60), 1970.

[a] For projection purposes, a maximum growth rate of 6 percent and a minimum growth rate of 0.5 percent were assumed for each country's per capita income. This has lowered the average growth in the oil-exporting countries to 5.5 percent but increased the average growth rates in the labor-exporting group to 4.4 percent and in the major food-producing group to 3.8 percent.

of 5.8 percent and rapidly approach the level of human consumption (Table 12). The projections of staple food consumption by country in the year 2000 are given in Appendix 2, Table 29.

The highly populated major food-producing countries will probably continue to account for about half of the total consumption of staples. Feed use, projected to increase at an annual rate of 5.6 percent in this group, should, at that rate, surpass direct consumption by the end of the century.

Projections show the oil-exporting countries continuing to experience the most dramatic increases in consumption. From a relatively low base, consumption could more than double by the year 2000. Meanwhile, driven by high income elasticities, the derived demand for animal feed, with an annual growth rate of 6.4 percent, could more than triple by the year 2000.

The labor-exporting countries are expected to continue to have the slowest consumption growth rate in the region, 3.3 percent annually. Feed use, however, is projected to continue to increase rapidly, nearly threefold, by the year 2000.

The heavy demand for meat, milk, and eggs is expected to continue. During the 1980-2000 period, regional meat consumption is expected to reach an annual growth rate of 5.8 percent; milk consumption, 4.7 percent, and egg consumption, 7.0 percent (Table 13). Projections of consumption of these primary livestock products by country for the year 2000 are given in Appendix 2, Table 30.

In the oil-exporting countries, meat consumption, which is projected to grow at an annual rate of 6.4 percent, may be expected to more than triple. The group would then account for two-fifths of the meat consumed in the region by the year 2000. Meat consumption is expected to increase 6.1 percent annually in the labor-exporting countries and 5.1 percent in the major food-producing group.

The projections show milk consumption in the oil-exporting countries increasing at an annual rate of 4.8 percent, which would increase the group's share of the region's consumption to 38 percent by the year 2000. The rise for the major food-producing countries is projected to be 4.2 percent, for a regional share of 44 percent. The projected annual rate of increase for the labor-exporting countries, however, is highest in the region—5.8 percent.

Egg consumption is expected to increase by 8.8 percent annually in the oil-exporting countries, 6.0 percent in the major food-producing countries, and 5.1 percent in the labor-exporting countries.

Projections under Alternative Income Growth Scenarios

Under the high-income growth scenario, regional consumption of basic staples would only be about 3 percent higher than the trend-based projection of basic staples, 8 percent higher in meat, about 4 percent higher in milk, and less than 2 percent higher in eggs by the year 2000. The projections in Tables 12 and

Table 12—Use of domestic staple crops for food and feed in 1980 and projections to 1990 and 2000, by country group

Year/Projection	Region			Oil-Exporting Countries			Labor-Exporting Countries			Major Food-Producing Countries		
	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed	Total	Food	Feed
	(million metric tons)											
1980												
Actual	84.9	48.2	23.3	23.4	15.2	6.0	16.3	10.9	3.8	45.2	22.0	13.5
1990												
Trend	119.3	63.6	40.4	34.3	21.3	10.6	22.2	14.4	6.1	62.8	27.9	23.7
High-income growth	121.3	63.5	42.4	34.5	21.3	10.8	23.5	14.5	7.2	63.3	27.7	24.4
Low-income growth	115.5	64.0	39.3	33.5	21.2	9.9	21.0	14.2	5.0	61.0	28.6	21.2
2000												
Trend	169.3	77.4	71.5	50.3	27.0	20.6	31.0	18.3	10.8	87.9	32.1	40.1
High-income growth	174.5	77.1	77.0	49.1	26.9	21.0	35.3	18.5	14.8	90.1	31.7	42.7
Low-income growth	155.2	79.1	55.8	45.8	26.8	18.1	27.0	18.0	7.1	82.4	34.3	32.4

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Note: The period 1966-73 is the basis for the low-income growth scenario for the oil- and labor-exporting countries, but it is the period of high-income growth for the major food-producing countries. The reverse is true for the period 1973-80.

13 suggest that higher income growth would accelerate the decline in direct human consumption of basic staples and substantially increase the consumption of primary livestock products and hence feed.

This would be true except for the labor-exporting countries. For this group, both consumption of basic staples for food and indirect use for feed would grow more rapidly under the high-income scenario, showing a total increment of 4.3 million tons over trend by the year 2000. It would also experience the largest increments over trend in the consumption of primary livestock products—more than 27 percent in meat, about 17 percent in milk, and 19 percent in eggs over the trend-based projections (Tables 12 and 13).

In the oil-exporting countries, consumption of staples for food is projected to decline slightly from trend. The increments in livestock products under the high-income scenario are small relative to the trend-based projection.

According to this scenario, in the major food-producing countries an estimated decline of 0.4 million tons in direct human consumption would be compensated for by the rise in feedgrains, resulting in a total increase of 2.2 million tons of basic staples above the trend projection of the group by the year 2000. Consumption of livestock products would also increase over the trend-based projection.

Under the low-income scenario, food demand in the region in 2000 would be considerably less than in the trend projections, decreasing about 14.1 million tons in basic staples, 1.9 million tons in meat, 5.5 million tons in milk, and 0.4 million tons in eggs.

As the result of the decline in feed use, consumption in the labor-exporting countries would sustain the greatest loss: 13 percent in basic staples and 30 percent in meat below the trend-based projection for the year 2000. The oil-exporting countries would incur the smallest loss: 9 percent in basic staples and about 10 percent in meat.

The increase in the consumption of staples as food in the major food-producing countries would be compensated for by a loss of 19 percent in feed use and of 12 percent in meat consumption by the year 2000.

Comparative Analysis of Future Consumption

In Table 14 the average annual per capita income in 1980 for the Middle East/North Africa is projected to 1990 and 2000. Three countries were selected, whose per capita

Table 13—Consumption of meat, milk, and eggs in 1980 and projections to 1990 and 2000, by country group

Year/Projection	Region			Oil-Exporting Countries			Labor-Exporting Countries			Major Food-Producing Countries		
	Meat	Milk	Eggs	Meat	Milk	Eggs	Meat	Milk	Eggs	Meat	Milk	Eggs
	(1,000 metric tons)											
1980												
Actual	4,378.9	21,195.9	935.8	1,622.2	7,796.4	307.5	742.8	3,203.2	160.9	2,013.9	10,196.3	467.4
1990												
Trend	7,814.6	33,836.0	1,881.9	3,195.0	12,597.4	795.6	1,309.2	5,712.2	245.3	3,310.4	15,526.5	841.0
High-income growth	8,136.7	34,679.0	1,912.3	3,276.8	12,778.2	819.5	1,479.5	6,310.5	269.9	3,380.4	15,590.3	822.9
Low-income growth	7,252.5	32,020.6	1,774.3	3,051.7	12,044.6	755.4	1,086.2	4,913.0	209.8	3,114.6	15,063.0	809.1
2000												
Trend	13,416.8	53,178.8	3,634.0	5,546.0	19,955.8	1,678.7	2,440.7	9,813.4	434.4	5,430.1	23,409.6	1,521.0
High-income growth	14,569.7	55,452.8	3,693.4	5,784.6	20,357.2	1,771.2	3,088.4	11,475.1	517.8	5,696.7	23,620.5	1,404.4
Low-income growth	11,480.1	47,655.5	3,273.7	4,983.6	18,200.8	1,512.1	1,706.1	7,578.7	322.9	4,790.4	21,876.0	1,438.7

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980-81," Rome, 1981 (computer printout).

Note: The period 1966-73 is the basis for the low-income growth scenario for the oil- and labor-exporting countries, but it is the period of high-income growth for the major food-producing countries. The reverse is true for the period 1973-80.

Table 14—Food consumption and incomes in the Middle East/North Africa, 1980, 1990, and 2000, compared with those of selected high-income countries, 1976

Region or Country	Year	Per Capita Income	Staple Crops		Primary Livestock Products			Share of Poultry in Total Meat Consumption
			Food	Feed	Meat	Milk	Eggs	
		(1980 U.S. $)	(kilograms/year/capita)					(percent)
Middle East/North Africa	1980	2,208	188	90	17	81	4	29
	1990	3,954	184	118	23	99	4	33
	2000	7,085	175	163	30	120	6	37
Greece	1976	3,782	153	285	55	193	11	16
Venezuela	1976	4,024	138	112	42	120	8	14
Ireland	1976	4,432	143	477	74	275	12	14
Japan	1976	7,713	152	138	22	51	16	32
United Kingdom	1976	7,966	120	266	66	261	13	17
France	1976	10,053	99	364	76	255	13	17

Sources: World Bank, "GNP Data Tape, 1979-81," Washington, D.C., 1982; Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout); Food and Agriculture Organization of the United Nations, "Food Balance Sheets, 1975-77 Average," Rome, 1980 (computer printout); and Food and Agriculture Organization of the United Nations, "Per Capita Food Supplies, 1961-65 Average, 1966-77," Rome, 1980 (computer printout).

income in 1976, according to World Bank figures, was similar to the 1990 figures for the Middle East/North Africa and three countries with per capita income similar to the figures projected for the year 2000. The historical data for per capita consumption of basic staples and primary livestock products in these more developed countries may then be compared with the figures projected for the Middle East/North Africa.

The trend-based projections for the Middle East/North Africa suggest that the anticipated patterns of consumption will generally fall behind those already attained in the developed countries. This is particularly true for livestock products, with the exception of poultry. For instance, consumption of meat, milk, and eggs in the region in 1990 will probably be less than in Greece, Ireland, and Venezuela in 1976. Greece, in which consumption is approximately average, consumed more than twice the amount of meat and eggs and nearly twice the amount of milk in 1976 that the Middle East/North Africa is projected to consume in 1990.

However, the consumption of basic staple crops presents a different picture. In 1990 the Middle East/North Africa is projected to consume larger amounts of basic staples as food than Greece, Venezuela, or Ireland in 1976, but the region's demand for animal feed is still expected to be less than in Greece and Ireland (but not Venezuela).

By the year 2000 the situation may have altered somewhat, as changing patterns of consumption bring the Middle East/North Africa more in line with the patterns of countries that are more developed. Per capita consumption of livestock commodities in the region is projected to surpass that of Japan in 1976. But per capita consumption of staples by humans will probably remain much higher than in these developed countries, despite the anticipated decline in the crop's income elasticities. At the same time, feed utilization may continue to rise, approaching the amount of direct consumption by the year 2000.

Thus it appears that basic staples will probably continue to be an important part of human consumption in the region in the future. These extra kilograms of staples consumed as food in the Middle East/North Africa may help to close the nutritional gap between what the developed countries consume now and what the Middle East/North Africa is projected to consume.

Trend Projections of Food Supply

Unless there are large gains in productivity through the improvement of agricultural

practices and large increases in capital outlays, production of basic food staples is projected to be about 88 million tons by 1990, and about 117 million tons by 2000, which represents an average annual growth rate of 2.8 percent, barely ahead of population growth (Table 15). Consequently, given the physical constraints and the scarcity of agricultural resources that are expected to continue to characterize most countries of the region, the major food-producing countries will probably have to provide the bulk of the food supply in the region. By the year 2000, Turkey alone could provide at least a third of the region's staple crops. In contrast, the oil-exporting countries taken together (with almost twice the population of Turkey) are projected to account for less than 20 percent of the region's supply, and the labor-exporting countries to account for only 10 percent of it, compared with about 14 percent in 1980.

Looking at future crop production in the context of population and cultivated area leaves little basis for optimism, either for the improvement of per capita production of basic staples or for the expansion of land cultivation. (Historical and projected population figures by country are given in Appendix 2, Table 31.) By the year 2000, trend projections indicate that per capita production will have increased to 266 kilograms, a mere 5-kilogram increase over the 1980 base year (see Tables 11 and 15). Only the major food-producing countries are expected to show substantial advances in per capita staple production (422 kilograms per capita by the year 2000 compared to 370 kilograms in 1980). These figures contrast sharply with the expected decline to 136 kilograms per capita for the oil-exporting countries and 137 kilograms per capita for the labor-exporting countries.

As shown below, area cultivated for staple crops is projected to increase by nearly 8 million hectares in 1990; by 2000, cultivation of staples could rise to about 71 million hectares for the region—more than a third higher than the 1980 trend value.

Country Group	1980	1990	2000
	(million hectares)		
Region	51.6	59.4	71.1
Major food-producing countries	33.8	40.3	50.6
Oil-exporting countries	14.1	15.0	16.0
Labor-exporting countries	3.7	4.1	4.5

Table 15—Production of staple food crops and projected gaps between supply and demand in 1980 and projections to 1990 and 2000, by country group

Country Group	1980		1990				2000			
				Gaps				Gaps		
	Production	Gap	Production	Trend	High-Income	Low-Income	Production	Trend	High-Income	Low-Income
	(million metric tons)									
Region	67.8	17.1	87.9	31.4	33.4	27.6	117.3	52.0	57.2	37.9
Oil-exporting countries	13.3	10.1	16.2	18.1	18.3	17.3	20.6	29.7	28.5	25.2
Labor-exporting countries	9.4	6.8	10.7	11.5	12.8	10.3	12.2	18.8	23.1	14.8
Major food-producing countries	45.0	0.3	61.0	2.8	2.3	0.0	84.5	3.4	5.6	(2.1)

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Notes: The figure in parentheses indicates a surplus.

The alternative gaps indicate the differences between projected supply and demand of staple food crops (the trend gap) and the size of the gap based on the high- and low-income growth scenarios. The period 1966-73 is the basis for the low-income growth scenario for the oil- and labor-exporting countries, but it is the period of high-income growth for the major food-producing countries. The reverse is true for the period 1973-80.

Again reflecting the skewed distribution of crop production, most of the area expansion is expected to take place in the major food-producing countries, particularly the Sudan, in which crop area could reach 20 million hectares by the year 2000. In the other country groups, the contribution of area expansion may be minimal. The oil- and labor-exporting countries, perhaps with the exception of Iran and Iraq, may have to rely almost exclusively on yield advances to increase their domestic supplies.

The outlook for projected output of primary livestock products appears brighter than for basic staples.[9] Meat production is projected to rise to 5.2 million tons by 1990 and 7.8 million tons by 2000, an average annual growth rate of 4.1 percent. Annual production of milk is expected to increase by 2.8 percent and eggs by 7.0 percent over the 1980-2000 period.

According to trend projections, meat production could expand at an annual rate of 6.1 percent in the oil-exporting countries, reaching 3.3 million tons by the year 2000 (Table 16). By then, Iran could be producing the most, accounting for a fourth of the region's output.

Increases in meat production are projected to be much less dramatic in the major food-producing countries. At an annual rate of increase of 3.1 percent, meat output is expected to reach 3.7 million tons in the year 2000. Turkey is expected to be the dominant producer of the group, accounting for more than a fifth of the regional total.

At a rate of 1.9 percent annually, meat production is projected to expand the least among the labor-exporting countries. Total output, reaching 0.8 million tons in the year 2000, may account for 10 percent of the region's total, with Egypt dominating the group's production at about 0.6 million tons.

Milk production in the oil-exporting countries is projected to rise to about 6.6 million tons by 1990 and 10.4 million tons by 2000, accounting for more than a third of the region's output. It is expected to rise to about 11.2 million tons by 1990 and 13.6 million tons by 2000 in the major food-producing countries, but the regional share of these countries could decline to less than half by the year 2000. Among the labor-exporting countries, milk production could increase to 3.3 million tons in 1990 and 4.3 million tons by 2000—about 15 percent of the region's output.

Egg production is projected to rise to 0.6 million tons by 1990 and to more than 1 million tons by 2000 in the oil-exporting countries. It could rise to 0.9 million tons by 1990 and 1.8 million tons by 2000 in the major food-producing countries, accounting for 58 percent of the total output. In the labor-exporting countries, egg production could increase to nearly 0.2 million tons by 1990 and about 0.3 million tons by 2000, accounting for the smallest share in the region's output.

The Growing Food Gap

Deficits in Staple Crops

The gap between demand and supply of staple crops that spread throughout the Middle East/North Africa during the 1970s is projected to grow steadily through the 1990s and to the end of the century. From only 8 million tons in 1973, the gap rose to 17 million tons by 1980, and is expected to reach 52 million tons by the year 2000.

The agriculturally less well-endowed countries of the oil- and labor-exporting groups could compile the largest net deficits in the region, in excess of 48 million tons by the year 2000 (Table 15 and Figure 9). Judging from the size of the projected gaps, the prospects for achieving self-sufficiency in staple crops appear unlikely for either the oil- or labor-exporting groups. To close the gap in these countries, production would have to grow more than four and a half times faster than the historically projected growth rates. Even under the scenario that assumes low income growth, net deficits in the oil-

[9] Support for the application of trend-based projections in meat, milk, and eggs is demonstrated in Patrick Yeung's work on the existence of livestock cycles in Third World countries. His study shows that removing the cyclical components from time series data for primary livestock products will not produce results superior to the trend extrapolations used in this report. See Patrick Yeung, "A Method for the Simultaneous Estimation of Trends and Cycles," International Food Policy Research Institute, Washington, D.C., n.d. (mimeographed).

Table 16—Production of meat, milk, and eggs and projected gaps between supply and demand in 1980 and projections to 1990 and 2000, by country group

Commodity/ Country Group	1980		1990				2000			
				Gaps				Gaps		
	Production	Gap	Production	Trend	High-Income	Low-Income	Production	Trend	High-Income	Low-Income
	(1,000 metric tons)									
Meat										
Region	3,540.6	838.3	5,154.4	2,662.2	3,030.0	2,100.1	7,779.6	5,637.2	6,963.3	3,690.5
Oil-exporting countries	997.3	624.9	1,846.8	1,348.2	1,475.7	1,204.9	3,290.7	2,255.3	2,667.1	1,682.4
Labor-exporting countries	571.2	211.6	641.0	668.2	838.5	445.2	771.2	1,669.5	2,317.2	934.4
Major food-producing countries	2,012.1	1.8	2,664.6	645.8	715.8	450.0	3,717.7	1,712.4	1,979.0	1,072.7
Milk										
Region	16,351.7	4,844.2	21,142.6	12,693.4	13,536.4	10,878.0	28,293.7	24,885.1	27,159.1	19,361.8
Oil-exporting countries	4,325.6	3,470.8	6,635.8	5,961.6	6,142.4	5,408.8	10,351.3	9,604.5	10,005.9	7,849.5
Labor-exporting countries	2,417.3	785.9	3,266.6	2,445.6	3,043.8	1,646.4	4,305.8	5,507.6	7,169.3	3,272.4
Major food-producing countries	9,608.8	587.5	11,240.2	4,286.3	4,350.1	3,822.8	13,636.6	9,773.0	9,983.9	8,239.4
Eggs										
Region	825.0	110.8	1,682.5	199.4	229.9	91.9	3,173.8	460.2	519.6	99.9
Oil-exporting countries	215.9	91.6	607.7	187.9	211.8	147.7	1,093.1	585.6	678.1	419.0
Labor-exporting countries	142.4	18.5	187.6	57.7	82.3	22.2	274.4	160.0	243.4	48.5
Major food-producing countries	466.7	0.4	887.1	(46.1)	(64.2)	(78)	1,806.3	(285.3)	(401.9)	(367.6)

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Notes. The figures in parentheses indicate a surplus.

The alternative gaps indicate the differences between projected supply and demand of livestock products (the trend gap) and the size of the gap based on the high- and low-income growth scenarios. The period 1966-73 is the basis for the low-income growth scenario for the oil- and labor-exporting countries, but it is the period of high-income growth for the major food-producing countries. The reverse is true for the period 1973-80.

and labor-exporting countries would remain substantial.[10]

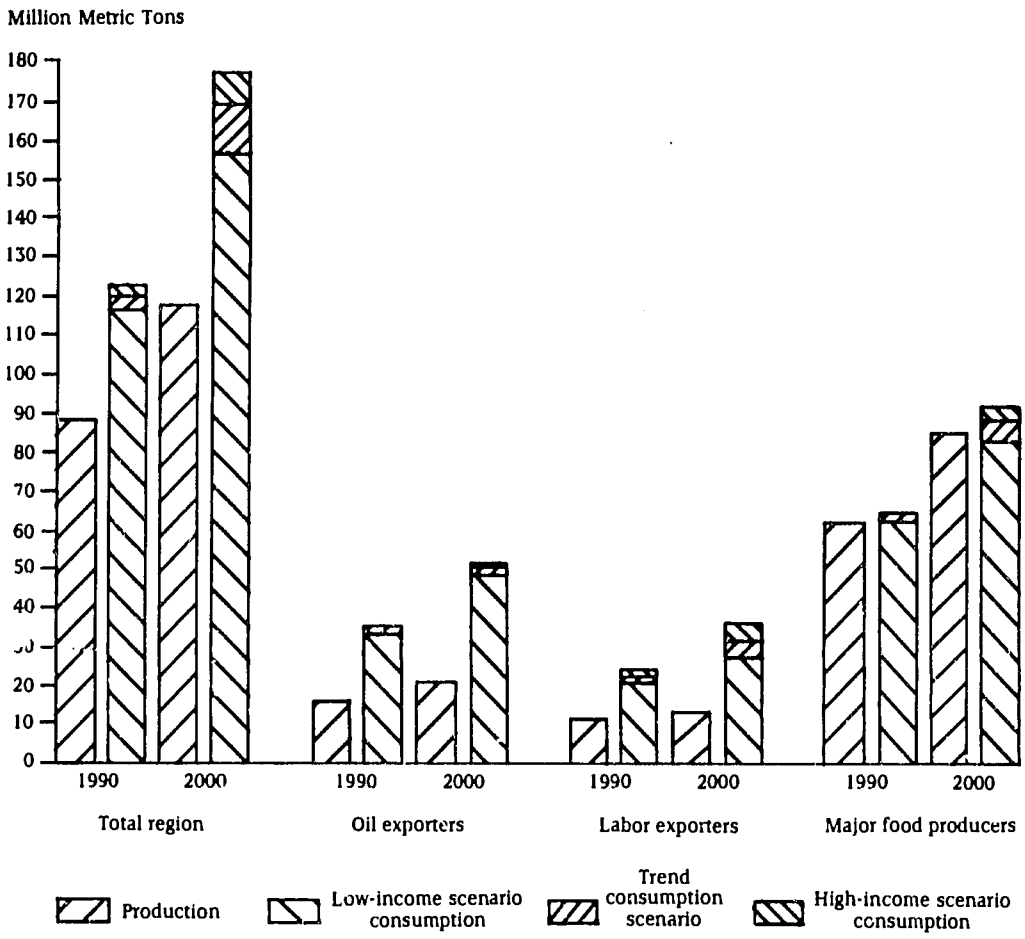
However, future gaps in basic staples may vary greatly among the major food-producing countries, depending on the choice of scenario. Under the low-income growth assumption, the group, especially the Sudan, Syria, and Turkey, could accrue a moderate surplus compared to a net deficit of about 3.4 million tons under the trend projections (see Table 15). Under the high income growth assumption, the group could incur a net deficit of nearly 6 million tons.

Deficits in Primary Livestock Products

Production and consumption projections indicate that shortages that began to occur during the 1970s will probably continue to expand rapidly throughout the 1980-2000 period. By the end of the century, the trend-based deficit is expected to amount to nearly

[10] According to the methodology employed in this study, a 6 percent limitation has been placed on the growth of per capita income in Iran, Iraq, and Saudi Arabia. Thus consumption for the oil-exporting country group in the high-income growth scenario will not differ substantially from the trend-based values (see Appendix 1).

Figure 9—Projections of production and consumption of staple food crops, under trend, low-income, and high-income scenarios, by country group, 1990 and 2000



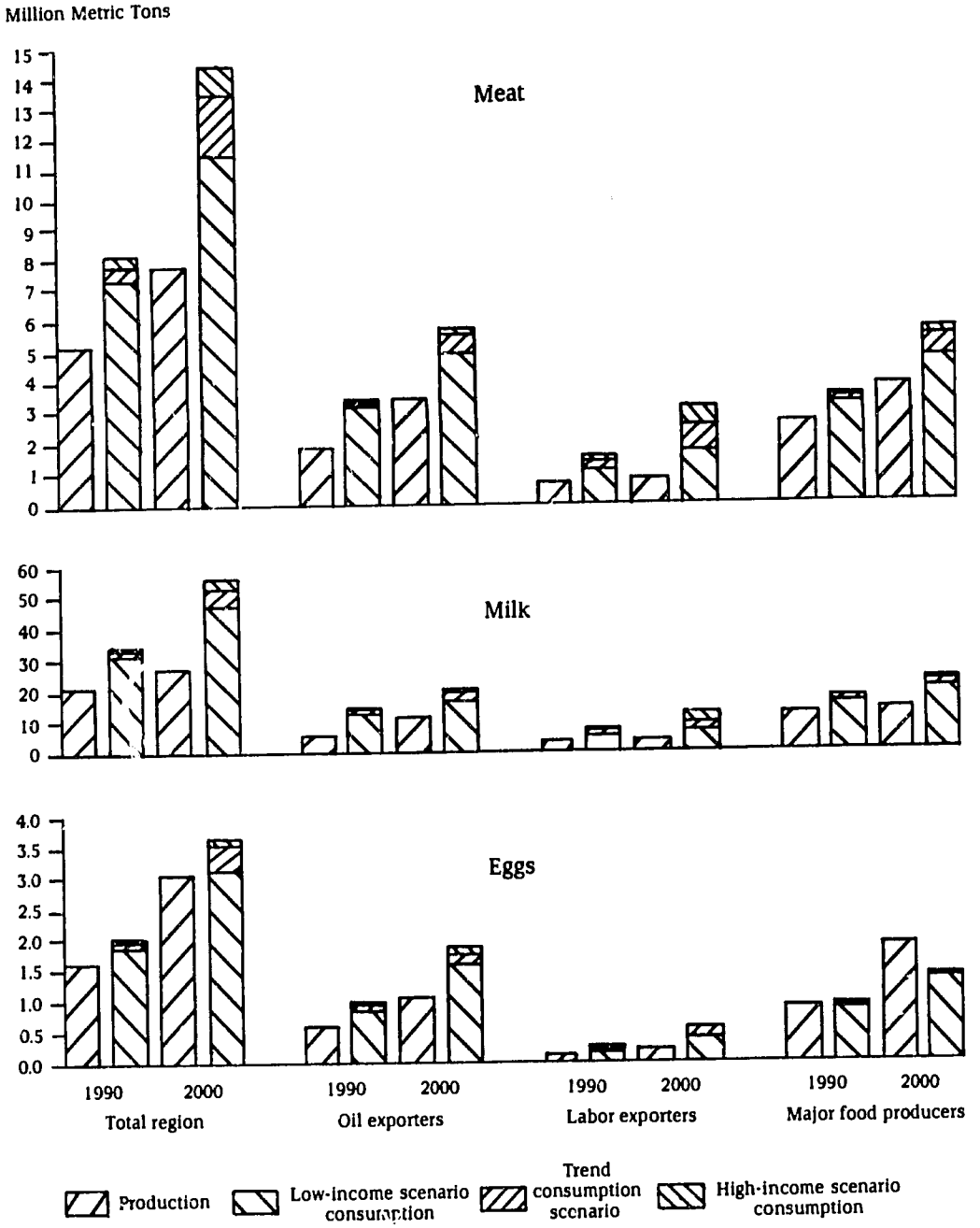
Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

5.6 million tons of meat, about 25 million tons of milk, and 0.5 million tons of eggs (Table 16 and Figure 10).

Meat deficits in the oil- and labor-exporting groups could account for about 40 percent and 30 percent respectively of the region's total. With the possible exception of surpluses in Cyprus and the Sudan, the major food-producing countries, which started from a near balance in 1980, are projected to accumulate a meat deficit that could amount to about 30 percent of the region's total by the year 2000.

The prospect for reaching self-sufficiency in meat seems unlikely for most countries, considering that production growth would have to rise at an annual rate of 6.9 percent over the 1980-2000 period and that a growth rate of 8.9 percent would be required for the oil-exporting countries. Meat production would have to rise by more than 5.1 percent in the major food-producing and 7.9 percent in the labor-exporting groups, compared to the projected rates of 3.1 percent and 1.9 percent annually. Meat self-sufficiency in the region even appears to be unlikely under

Figure 10—Projections of production and consumption of meat, milk, and eggs, under trend, low-income, and high-income scenarios, by country group, 1990 and 2000



Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

the low-income growth scenario, which would require average production growth of more than 6.1 percent annually.

Nor does the prospect for self-sufficiency in milk appear likely in most of the countries (see Table 16 and Figure 10). The projected regional net deficit of 25 million tons by 2000 is more than fivefold that of the 1980 base year. The oil-exporting countries could account for about 39 percent of the regional deficit, whereas the labor-exporting countries could continue to have the smallest deficit. The milk deficit in the major food-producing countries is expected to rise more rapidly throughout the projected period, becoming the highest in the region at about 10 million tons. The high-income scenario could increase the trend-based deficit in milk in the region by about 2 million tons by the year 2000, and the low-income scenario could diminish the deficit by 5.5 million tons.

Although projections for eggs still indicate a small gap for the region as a whole, the supply estimates vary widely among countries. Projected surpluses among the major food-producing countries are expected to offset nearly two-fifths of the total deficit.

7

STRATEGIES FOR ALTERING THE GAP MIX IN BASIC STAPLES

Based on the development experiences of the more advanced economies, it seems likely that as the demand for food shifts toward primary livestock products, the share of basic staples used for feed will increase and the proportion for direct human consumption will decrease. The rationale is that as development reaches a higher stage and the income elasticity of demand for staple foods declines, per capita human consumption will no longer rise; eventually the derived demand for feedgrains will become the primary use for basic food staples.

Throughout the Middle East/North Africa, development has already begun to alter the composition of the deficit in staple crops. As per capita income rises, the growth of human consumption of basic staples tends to taper off and consumption of livestock products increases.

On the supply side, however, the expansion in commercial poultry and dairy farms appears to have been realized with little or no coherent policy integrating domestic livestock production with crop production. As a result, increases in the demand for coarse grains—mostly for feed use—have caused the Middle East/North Africa to become heavily dependent on imports. In the late 1970s imports of coarse grains rose faster than any other cereal, including wheat. Consequently, with no evidence that supply policies have been effective in adapting production to the new realities of demand in the region, the wheat imbalance will probably diminish and future gaps will probably be dominated instead by the demand for feedgrains. Therefore, adjusting the crop mix through increased emphasis on coarse grain production could become an important strategy for improving self-reliance in food staples.

First, as shown in Table 17, the growth of demand for coarse grains in the region is expected to surpass that projected for wheat during the 1980-2000 period. Wheat consumption is expected to increase more slowly during the 1990-2000 interval. The largest decline in the growth of consumption of wheat and the largest increase in the consumption of coarse grains is projected to occur among the oil-exporting countries. In contrast, expansion of wheat consumption will probably continue to be high in the labor-exporting group, while expansion in coarse grain consumption is projected to be the lowest.

Changing Patterns in the Composition of the Gap

As shown in Chapter 6, if past trends continue, demand for food commodities in the region will surpass projected output, resulting in a gap of about 52 million tons in basic staples by the end of the century. Perhaps as important, projections also suggest that the composition of the gap will change considerably. Continued emphasis in the region on increasing wheat production, together with the rapid increase in the demand for coarse grains for animal feed, can be expected to diminish wheat's share of the deficit substantially. The wheat deficit, traditionally the largest component of the region's gap in basic staple foods, is expected to decline from 59 percent of the total deficit in 1980 to about 22 percent by the year 2000. Meanwhile, the gap in coarse grains is projected to expand rapidly, eventually reaching 36 million tons. By the year 2000 it could account for nearly two-thirds of the region's gap in staple foods.

However, the pattern of imbalance between wheat and coarse grains may not be the same in all three of the country groups. As shown in Table 18 and Figure 11, both wheat and coarse grain deficits are expected to continue to rise rapidly in the oil- and labor-exporting countries. Clearly, coarse grain imports to the oil-exporting countries could increase sharply, eventually surpassing wheat imports by the year 2000. However, because of the continuing change to a preference for wheat in the labor-exporting group, the resulting wheat deficits may still be

Table 17—Estimated average annual growth of wheat and coarse grain consumption, by country group, 1980-2000, 1980-90, and 1990-2000

Country Group/ Commodity	1980-2000	1980-90	1990-2000
		(percent)	
Region			
Wheat	3.1	3.3	2.9
Coarse grains	4.2	3.9	4.5
Oil-exporting countries			
Wheat	3.2	3.6	2.8
Coarse grains	5.2	4.7	5.7
Labor-exporting countries			
Wheat	3.3	3.4	3.2
Coarse grains	3.2	2.7	3.8
Major food-producing countries			
Wheat	3.0	3.1	2.9
Coarse grains	4.2	4.1	4.3

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

almost twice the size of the coarse grain deficits in the year 2000 in those countries.

For the major food-producing countries, the food situation could be quite different from that of the rest of the region. Continuing high production growth, combined with an anticipated decline in the growth of wheat consumption, could result in a substantial surplus of wheat among the countries of this group, particularly in the Sudan, Syria, and Turkey. If past trends continue, increased wheat production could result in almost 4 million tons of surplus wheat by 1990 and more than 11 million tons by the year 2000.

The Coarse Grain Strategy

Like the rest of the region, however, deficits in coarse grains are projected to rise in the major food-producing countries. Starting from a mere 1.3 million tons in 1980, deficits in these crops are expected to exceed 17 million tons by the year 2000 (see Table 18 and Figure 11). With both coarse grains and wheat imports expanding rapidly in the oil- and labor-exporting groups, and given the surpluses projected for wheat in the major food-producing countries, increased emphasis on coarse grain production could prove to be a viable strategy for this country group.

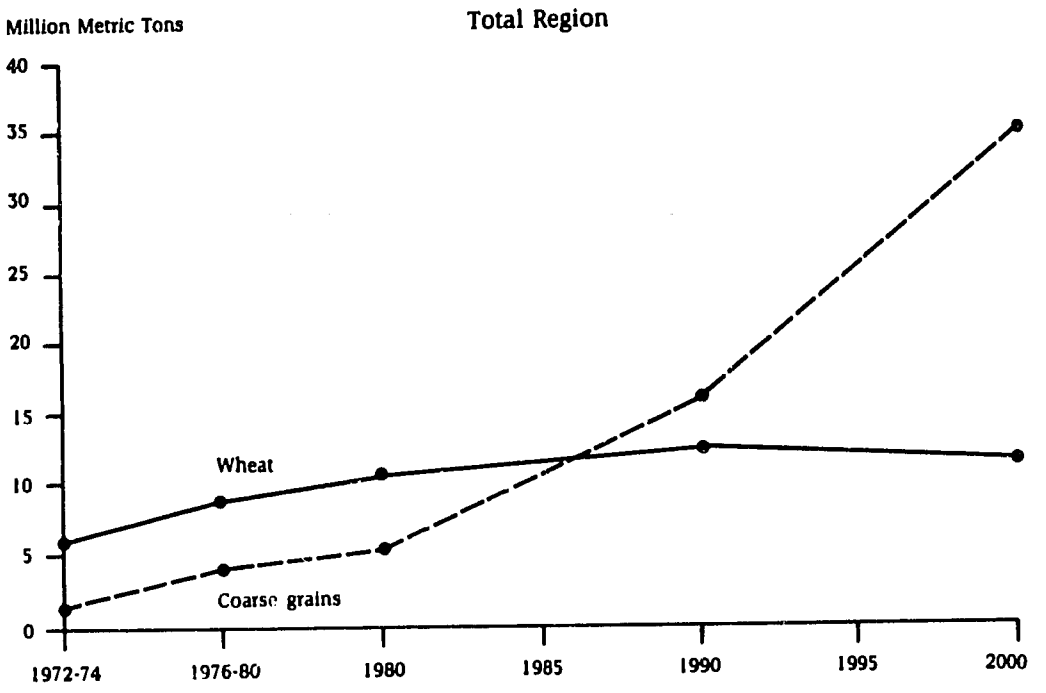
In contrast to wheat, in which large areas of the region have had a comparative advantage, evidence suggests that production conditions have not been favorable for increases in coarse grain output.[11] Coarse grains have had the lowest growth rate of all staples in the region. They have a lower value than other cereals, and area harvested continues to fall short of the historic average in most countries. The possibility that output would increase enough to be compatible with the rapidly rising demand for feed appears to have been adversely affected by unfavorable output prices and declining profitability. The net returns from coarse grains have also been depressed by rising labor costs, which may have been aggravated by rural migration.[12] At the same time, perhaps because human consumption of coarse grains is largely confined to the poor and to subsistence farmers, little effort has been made to apply yield-increasing technologies. Thus it appears that commercial poultry and dairy farms have expanded with little or no coherent policy to integrate domestic livestock production with crop production.[13]

[11] Higher demand and favorable output prices for wheat were reinforced by sowing higher quality land with wheat and by applying modern inputs intensively. During the 1970s about 2.5 million hectares in Afghanistan, Morocco, Syria, Tunisia, and Turkey—13-15 percent of the harvested wheat area—and more than 1 million hectares in Algeria, Iran, and Iraq (about 10 percent of the harvested wheat area) were sown in the new high-yielding seed varieties (Dana G. Dalrymple, *Development and Spread of High-Yielding Varieties of Wheat and Rice in the Less Developed Nations*, Foreign Agriculture Economic Research Report 95 [Washington, D.C.: U.S. Department of Agriculture, 1978]).

[12] At the peak of labor migration from the Yemen Arab Republic in 1975-78, higher labor costs and the decline in the profitability of coarse grains resulted in a decline in the area harvested of these crops of more than 0.3 million hectares (one-fourth of the total area allocated during the early 1970s).

[13] The development of barley's production is a case in point. Perhaps because of the decline in direct consumption of barley, its production growth has remained almost the lowest among staple crops in the region, despite the rapid increase in its use as animal feed—41 percent of total feedgrains by the late 1970s.

Figure 11—The gap between supply and demand of coarse grains and wheat by country group, historic averages and trend projections to 2000



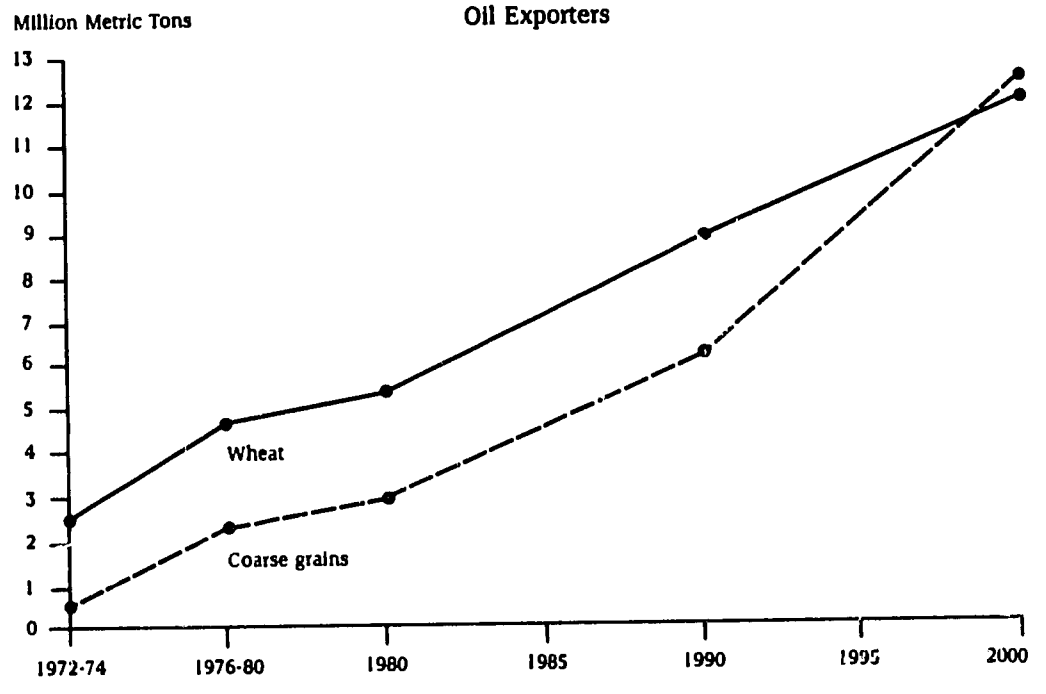


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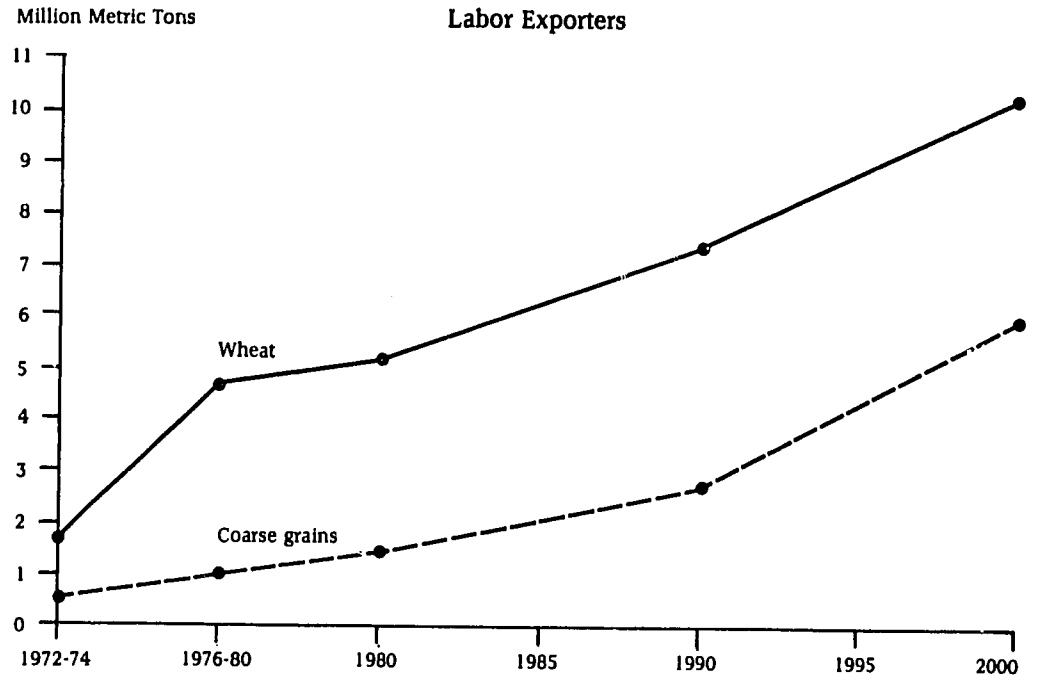
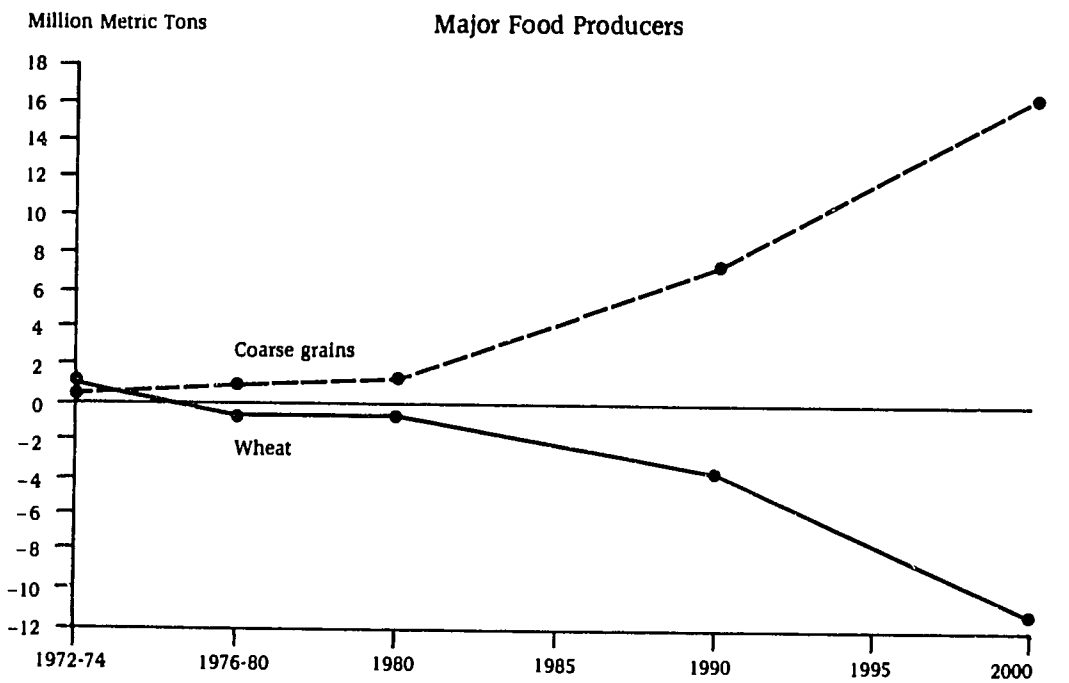
Figure 11—Continued





Source: Derived from basic data in Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 18—Production and consumption of wheat and coarse grains used as feed and food in 1980 and projections to 1990 and 2000, by country group

Country Group/Year	Wheat Production	Wheat Consumption			Coarse Grains Production	Coarse Grains Consumption		
		Total	Food	Feed		Total	Food	Feed
	(million metric tons)							
Region								
1980	36.0	46.1	30.1	7.1	22.9	28.7	10.3	15.4
1990	51.2	63.8	39.1	12.9	26.3	42.2	13.2	26.8
2000	74.3	85.2	46.1	22.7	30.3	65.7	16.2	45.7
Oil-exporting countries								
1980	8.5	13.9	10.6	1.9	2.8	5.8	1.5	3.9
1990	10.9	19.9	14.9	3.3	3.1	9.2	1.7	6.9
2000	14.1	26.3	18.0	6.5	3.5	16.1	2.1	13.3
Labor-exporting countries								
1980	2.2	7.3	5.6	1.1	4.8	6.3	3.2	2.5
1990	2.8	10.2	7.5	2.0	5.4	8.2	3.8	3.8
2000	3.7	14.0	9.6	3.4	6.0	11.9	4.8	6.8
Major food-producing countries								
1980	25.3	24.9	13.9	4.1	15.3	16.6	5.6	9.0
1990	37.5	33.7	16.7	7.6	17.8	24.8	7.7	15.1
2000	56.5	44.9	18.5	12.8	20.8	37.7	9.6	25.6

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

There are indications that advances in technology may favor barley and sorghum production over other crops, particularly in areas of the region where farming conditions are marginal for producing wheat. Applying this yield-raising technology could reduce the projected coarse grain imbalance in the major food-producing countries substantially. This could lead to increased intraregional trade in barley and sorghum with no significant reduction in the area harvested of other staple crops, such as wheat.

Data provided by the World Bank show that barley's yield could be at least 40 percent higher than the trend projection, whereas the yield for sorghum, the major crop in the Sudan, could more than double the trend-based projection for 1990.[14] Studies have also shown that barley may compete favorably with wheat in areas where rainfall is low and variable.[15] In areas where annual rainfall is less than 350 millimeters, which makes it hard to grow wheat, revenue earned from barley and sorghum could increase considerably. Table 19 shows that barley could be more profitable than wheat in the drier areas of the largest of the major food-producing countries—Turkey and Morocco. Substantial increases in net revenues are also shown in the same table for barley in Tunisia and Syria and for sorghum in the Sudan.[16]

As a result of the application of technol-

[14] The figures for Turkey are from V. Le-Si, P. L. Scandizzo, and H. Kasnakoglu, *Turkey Agricultural Sector Model*, AGREP Division Working Paper 67 (Washington, D.C.: World Bank, 1983). The figures for the Sudan are from World Bank, *Pricing Policies and Structural Balances*, Vol. 2: Statistical Annex Report No. 4523a-SU (Washington, D.C.: World Bank, 1983). The figures for Syria are from World Bank, Europe, Middle East, and North Africa Department, Southern Regional Agricultural Development, Report 3563-SYR (Washington, D.C.: World Bank, 1982). The figures for Tunisia and Morocco are obtained from a personal communication with J. B. Doolette of the World Bank, Europe, Middle East, and North Africa Department, 1984.

[15] See Economic Commission for Western Asia, *Agriculture and Development* 2 (May 1979); and International Center for Agricultural Research in the Dry Areas, *ICARDA Research Highlights, 1981* (Beirut: ICARDA, 1982).

[16] It should be noted that Turkey is the only country in the group where area harvested declined throughout the past decade. Limiting the area to the 1976-80 level for 1990 and 2000 (as assumed in this study) may cause underestimation of future allocation in coarse grain crops. Consequently, by restoring the area harvested to the level of the late 1960s, 0.7 million hectares could be added to future allocation, raising output by 2 million tons in 1990.

Table 19—Actual yield, cost, and revenue per hectare of barley or sorghum and wheat, 1976-80, and estimated potential with new technology in 1990, for selected countries

Country/ Commodity	Yield		Cost[a]		Net Revenue	
	Actual 1976-80	Potential 1990	Actual 1976-80	Potential 1990	Actual 1976-80	Potential 1990
	(metric tons/hectare)		(1980 U.S. $)			
Turkey						
Wheat	1.8	2.0	152	186	48	38
Barley	1.9	2.8	152	218	30	50
Morocco						
Wheat	1.0	1.5	97	160	76	146
Barley	0.9	1.3	79	101	88	153
Tunisia						
Wheat	0.8	1.5	156	242	65	173
Barley	0.7	1.5	133	195	7	105
Syria						
Wheat	0.7	1.2	152	277	61	88
Barley	0.7	1.3	117	244	51	70
Sudan						
Wheat	1.0	1.3	211	378	189	273
Sorghum	0.7	1.5	138	221	26	131

Source: World Bank, "Country Reports and Documents: 1981-1983," Washington, D.C., 1984 (computer printout).

[a] Cost excludes labor cost.

ogy in these two crops, future yields of coarse grains could rise, leading to greater output than projected for 1990 and 2000 (Table 20). First, potential coarse grain yields that include the effect of technology on barley and sorghum production are estimated for each of the major food-producing countries. Then the area projected for coarse grains is multiplied by the potential yield to compute the increment in output for each country. The payoff from this higher yield alone could boost projected coarse grain output for the major food-producing countries by more than 10 million tons in 1990 and 14 million tons by 2000 (see Table 20). This means that the major food-producing countries as a group could have a surplus of more than 4 million tons of coarse grains by 1990 without decreasing their projected wheat production. Thus Turkey and Tunisia could be approaching self-sufficiency in coarse grain crops, Syria could have more than 250,000 tons in surplus, while the Sudan could have nearly 6 million tons in exportable surplus.[17]

Looking at the trends to the end of the century, demand for coarse grains may surpass the production capacity of the major food-producing countries, except in the Sudan. However, by the year 2000, the gains in production from a concerted effort to increase production through new technology could close the gap for the major food-producing countries as a group, while the deficit could continue to grow in the rest of the region. By then, the Sudan's surpluses may have reached about 12 million tons.

[17] The potential yields for the individual countries in the major producing group are based on data provided by the World Bank, which are assumed to be applicable in this study to 1990 and 2000 for barley and sorghum in the Sudan. The size of the increase in output as derived for each country in the group is the product of the difference between the trend and the potential yield times the projected area harvested, where potential yield is a weighted average of the area harvested of the individual coarse grain crops.

Table 20—Trend projections of yield and area for coarse grains and potential increases with new technology for the major food-producing countries, 1990 and 2000

Country	Yield			Trend of Area		Increment of Output	
	Trend		Potential				
	1990	2000	1990	1990	2000	1990	2000
	(metric tons/hectare)			(1,000 hectares)		(1,000 metric tons)	
Afghanistan	1.43	1.46	1.55	814	801	98	72
Morocco	1.01	1.12	1.22	2,870	2,920	603	292
Sudan	0.54	0.47	1.26	6,852	10,425	4,933	8,236
Syria	0.63	0.64	1.40	1,717	1,972	1,322	1,499
Tunisia	0.71	0.84	1.27	615	786	344	338
Turkey	2.13	2.31	2.65	4,090	4,090	2,127	1,391
Total	1.01	0.92	1.58	18,299	24,301	9,427	11,828

Sources: World Bank, "Country Reports and Documents: 1981-1983," Washington, D.C., 1984 (computer printout); and Food and Agriculture Organization of the United Nations, "Implications of AT 2000 for the Near East and North Africa Region, 1980," proceedings of the Ninth Session of the Near East Commission on Agricultural Planning (ESP:NEAP 80/4), Damascus, July 1980 (mimeographed).

Notes: Cyprus is excluded for lack of data on potential yield. The potential yield of coarse grains is based on the FAO yield estimate for the 1990 period. Due to the declining trend for Turkey, area harvested for 1990 and 2000 is assumed fixed at the 1976-80 averages and the projected yield for 1990.

8

CONCLUSIONS

It has become apparent that the vast disparity of wealth that developed during the 1970s between the oil exporters and the rest of the region has become important in the evolution of the food gaps in the Middle East/North Africa. The enormous rise in oil revenues since 1973 brought about annual increases of 1 million tons in the staple food deficit in the oil- and labor-exporting countries. This deficit is projected to expand at a rate of 1.5 million tons a year. At this rate it could reach 48.5 million tons by the turn of the century.

Because of the scarcity of agricultural resources, the growth of food staple production in the agriculturally less well-endowed countries of the oil- and labor-exporting groups may continue to fall behind population growth and the future gap between supply and demand may continue to widen. Consequently, it is highly unlikely that the countries of these two groups will be able to close the gap with domestic production since this would necessitate a growth rate about five times greater than historically projected.

Only in the major food-producing countries have production advances in basic staples kept pace with the growth of demand. Like the rest of the region, efforts in these countries have been concentrated on increasing wheat production, leading to self-sufficiency in this crop or even to surpluses. Again, because of higher demand and favorable output for wheat prices, higher quality land was sown and about 2.5 million hectares—13.5 percent of the harvested wheat area in Turkey, Afghanistan, Syria, Morocco, and Tunisia—were sown with high-yielding varieties.

However, the surge in demand for coarse grains as animal feed together with the declining proportion used for human consumption of basic staples such as wheat is expected to alter the mix of crops that make up the gap, increasing the size of the coarse grain deficit. And because domestic coarse grain production has been depressed by unfavorable output prices and by the failure to apply yield-increasing technology, the rapid expansion in commercial poultry and dairy farms has caused imports of coarse grains to rise faster than imports of other cereals, including wheat. If this pattern of domestic utilization continues in the future, the wheat deficit would diminish while the deficit in feedgrains would grow.

Therefore, it appears that policies to encourage coarse grain production, especially barley and sorghum in the major food-producing countries, would be a viable strategy because it would help production to adapt to the rapidly rising demand for animal feed, narrow the grain gap, and promote greater complementarities in the production of primary livestock. In this country group, where land is still available for agricultural expansion, policies to promote the application of yield-increasing technology on drier land could reduce the trade imbalance in coarse grains without affecting wheat production.

In sum, the growing demand for livestock products will probably lead to increasing imports of coarse grains for feed. By increasing the emphasis of agricultural policy on coarse grain production, some of the countries of this group, such as Turkey, the Sudan, and Syria, could achieve surpluses. The proximity of the major food-producing countries to the oil- and labor-exporting countries could enhance the comparative advantage of their food exports to these countries. Such a policy might also promote self-reliance in the region and help to alleviate the concerns of some Middle Eastern countries about food security.

APPENDIX 1: METHODOLOGY, ASSUMPTIONS, AND DATA SOURCES

The data on major food crops and primary livestock products were provided by the Food and Agriculture Organization of the United Nations (FAO). The annual data for the period 1966-80 on production, consumption, and trade covers all countries in the Middle East/North Africa region included in FAO's "Supply Utilization Tape, 1981," except Kuwait and Oman. Data on these two countries were derived from the FAO "Supply Utilization Turnaround Document—Kuwait and Oman" for 1980/81. FAO also provided the five-year-interval estimates of income elasticities by commodity for each country, which were used in the consumption projections. Population estimates and projections were mostly those of the United Nations Department of Economic and Social Affairs, which were based on the 1978 assessment of world demographic data. The annual country data on GNP at constant 1980 prices used to provide estimates of trend growth of per capita income came from the World Bank.[18]

Trends of the different variables used in production, consumption, and trade were derived in this study from data for the 1966-80 period for each individual country, country group, and the total region.

Production Trends and Projections

Logarithmic trend equations were fitted to the 1966-80 country data on crop production, area harvested, and the primary livestock products: meat, milk, and eggs. Crop data were aggregated for cereals, noncereals, and basic staples in terms of wheat equivalents based on calorie content. Similarly, the various types of meat (poultry, mutton and goat, beef and buffalo, and pig) and milk (cow, buffalo, sheep, goat, and camel) were aggregated to derive the total figure.

The general equation fitted to time-series data was

$$Y_t = e^{a + bt}, \qquad (1)$$

where

Y_t = estimate of the variable in year t,

a = constant term, the logarithm of the variable's estimate for the base year, t = 0),

b = logarithm of the estimated value of one plus the variable's annual rate of change, and

t = period in years, starting from the base year.

For country-group rates, the average annual rate of change of the variable between two points in time was derived using the equation:

$$Y_t = Y_0 (1 + r)^t, \qquad (2)$$

where

Y_0 = estimate of the variable for the base year, and

r = annual rate of change in the variable.

Assuming a continuation in the historical trends for each country, the output projections were essentially extrapolations of these values, using equation (1). Thus, for all of the countries except the Sudan and Syria, the 1990 and 2000 projected values of staple crops (projected on the basis of cereal and noncereal groups) were based on the 1966-80 annual data. The 1961-80 annual data were used for the Sudan and Syria. For countries with negative growth rates, the 1976-80 average output was substituted for 1990 and 2000. Similarly, the 1966-80 data were extrapolated for each country, using equation (1) to derive the 1990 and 2000 projections for total meat, milk, and eggs.

However, because of the unusually high growth rates in some countries, particularly those of the oil-exporting group, a maximum limit was set in projections. In the case of meat production, a 6 percent annual growth rate was applied for Kuwait, Libya, and Saudi Arabia. For milk, the 1973-80 growth rate (9.3 percent annually) was used for Saudi

[18] United Nations, Department of Economic and Social Affairs, *World Population Prospects;* World Bank "GNP Data Tape, 1979-81."

Arabia. And a maximum limit of 8 percent annual growth was also applied to the eggs projection.

Total Domestic Utilization (Consumption)

Direct Human Consumption

To obtain direct human consumption figures, the trend estimates for per capita human consumption were obtained by fitting the 1966-80 annual data for each of the cereal crops and total noncereals to equation (1). Per capita food consumption was then projected to 1990 and 2000 on the basis of income elasticity estimates (five-year interval income elasticity for the respective crop) and the trend growth rates of per capita GNP (also based on the 1966-80 period) according to the equation

$$C_t = C_{1980}\,(1 + r_y n)^t, \qquad (3)$$

where

C_t = the per capita consumption of the commodity in year t,

C_{1980} = trend value of per capita consumption for the base year,

t = 1990 or 2000,

r_y = the trend annual growth rate of per capita income (real GNP), and

n = the income elasticity of demand for the commodity.

Projections on the total demand for direct human consumption were then computed using population projections. A maximum of 6.0 percent and a minimum of 0.5 percent were set on the annual growth rate of per capita income during the 1980-2000 projection period.

A similar procedure was followed for the direct human consumption of livestock products (meat, milk, and eggs). In the case of meat, the trend estimates fitting the 1966-80 annual data to equation (1) were obtained for each type of meat. Per capita consumption was then projected to 1990 and 2000 by type and total meat on the basis of income elasticity estimates and the trend growth rates of per capita GNP where lower and upper limits were set at 0.5 percent and 6.0 percent.

In the case of milk, aggregations were first performed on each type of milk. Total cow milk was derived by converting first the components (skim milk of cows, whole milk condensed, whole milk evaporated, skim milk evaporated, dry whole cow milk, dry skim cow milk, cheese from whole cow milk, and cheese from skim cow milk) into whole fresh milk equivalents, which were then added to fresh milk and cream of cow milk.

For total buffalo milk, the cheese and skim milk of buffalo were also converted first into milk equivalents and then added to the fresh milk of buffalo. Similarly, the cheese from sheep and goat milk and the skim milk of sheep were converted into milk equivalents and then added to fresh sheep and goat milk. As in the case of meat, the trend estimate of per capita direct milk consumption was projected to 1990 and 2000.[19]

Animal Feed

Trend estimates of the per capita feed use from staple crops and milk were obtained by fitting the 1966-80 annual data and then using equation (1) to project them. The per capita figure was then projected to the years 1990 and 2000 through equation (3), with the income elasticity of meat used as a proxy for the income elasticity of animal feed.

Seed, Waste, and Other Nonfood Uses

Historical seeding rates and egg breeding rates were applied to the projections of total harvested area for 1990 and 2000.

Waste allowances for staple crops, milk, and eggs were percentages of the countries' projected production in 1990 and 2000, which were assumed to be equal to the 1976-80 proportions.

High- and Low-Income Scenarios

The demand for staple crops and primary livestock products was also estimated for 1990 and 2000 on the basis of the high and low growth rates of income. In both scenarios

[19] In this study total milk was a linear summation of cow milk, buffalo milk, sheep and goat milk, and camel milk.

trend estimates of population growth were combined with a rising per capita income. Because income in the major food-producing countries rose faster during the earlier period 1966-73, the high-income scenario for that country group is based on the 1966-73 trend growth of per capita income. The estimates for the oil- and labor-exporting countries, however, are based on 1973-80 because those country groups experienced faster income growth in the later period. The opposite is true for the low-income scenario.

APPENDIX 2:
SUPPLEMENTARY TABLES

Table 21—Composition and distribution of staple crop consumption, by country group, 1966-70 and 1976-80 averages

Crop	Region		Oil-Exporting Countries				Labor-Exporting Countries				Major Food-Producing Countries			
	1966-70	1976-80	1966-70	Percent of Region	1976-80	Percent of Region	1966-70	Percent of Region	1976-80	Percent of Region	1966-70	Percent of Region	1976-80	Percent of Region
							(1,000 metric tons)							
Staple crops														
Total	53,513.6	79,199.5	12,332.0	23	21,318.7	27	10,830.3	20	15,037.8	19	30,350.8	57	42,847.7	54
Food	31,307.4	45,095.6	7,973.1	25	13,975.3	31	7,758.7	25	10,362.8	23	15,575.6	50	20,838.9	46
Feed	12,895.7	21,037.5	2,547.9	20	5,284.1	25	1,913.8	15	3,185.3	15	8,434.0	65	12,569.2	60
Cereals														
Total	50,628.6	74,802.2	11,869.8	23	20,469.5	27	10,146.1	20	14,197.0	19	28,612.6	57	40,135.7	54
Food	29,261.1	41,978.5	7,580.0	26	13,164.0	31	7,728.9	25	9,691.8	23	14,451.3	49	19,104.2	46
Feed	12,570.7	20,552.1	2,537.9	20	5,249.3	26	1,861.2	15	3,139.3	15	8,171.5	65	12,163.4	59
Wheat														
Total	27,821.5	43,331.3	7,626.2	27	13,018.6	30	3,984.8	14	6,681.9	16	16,210.5	58	23,630.4	55
Food	18,366.0	27,950.1	5,418.2	29	9,799.4	35	3,250.6	18	5,202.7	19	9,701.2	53	12,948.0	46
Feed	3,811.0	6,659.6	972.5	26	1,770.2	26	366.7	10	923.3	14	24,767.0	65	3,966.1	60

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).
Note: Figures may not add to total because of rounding.

Table 22—Consumption and production of staple food crops by country, 1966-70 and 1976-80 averages

Country Group/ Country	Total Staples				Total Cereals				Total Noncereals			
	1966-70		1976-80		1966-70		1976-80		1966-70		1976-80	
	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
	(1,000 metric tons)											
Oil-exporting countries												
Algeria	1,773.0	2,347.9	1,950.1	4,014.9	1,689.7	2,247.8	1,789.5	3,765.2	83.4	100.1	160.6	249.7
Iran	6,177.4	6,371.3	8,260.6	10,977.9	5,928.7	6,128.0	7,919.6	10,607.2	248.7	243.3	341.0	370.8
Iraq	2,238.2	2,271.3	1,869.4	3,284.4	2,187.5	2,207.7	1,811.2	3,197.7	50.7	63.6	58.2	86.6
Kuwait	...	133.0	0.1	316.9	...	124.1	...	295.8	...	9.0	...	21.2
Libya	172:1	384.9	274.4	813.3	155.0	364.0	234.2	757.8	17.1	21.0	40.1	55.5
Oman	5.5	35.7	:.8	121.1	3.7	31.5	5.6	113.6	1.8	4.2	2.2	7.4
Saudi Arabia	460.7	775.7	328.6	1,741.9	456.8	755.0	321.0	1,690.7	3.9	20.6	7.7	51.2
Labor-exporting countries												
Egypt	6,863.9	8,468.8	7,878.8	12,210.8	6,318.7	7,924.8	7,270.8	11,557.8	545.2	544.0	608.0	653.0
Jordan	267.1	397.4	107.1	490.3	224.2	356.3	92.1	461.1	42.9	41.1	15.6	29.1
Lebanon	108.3	628.7	91.1	824.1	70.1	585.9	54.9	772.6	38.2	42.8	36.2	51.5
Yemen Arab Republic	1,139.1	1,132.1	1,003.1	1,255.8	1,089.7	11,082.7	903.9	1,155.3	49.4	49.4	99.3	100.4
Yemen People's Democratic Republic	87.4	203.9	113.3	256.9	84.5	196.4	109.0	250.2	2.9	7.5	4.3	6.7
Major food-producing countries												
Afghanistan	3,704.5	3,779.4	4,300.0	4,307.9	3,625.9	3,697.7	4,189.0	4,198.1	78.6	81.6	111.0	109.8
Cyprus	190.5	263.4	175.3	442.3	138.5	231.9	120.5	416.8	52.0	31.5	54.9	25.4
Morocco	4,418.9	4,208.6	4,673.6	6,112.0	4,054.0	4,022.7	4,293.9	5,767.0	365.0	185.9	379.7	345.0
Sudan	2,335.3	2,455.9	3,978.2	4,144.7	1,801.3	2,143.5	2,886.2	3,456.4	533.9	312.4	1,092.0	688.3
Syria	1,416.6	1,570.9	2,797.7	2,578.2	1,238.4	1,440.7	2,537.7	2,377.1	178.2	130.2	260.0	201.0
Tunisia	774.0	1,078.7	1,079.4	1,724.2	725.5	1,031.0	976.7	1,632.0	48.5	47.6	102.7	92.3
Turkey	17,428.1	16,993.9	25,933.0	23,538.6	16,436.1	16,045.2	24,538.0	22,288.3	992.0	948.8	1,394.9	1,250.2

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 23—Composition and distribution of meat, milk, and egg consumption, by country group, 1966-70 and 1976-80

Country Group/Period	Meat										Eggs	
	Total		Beef and Buffalo		Mutton and Goat		Pig		Poultry			
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
Region												
1966-70	2,393.4	100	917.6	100	1,096.9	100	15.8	100	363.0	100	379.6	100
1976-80	3,955.5	100	1,339.6	100	1,497.8	100	25.0	100	1,043.1	100	813.8	100
Oil-exporting countries												
1966-70	577.5	24	148.6	16	328.2	30	2.1	13	98.6	27	98.3	26
1976-80	1,460.0	37	389.0	29	566.1	38	3.0	12	501.9	45	284.6	35
Labor-exporting countries												
1966-70	479.4	20	242.1	26	132.6	12	2.3	15	102.3	28	88.8	23
1976-80	658.6	17	311.2	23	143.4	10	5.8	23	198.2	18	127.9	16
Major food-producing countries												
1966-70	1,336.5	56	526.9	58	636.1	58	11.4	72	162.1	45	192.5	51
1976-80	1,836.9	46	639.4	48	788.3	52	16.2	65	393.0	37	401.4	49

Country Group/Period	Milk											
	Total		Cow		Buffalo		Sheep		Goat		Camel	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
Region												
1966-70	13,248.0	100	7,807.5	100	1,254.3	100	2,331.0	100	1,747.8	100	107.5	100
1976-80	19,357.1	100	12,843.4	100	1,533.0	100	2,945.2	100	1,916.5	100	119.0	100
Oil-exporting countries												
1966-70	3,306.1	25	1,971.8	25	86.3	7	750.3	32	452.8	26	44.9	42
1976-80	6,653.2	34	4,970.9	38	69.1	5	1,057.5	36	506.5	26	49.2	41
Labor-exporting countries												
1966-70	2,021.0	15	865.5	11	871.4	69	99.9	4	180.6	10	4.2	4
1976-80	2,982.7	15	1,480.8	12	1,179.8	77	118.6	4	199.0	10	4.6	4
Major food-producing countries												
1966-70	7,920.9	60	4,970.2	64	296.5	24	1,480.8	64	1,115.0	64	58.4	54
1976-80	9,721.1	51	6,391.7	50	284.1	12	1,769.1	60	1,211.0	64	65.3	55

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982, and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 24—Consumption and production of meat, milk, and eggs by country, 1966-70 and 1976-80 averages

Country Group/ Country	Total Meat				Total Milk				Eggs			
	1966-70		1976-80		1966-70		1976-80		1966-70		1976-80	
	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
	(1,000 metric tons)											
Oil-exporting countries												
Algeria	90.6	94.2	132.5	147.2	475.4	680.1	699.5	1,432.8	11.4	12.0	18.1	49.7
Iran	285.7	290.3	584.1	741.1	1,653.3	1,692.6	2,366.7	2,898.8	48.6	49.4	133.6	152.0
Iraq	97.4	99.3	137.5	165.5	429.9	492.5	475.9	815.9	8.9	16.7	19.2	22.8
Kuwait	4.5	23.4	4.4	75.0	11.9	97.0	25.7	247.0	1.3	6.5	2.8	13.5
Libya	18.4	31.1	39.7	103.7	49.2	99.5	106.3	256.4	2.0	3.1	12.1	12.3
Oman	3.2	3.6	4.8	12.3	32.4	39.3	36.9	79.8	0.3	0.4	0.7	1.7
Saudi Arabia	11.3	35.7	27.9	215.2	106.2	205.1	358.8	922.5	6.8	10.2	19.1	32.6
Labor-exporting countries												
Egypt	321.7	334.5	384.3	447.3	1,417.6	1,434.6	1,881.4	2,116.7	53.9	53.9	84.8	82.6
Jordan	14.9	20.5	25.0	40.4	47.7	78.5	43.1	145.5	5.6	8.7	9.5	11.6
Lebanon	28.2	55.7	32.5	63.8	96.0	209.0	101.0	246.2	28.8	16.6	20.5	18.2
Yemen Arab Republic	55.4	55.6	63.6	92.5	213.5	220.4	251.9	355.1	8.0	8.0	10.3	12.7
Yemen People's Democratic Republic	8.1	13.0	11.1	14.6	42.7	78.4	44.9	119.3	1.2	1.6	1.6	2.8
Major food-producing countries												
Afghanistan	188.7	188.7	209.6	209.6	819.1	817.3	824.5	834.0	16.1	16.1	16.7	16.7
Cyprus	25.3	30.3	40.5	44.5	56.3	83.1	83.0	110.3	5.2	5.1	6.5	6.0
Morocco	181.4	182.8	197.3	218.9	469.7	543.2	631.7	730.8	41.9	41.9	70.4	70.4
Sudan	233.9	228.3	336.1	330.0	1,193.2	1,216.8	1,447.0	1,490.1	16.3	16.3	28.5	28.5
Syria	74.6	64.7	109.1	113.5	529.0	586.9	760.5	919.2	13.8	15.9	51.2	52.3
Tunisia	52.3	51.7	81.0	89.9	210.5	274.7	260.2	453.5	12.2	12.3	26.1	27.0
Turkey	600.8	590.1	841.1	830.6	4,368.6	4,398.9	5,190.4	5,183.2	84.9	84.9	200.4	200.4

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 25—Composition and distribution of production of staple food crops, by country group, 1966-70 and 1976-80 averages

Crop/Period	Region	Oil-Exporting Countries		Labor-Exporting Countries		Major Food-Producing Countries	
	Amount	Amount	Percent of Region	Amount	Percent of Region	Amount	Percent of Region
	(1,000 metric tons)			(1,000 metric tons)		(1,000 metric tons)	
Total staples							
1966-70	49,560.6	10,826.9	22	8,465.8	17	30,267.9	61
1976-80	64,822.3	12,691.1	20	9,194.0	14	42,937.2	66
Total cereals							
1966-70	46,228.2	10,421.3	23	7,787.2	17	28,019.7	61
1976-80	60,054.0	12,081.3	20	8,430.7	14	39,542.0	66
Wheat							
1966-70	23,762.5	6,636.3	28	1,680.3	7	15,445.9	65
1976-80	34,270.7	8,221.2	24	2,040.9	6	24,008.6	70
Rice							
1966-70	2,904.5	868.8	30	1,604.5	55	431.2	15
1976-80	3,173.4	1,053.7	33	1,614.7	51	505.0	16
Coarse grains							
1966-70	19,561.2	2,916.2	13	4,502.4	23	12,142.6	62
1976-80	22,609.8	2,806.4	13	4,775.1	21	15,028.3	66
Total noncereals							
1966-70	3,332.4	405.6	12	678.6	20	2,248.2	68
1976-80	4,768.5	609.9	13	763.4	16	3,395.2	71

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Notes: Figures may not add to total because of rounding. Production of staple food crops is expressed in cereal equivalents. Coarse grains include barley, maize, rye, oats, millet, sorghum, and other cereals not elsewhere included. Noncereals include roots and tubers, pulses, groundnuts, and bananas.

Table 26—Composition and distribution of meat, milk, and egg production, by country group, 1966-70 and 1976-80 averages

Country Group/Period	Meat										Eggs	
	Total		Beef and Buffalo		Mutton and Goat		Pig		Poultry			
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
Region												
1966-70	2,296.3	100	890.4	100	1,045.5	100	14.1	100	346.4	100	367.0	100
1976-80	3,262.0	100	1,141.3	100	1,279.1	100	22.2	100	819.4	100	732.1	100
Oil-exporting countries												
1966-70	511.1	22	137.6	15	290.2	28	1.3	9	82.1	24	79.3	22
1976-80	930.8	28	260.6	23	361.9	28	1.7	8	306.6	38	205.5	28
Labor-exporting countries												
1966-70	428.2	19	219.4	25	103.4	10	1.7	12	103.7	30	97.5	27
1976-80	516.5	16	253.1	22	116.4	9	4.4	20	142.6	17	126.7	17
Major food-producing countries												
1966-70	1,357.0	59	533.4	60	651.9	62	11.1	79	160.6	46	190.3	51
1976-80	1,814.7	56	627.5	55	800.8	63	16.2	72	370.1	45	399.9	55

Country Group/Period	Milk											
	Total		Cow		Buffalo		Sheep		Goat		Camel	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
Region												
1966-70	12,222.2	100	6,759.3	100	1,279.8	100	2,329.9	100	1,745.8	100	107.5	100
1976-80	15,589.2	100	9,088.1	100	1,561.4	100	2,906.9	100	1,913.8	100	119.0	100
Oil-exporting countries												
1966-70	2,758.3	22	1,416.8	25	86.1	7	757.8	33	452.7	26	44.9	42
1976-80	4,069.6	26	2,413.6	38	68.9	4	1,031.7	35	506.3	26	49.2	41
Labor-exporting countries												
1966-70	1,817.6	15	638.9	9	896.6	70	99.6	4	178.2	10	4.2	4
1976-80	2,322.3	15	795.1	9	1,207.6	77	118.2	4	196.8	10	4.6	4
Major food-producing countries												
1966-70	7,646.3	63	4,703.5	70	297.1	23	1,472.4	63	1,114.9	64	58.4	54
1976-80	9,197.3	59	5,879.5	65	284.8	19	1,757.1	61	1,210.6	64	65.3	55

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).
Note: Figures may not add to total because of rounding.

Table 27—Composition and distribution of area harvested of staple food crops, by country group, 1966-70 and 1976-80 averages

Crop/Period	Region	Oil-Exporting Countries		Labor-Exporting Countries		Major Food-Producing Countries	
	Amount	Amount	Percent of Region	Amount	Percent of Region	Amount	Percent of Region
	(1,000 metric tons)			(1,000 hectares)		(1,000 hectares)	
Total staples							
1966-70	46,167.1	13,577.8	29	4,026.7	9	28,562.6	62
1976-80	50,808.7	13,943.6	27	3,759.0	7	33,106.1	65
Total cereals							
1966-70	43,281.5	13,179.8	30	3,636.8	8	26,464.8	61
1976-80	46,872.8	13,388.7	29	3,368.9	7	30,115.2	64
Wheat							
1966-70	24,189.7	8,951.2	37	740.7	3	14,497.8	60
1976-80	26,355.6	9,275.9	35	814.9	3	16,264.8	62
Rice							
1966-70	1,210.6	473.7	39	459.2	38	277.7	23
1976-80	1,157.7	434.3	38	433.7	37	289.8	25
Coarse grains							
1966-70	17,881.2	3,754.9	21	2,436.9	14	11,689.3	65
1976-80	19,359.5	3,678.5	19	2,120.3	11	13,560.6	70
Total noncereals							
1966-70	2,885.6	398.0	14	389.9	14	2,097.8	73
1976-80	3,935.9	554.9	14	390.1	10	2,990.9	76

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).
Note: Figures may not add to total because of rounding.

Table 28—Average annual growth rates of imports and exports of staple food crops, by country group, 1966-80, 1966-73, and 1973-80

Country Group/ Period	Wheat		Rice		Coarse Grains		Total Cereals		Total Noncereals		Total Staples	
	Im- ports	Ex- ports	Im- ports	Ex- ports	Im- ports	Ex- ports	Im- ports	Ex- ports	Im- ports	Ex- ports	Im- ports	Ex- ports
	(percent)											
Region												
1966-80	9.99	-10.96	18.65	-12.40	17.74	9.84	12.23	9.60	8.06	0.94	12.03	-2.69
1966-73	8.18	-1.30	48.22	-3.01	29.08	-6.02	11.32	0.47	7.85	-4.66	11.12	1.90
1973-80	58.22	-5.02	3.33	-6.47	49.02	-1.59	3.95	4.67	-4.14	0.31	3.98	0.26
O -exporting countries												
1966-80	16.83	-25.89	21.94	5.40	21.33	-16.37	17.99	-24.81	11.04	-19.94	17.56	-19.96
1966-73	15.40	2.52	50.23	1.93	33.88	-20.66	15.69	-0.49	12.87	-5.09	15.46	-1.43
1973-80	9.28	-49.82	22.96	31.51	23.49	-20.72	13.70	41.72	6.80	-22.02	13.57	-37.09
Labor-exporting countries												
1966-80	8.72	24.18	2.16	-12.89	12.54	6.26	9.13	-12.74	5.81	-3.25	9.02	-10.74
1966-73	2.36	18.62	1.83	2.86	26.86	6.14	2.35	-4.39	1.91	1.73	2.15	-3.17
1973-80	10.61	6.33	6.20	-9.55	37.71	17.23	13.06	-5.76	14.52	2.12	13.07	-2.59
Major food-producing countries												
1966-80	4.10	2.31	13.67	39.21	13.05	-7.56	7.56	0.95	2.69	2.71	7.47	5.31
1966-73	7.68	5.78	55.28	29.66	15.37	2.94	15.27	6.52	7.56	5.70	15.04	7.11
1973-80	62.84	24.63	13.91	25.65	56.41	1.65	-6.56	19.29	-18.06	0.44	-6.56	12.65

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Note: Figures may not add to total because of rounding.

Table 29—Trend-based projections of staple food production and consumption, by country, 2000

Country Group/Country	Production	Total Domestic Use	Food	Feed
		(1,000 metric tons)		
Oil-exporting countries				
Algeria	2,822.0	9,909.7	5,512.4	3,615.5
Iran	14,954.0	24,953.5	13,245.5	10,434.9
Iraq	1,772.7	9,087.0	4,400.0	4,256.3
Kuwait	...	800.6	500.0	300.6
Libya	743.7	1,902.4	1,060.1	674.5
Oman	18.5	305.8	241.5	37.1
Saudi Arabia	281.0	3,369.9	2,046.7	1,261.5
Labor-exporting countries				
Egypt	10,922.4	24,483.2	13,991.4	8,778.8
Jordan	73.2	1,476.4	616.9	827.0
Lebanon	93.6	1,410.1	810.4	567.0
Yemen Arab Republic	953.0	2,933.5	2,232.8	550.1
Yemen People's Democratic Republic	208.1	772.6	679.1	77.0
Major food-producing countries				
Afghanistan	6,093.3	7,274.7	5,884.3	941.4
Cyprus	161.0	735.5	107.9	597.9
Morocco	5,817.5	14,106.6	6,304.3	6,704.4
Sudan	10,164.0	8,557.6	6,215.2	943.5
Syria	4,891.3	6,510.9	2,039.8	3,882.2
Tunisia	2,385.8	3,945.6	1,055.7	2,407.5
Turkey	55,000.3	46,729.4	10,449.1	24,633.1

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).
Note: Figures may not add to total because of rounding.

Table 30—Trend-based projections of meat, milk, and egg production and consumption, by country, 2000

Country Group/ Country	Meat		Milk		Eggs	
	Production	Consumption	Production	Consumption	Production	Consumption
	(1,000 metric tons)					
Oil-exporting countries						
Algeria	328.7	634.4	1,647.0	4,603.6	49.8	275.6
Iran	2,105.9	2,616.9	5,165.4	7,940.7	755.0	875.5
Iraq	287.9	972.3	596.2	3,358.6	102.1	197.4
Kuwait	59.1	205.2	130.7	660.4	14.5	40.0
Libya	165.6	271.9	556.9	655.0	70.6	34.4
Oman	10.9	49.0	49.1	192.7	3.5	13.8
Saudi Arabia	332.6	796.4	2,206.0	2,544.8	27.6	242.0
Labor-exporting countries						
Egypt	581.5	1,429.2	3,766.3	5,783.8	266.7	240.7
Jordan	47.4	320.6	44.1	968.9	25.9	63.5
Lebanon	37.4	157.3	109.0	601.6	30.6	41.7
Yemen Arab Republic	81.0	447.4	336.3	1,995.6	18.6	72.6
Yemen People's Democratic Republic	23.9	86.1	50.1	463.5	2.7	15.8
Major food-producing countries						
Afghanistan	216.1	379.4	849.5	1,463.7	18.4	32.1
Cyprus	119.9	80.3	195.1	242.9	10.3	9.9
Morocco	315.0	836.0	1,178.0	2,211.6	209.1	260.7
Sudan	744.0	646.6	2,182.8	2,823.0	88.7	62.6
Syria	273.2	478.0	1,459.9	3,460.4	278.2	496.1
Tunisia	221.5	423.1	370.3	1,188.3	131.2	79.6
Turkey	1,827.9	2,586.4	7,400.9	12,019.8	1,070.3	579.8

Sources: Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982; and Food and Agriculture Organization of the United Nations, "Supply Utilization Account Turnaround Document—Kuwait and Oman, 1980/81," Rome, 1981 (computer printout).

Table 31—Population by country and country group, 1966-70 and 1976-80 averages and projections to 2000

Country Group/Country	1966-70	1976-80	2000
		(1,000)	
Region	189,203	247,448	440,706
Oil-exporting countries	57,909	78,802	151,856
Algeria	13,496	18,024	36,016
Iran	26,687	35,869	65,420
Iraq	8,782	12,227	24,270
Kuwait	627	1,217	3,166
Libya	1,832	2,751	5,768
Oman	619	840	1,651
Saudi Arabia	5,866	7,875	15,565
Labor-exporting countries	42,352	53,326	88,799
Egypt	31,714	39,881	64,672
Jordan	2,158	2,988	5,894
Lebanon	2,340	3,013	4,891
Yemen Arab Republic	4,701	5,654	9,962
Yemen People's Democratic Republic	1,439	1,790	3,380
Major food-producing countries	88,943	115,319	200,051
Afghanistan	16,186	20,900	36,654
Cyprus	614	646	711
Morocco	14,305	19,038	36,149
Sudan	13,442	17,394	31,270
Syria	5,867	8,111	16,291
Tunisia	4,922	6,045	9,563
Turkey	33,606	43,186	69,413

Source: United Nations, Department of Economic and Social Affairs, *World Population Prospects as Assessed in 1973 (1970-2000)* (ST/ESA/SER.A/60), 1977.

APPENDIX 3: COMPARISON OF THE CEREAL GAP PROJECTIONS

Comparative Analysis of IFPRI and FAO Projections

The large food deficits in the Middle East/North Africa that are projected in this study are also anticipated in other regional and international studies, but there are differences in the projections. In Table 32 the possible size of the cereal deficits as projected in this report[20] are compared with those shown in the FAO global study, *Agriculture: Toward 2000*.[21] For comparability, coverage in the table is limited to cereal crops in the Middle East/North Africa (designated the Near East region by FAO). It includes 15 countries: Afghanistan, Cyprus, the People's Democratic Republic of Yemen, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Oman, Saudi Arabia, the Sudan, Syria, Turkey, and the Yemen Arab Republic.

The trend-based projections of the International Food Policy Research Institute (IFPRI) for 1990 and 2000 are compared to the trend and A and B scenarios of FAO. Scenario A assumes that the region will achieve the economic growth targets of the United Nations' International Development Strategy, whereas scenario B is based on an assumption of more modest growth for the economies of these countries.

As shown in Table 32, IFPRI cereal gaps appear to correspond closely to those of the A and B scenarios but fall short of trend projections by 2 million tons in 1990 and 5 million tons in 2000.

Although IFPRI and FAO use the same source for their data, the FAO study uses a different base period (1961-79) than IFPRI (1966-80). In part because of this, IFPRI's estimates of cereal output and total utilization (consumption) trends exceed those of the FAO scenarios.[22] On the production side, lower cereal projections in the FAO study may have resulted from placing upper boundaries on the countries' projections, where growth rates in land and water resources, investment, gains in productivity, and market constraints are considered. On the consumption side, given that the projected population growth rates and the income elasticity of demand for human consumption in the two studies are essentially the same, IFPRI's higher estimates must have been largely affected by the use of a higher growth rate for per capita income. Thus by extending the data on per capita GNP through 1980, the region would be expected to show a higher average annual growth rate of 5.4 percent for the 1980-2000 period compared to 3-4 percent in the FAO projections.

Furthermore, extending the historical data to 1980 increases the per capita utilization of feed in the region and this, together with the inclusion of the elasticity of demand for meat (a proxy for the elasticity of feed) in the IFPRI projections, contributes substantially to the higher figure for future cereal consumption.

Comparative Analysis of Arab Organization for Agricultural Development (AOAD) and IFPRI Cereal Projections

There are also differences between the IFPRI projections and those prepared for AOAD.[23] Both the AOAD and IFPRI studies anticipate continuing increases in demand-

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[20] The cereal projections in this report closely follow those for 90 developing countries in Leonardo Paulino, "Food in the Third World."

[21] Food and Agriculture Organization of the United Nations, *Agriculture: Toward 2000* (Rome: FAO, 1981).

[22] This contrasts, however, with the FAO provisional projections where cereal output is expected to reach 85.2 million tons by 1990 and 115.2 million tons by 2000. These figures imply that output will expand at an annual rate of 3.3 percent during the period 1975-2000 compared to 1.3 percent by 1990 and 2.2 percent by 2000 in the final FAO report, and 2.8 percent annually in the IFPRI projections. See Food and Agriculture Organization of the United Nations, "Implications of AT 2000 for the Near East and the North Africa Region," proceedings of the Ninth Session of the Near East Commission on Agricultural Planning, Damascus, July 1980, Table 38 (mimeographed).

[23] Ahmed A. Goueli, *Future of the Food Economy in the Arab Countries*, vol. 1 (Khartoum: Arab Organization for Agricultural Development, 1979 [in Arabic]).

Table 32—Comparison of IFPRI trend and FAO trend and A and B scenarios for projections of cereal output and demand, 1990 and 2000

Variable Projected	FAO Scenarios						IFPRI	
	Trend		A		B		Trend	
	1990	2000	1990	2000	1990	2000	1990	2000
	(million tons)							
Production	63	71	69	89	65	78	73	99
Consumption	81	106	85	114	82	108	89	129
Net balance	-18	-35	-16	-25	-17	-30	-16	-30

Sources: Food and Agriculture Organization of the United Nations, *Agriculture Toward 2000* (Rome: FAO, 1981), Table 5; and Food and Agriculture Organization of the United Nations, "Supply Utilization Tape, 1981," Rome, 1982.

Notes: The countries include Afghanistan, Cyprus, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Oman, the People's Republic of Yemen, Saudi Arabia, Sudan, Syria, Turkey, and the Yemen Arab Republic.

Under FAO's Scenario A, it is assumed that the region will achieve the economic growth targets of the United Nations' International Development Strategy, whereas Scenario B is based on an assumption of more modest growth.

supply imbalances in cereals in the Arab states between 1980 and 2000.

The AOAD projects cereal gaps for a region that includes Algeria, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Saudi Arabia, the Sudan, Syria, Tunisia, the Yemen Arab Republic, and the People's Democratic Republic of Yemen. According to this report the cereal gap was about 12 million tons in 1980 and is expected to reach 27 million tons by 2000. The AOAD gap for 1980 is about 1 million tons smaller than IFPRI's and the gap for the year 2000 is much smaller still—by nearly 21 million tons (Table 33).

Deficits in 1980 are smaller in the AOAD study for all countries except Egypt and Morocco. The AOAD study projected that the Sudan would have a moderate surplus where IFPRI projected a deficit, and IFPRI projected that Syria would have a surplus where AOAD projected a deficit.

The AOAD estimates for cereal output are higher than the IFPRI estimates, for 1980 by about 2 million tons and for 2000 by 6 million tons. Output in 1980 is estimated to be larger for all countries except Morocco and Syria. AOAD's individual country outputs for the year 2000 exceed those of IFPRI, except for Morocco and Syria.

AOAD's estimates of total consumption are higher than IFPRI's by nearly 2 million tons in 1980, but IFPRI's country estimates are higher for Kuwait, Lebanon, Libya, Morocco, Oman, Saudi Arabia, the Sudan, and Tunisia.

By the year 2000, however, AOAD's projected estimates of demand will fall behind those of IFPRI by more than 12 million tons. Projections are lower for every country with the exception of Lebanon, the Sudan, and the Yemen Arab Republic.

The differences between the two sets of projections have arisen for several reasons. First, AOAD estimates use national country data for 1960-77, whereas the IFPRI study uses FAO's country data for 1966-80.

Second, the AOAD projections reflect a positive growth rate in cereal production for all countries, expanding for the region as a whole by 2.4 percent a year between 1980 and 2000. Although the IFPRI projections place no upper boundaries on the countries' output, the output projected is assumed to be fixed at the 1976-80 average for countries that had a negative growth rate during the 1966-80 period. This was true for Iraq, Jordan, Lebanon, Saudi Arabia, and the Yemen Arab Republic, resulting in a relatively lower output projection for the Arab region as a whole: 2.1 percent annually over the 1980-2000 period compared to 2.4 percent in the AOAD projections.

Third, with respect to projected demand, it is not known what set of population and income growth values were used in the AOAD estimations. Their figures, which fall considerably behind those of IFPRI, especially for the year 2000, may reflect the unavailability of consumption data for the most recent years. Had these data been extended through 1980, they would have reflected

Table 33—Comparison of AOAD trend and IFPRI trend-based projections of cereal production, consumption, and deficits, by country, 1980 and 2000

Country	1980					
	AOAD			IFPRI		
	Production	Consumption	Difference	Production	Consumption	Difference
	(1,000 metric tons)					
Algeria	2,496.9	4,104.9	-1,608.0	1,827.5	3,887.9	-2,060.4
Egypt	8,830.1	13,459.1	-4,629.0	7,413.0	11,318.8	-3,905.8
Iraq	2,400.0	3,454.4	-1,054.4	1,811.2[a]	3,224.0	-1,412.8
Jordan	141.6	475.3	-333.7	92.1[a]	429.5	-337.4
Kuwait	...	263.7	-263.7	...[a]	353.2	-353.2
Lebanon	88.3	754.6	-666.3	54.9[a]	790.7	-735.8
Libya	366.3	474.8	-108.5	234.2	853.5	-619.3
Morocco	3,804.3	5,267.2	-1,462.9	4,401.9	5,876.7	-1,474.8
Oman	3.4	81.6	-78.2	8.6	133.9	-125.3
Saudi Arabia	284.1	1,409.5	-1,125.4	321.0[a]	1,557.6	-1,256.6
Sudan	3,423.8	3,352.7	71.1	3,222.2	3,665.0	-442.8
Syria	2,137.4	2,658.9	-521.5	2,663.2	2,505.8	157.4
Tunisia	1,135.2	1,534.4	-399.2	1,119.3	1,664.8	-545.5
Yemen Arab Republic	1,305.2	1,515.2	-210.0	903.9	1,052.3	-148.4
Yemen People's Democratic Republic	126.2	286.9	-160.7	117.7	255.2	-137.5
Total	26,542.8	39,093.2	-12,550.4	24,190.7	37,588.9	-13,398.2

Country	2000					
	AOAD			IFPRI		
	Production	Consumption	Difference	Production	Consumption	Difference
	(1,000 metric tons)					
Algeria	3,943.4	7,592.1	-3,648.7	2,365.4	8,694.4	-6,329.0
Egypt	11,222.6	21,376.6	-10,154.0	9,825.1	22,801.8	-12,976.7
Iraq	5,560.0	6,334.8	-774.8	1,811.2[a]	8,738.6	-6,927.4
Jordan	296.8	990.9	-694.1	92.1[a]	1,446.6	-1,354.5
Kuwait	...	510.8	-510.8	...	789.3	-789.3
Lebanon	108.0	1,510.9	-1,402.9	54.9[a]	1,330.1	-1,275.2
Libya	674.4	882.6	-208.2	545.9	1,681.8	-1,135.9
Morocco	4,860.0	8,388.3	-3,528.3	5,318.0	12,657.9	-7,339.9
Oman	6.7	107.0	100.3	15.9	305.8	-289.9
Saudi Arabia	684.6	2,977.0	-2,292.4	321.0[a]	3,220.9	-2,899.9
Sudan	7,937.1	7,004.9	932.2	9,165.8	6,634.5	2,531.3
Syria	3,767.9	4,993.4	-1,225.5	4,204.9	5,529.8	-1,324.9
Tunisia	2,001.0	2,417.9	-416.9	1,992.3	3,291.1	-1,298.8
Yemen Arab Republic	1,715.4	2,286.6	-571.2	903.9	1,945.3	-1,041.4
Yemen People's Democratic Republic	193.7	470.9	-277.2	197.3	677.3	-480.0
Total	42,971.6	67,844.7	-24,873.1	36,813.7	79,745.2	-42,931.5

Sources: Ahmed A. Goueli, *Future of the Food Economy in the Arab Countries*, vol. 1 (Khartoum: Arab Organization for Agricultural Development, 1979); and Food and Agriculture Organization of the United Nations, *Agriculture Toward 2000* (Rome: FAO, 1981).

Note: Bahrain, Djibouti, Mauritania, Qatar, Somalia, and the United Arab Emirates are excluded for lack of comparable coverage.

[a] The growth rate of cereal output was negative in these countries during 1966-80.

more completely the effects of rising oil revenues on per capita GNP, and the projected consumption would have been higher than was reported.

And, finally, extending the consumption data in the IFPRI study through 1980 appears to have had a considerable effect on the figures for per capita feed use. This, together with the utilization of the relatively high income elasticity of demand for meat, must have contributed to the discrepancy in total consumption between both projections.

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