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FACTORS AFFECTING THE IMPORT OF WHEAT  
IN SAUDI ARABIA

By

Abdullah I. Al-goosi

A PLAN B PAPER

Submitted to  
Michigan State University  
in partial fulfillment of the requirements  
for the degree of

MASTER OF SCIENCE

Department of Agricultural Economics

1980

## ACKNOWLEDGMENTS

I wish to extend my appreciation to the Department of Agricultural Economics for providing me with the opportunity to pursue a program of graduate studies at Michigan State University.

Special acknowledgment is due to Dr. Donald Mitchell for serving as my Academic Advisor, for his guidance and comments in the formulation of my program of course work, and for his wise counsel and suggestions in the preparation of this paper.

I appreciate, too, Dr. John Brake for serving on my committee and for his review of my paper.

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## CHAPTER I

### INTRODUCTION

#### A. Problem Identification

The modern economy of Saudi Arabia depends primarily on oil exports. Oil being the source of most of the country's exports, foreign exchange, and government revenues, it follows that the oil sector affects the economy rather than the economy affecting the oil sector.

Saudi Arabia lacks natural resources for most of its essential goods and because of sudden high income, it has become necessary to introduce new strategies for producing necessary goods and services. Since Saudi Arabia depends more on foreign trade than most other countries in the world, it has to export almost all of the oil it produces--oil being the country's only export commodity. Thus, Saudi Arabia is almost entirely dependent on the international market, which is, in turn, affected by oil prices.

Like the oil sector, agriculture has also received the Saudi Arabian government's keen attention. The agricultural sector is estimated to have contributed 1035.9

million riyals in 1970, about 6.5 percent of the Gross Domestic Production.<sup>1</sup>

The agricultural sector's annual growth rate was 4.1 percent in 1968, 3 percent in 1969, then estimated in 1970 at about 4 percent. Whereas this rate is less than those for other sectors in the Kingdom, it is not low when compared with growth rates in the developing countries.

The Kingdom's imports of all goods have been increased at an average annual rate of about 70 percent, but in 1976 rose by 83 percent. The value of foodstuff imported financed by commercial banks in 1976 rose by 10 percent, while the value of other imports increased by 61 percent.

Imports of food grains rose by about 12 percent<sup>2</sup> per annum in the period between 1956 and 1970. Imports of wheat, flour, and rice rose increasingly because of the factors mentioned earlier.

Wheat is considered to be the principal agricultural crop in Saudi Arabia. In the last few years domestic wheat crops faced many production and marketing problems, such as increasing demand and fluctuating supplies of wheat and flour. Thus, this paper provides a

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<sup>1</sup>Ministry of Planning, Development Plan, 1970.

<sup>2</sup>Ibid.



study of the factors that affect imports of wheat and flour, such as an increase in oil export and population.

#### B. Objectives of the Study

The main objectives of this Plan B paper can be defined as follows:

1. To estimate the demand equation for imported wheat and flour during the period between 1960 and 1976.
2. To identify the most important factors affecting the imported quantities of this commodity.

Secondary objectives of the study are:

1. To identify the most important socio-economic factors affecting the Saudi economy.
2. To give a general picture of the balance of payments and its effect on foreign trade.
3. To introduce the Kingdom's background position of production and imports for wheat and flour.

#### C. Plan of the Study

This study is presented in seven parts. Chapter II presents a background of Saudi Arabia and the agricultural sector. Chapter III is a description of the oil sector, the source of income upon which the Kingdom's economy depends. Chapter IV describes the balance of

payments and foreign trade conditions. Chapter V is a descriptive analysis of both world and Saudi Arabian internal conditions of production, imports, and exports for wheat and flour. Chapter VI is a quantitative analysis for wheat and flour in Saudi Arabia. Chapter VII includes the summary and recommendations on how to reach self-sufficiency of wheat production or at least to reduce the quantities of imported wheat and flour.

## CHAPTER II

### BACKGROUND CONDITIONS IN SAUDI ARABIA

#### A. Geography and Climate

The Arabian peninsula, of which the Saudi Arabian state forms by far the largest part, covers well over three million square kilometers (Saudi Arabia itself comprises 2,300,000 square kilometers--nearly 900,000 square miles, or about one-third the size of the United States). The population of Saudi Arabia is estimated to be over nine million people.

Saudi Arabia is bordered on the north by Kuwait, Iraq, and Jordan; on the east by Muscat and Oman, Trucial Oman, Qatar, and the Arabian Gulf; on the south by Yemen and Hadramout; and on the west by the Red Sea.

Of all the sizeable countries on the earth, Saudi Arabia is probably the driest. The dryness of the air reaching Saudi Arabia and the consequent lack of clouds, produces very high summer temperatures--about 100 to 120 degrees. Rainfall is scanty, irregular, and unreliable, occurring mostly during the months from October to April. The annual rain fall averages about five inches, except along the Red Sea coast, and inland over the mountains

of Asir, where annual rainfall approaches fifteen inches.

There are two major consequences of Saudi's geography. First, there are only four population centers in the Kingdom. In the western region are Jeddah, Taif, and the religious cities of Mecca and Medina. In the middle region are the capital city of Riyadh and the city of Buraydah. On the east coast are the cities of Dammam, Khobar, and Alhafof. Second, the opportunities for agricultural development are limited. Huge oil revenues give the country a high income per capita rate, resulting in more diversified tastes, and increasing quantities of imported food. Only 0.13 percent of the land is cultivated and the total area utilized for agriculture and forests is less than 3 percent. The total area planted with field crops is 395,000 hectares, and efforts to expand this area appreciably would be very costly.

The majority of people live in villages, and they, as well as those living in more remote areas, are dependent on agriculture, which supports approximately 55 percent of the population. Any effort to improve employment opportunities for this portion of the population would require the transfer of a substantial part of the labor force from agriculture to other sectors of the developing economy. Development policy cannot rely upon agriculture to provide

much opportunity for that proportion or for rising per capita incomes of the type implied by a rate of economic growth of over 10 percent a year.

### B. The Population

Until recently the problem of the arid terrain and consequent scarcity of good soil sharply controlled the way of life within Saudi Arabia. Apart from a few fishermen and traders, Saudi Arabia was able to support only a small population, estimated at 1.5 to 2 million in the 1930s.

Out of a total population of approximately nine million, the labor force numbers about 1.5 million, some of whom are unskilled, and most of them from Yemen. Agriculture's share numbers about 60 percent of the total population, and approximately 20 percent of the total population is employed in the public sector.

The structure and pace of Saudi economic development is conditioned by the lack of skill in the labor force more than by any other factor.<sup>1</sup> The Saudi government with its low population should utilize foreign skilled workers instead of unskilled workers.

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<sup>1</sup>Donald A. Wells, Saudi Arabian Development Strategy (Washington: American Enterprise Institute for Public Policy Research, 1976), p. 15.

### C. Agricultural Development

The Ministry of Agriculture and Water is the main body responsible for agricultural development in Saudi Arabia.

The area of cultivated land in the Kingdom is estimated at about 525,000 hectares, which is about 12 percent of the estimated arable land of about 4.5 million hectares. Of the total cultivated land, about 121,000 hectares are irrigated and about 404,000 hectares are rain-fed. Surveys undertaken by the Ministry of Agriculture have revealed that if the scarcity of water as a constraint on agricultural development is removed through the discovery and development of water resources, the total area of cultivated land could be more than doubled in the short run. In the long run, after more detailed studies and extensive development of infrastructure have been carried out the entire arable land could become cultivated, thereby helping the Kingdom realize its goals of self-sufficiency in the production of at least some of the major food crops.

Agriculture has historically absorbed a large proportion of the labor force. Given the difficult physical conditions, the agricultural sector's average annual growth in value added did not exceed 1.6 percent at constant prices between 1960 and 1971. Over the first

five-year plan (1971-1975), the average annual growth rate rose to 3.6 percent compared with a plan target of 4.6 percent per annum. Consumption of food has been increased at a faster rate due to a rise in both population and income. Consequently, the deficit had to be compensated for by increasing imports.

Estimates of agricultural production by major crops for the period 1973 to 1975 are shown in Table 1. The total production of the eleven major crops indicated in the table rose by 40 percent, from 1,764,000 tons in 1973 to 2,474,000 tons in 1974. In 1975 there was a small decline as compared with 1974, but still a substantial growth of 36 percent as compared with 1973. Among individual crops, the production of wheat, sorghum, and tomatoes increased by 98 percent, 368 percent, and 66 percent, respectively, over the two-year period. All other crops except dates also registered substantial, though smaller, percentage increases. Notwithstanding the small size of the crops by international standards, it is highly encouraging to note the trend of increased output in a country where development of agriculture has generally been considered improbable.

#### D. Economic Development

Saudi Arabia is faced with two choices--the choice of the level of exporting crude oil and the choice of the

TABLE 1.--Estimated Production of Agricultural Crops  
(thousand tons)

	1973	1974	1975
Wheat	135.0	192.0	175.0
Sorghum	27.3	115.9	127.9
Millet	9.9	11.5	10.9
Barley	11.0	15.4	16.7
Tomatoes	181.8	201.0	301.4
Dry onions	42.9	152.0	50.5
Other vegetables	46.8	84.3	68.9
Watermelons	63.7	120.5	271.4
Citrus fruit	13.9	18.9	19.5
Alfalfa	867.8	1202.7	1018.5
Dates	363.9	360.0	337.3
TOTAL	1764.0	2474.2	2397.7

SOURCE: Bulletin of Agricultural Current Sample Survey, from 1973-1975, Statistics Division, Department of Research and Development, Ministry of Agriculture and Water.



type of economic development. These choices are very important because they determine the future characteristics of the Saudi's economy.

Economic development with minimum feasible degree of inflation continues to be the cornerstone of economic policy. Government efforts are being directed toward the implementation of the Development Plan, which aims at the realization of the country's long-run growth and welfare objectives within the shortest possible span of time. The principle goals of the plan are to attain a high rate of economic growth (as shown in Table 2) and to reduce the country's dependence on oil exports through expansion in agriculture, industry, and mining production, with particular emphasis on petrochemical advantage.

Therefore, the country's commitment is toward encouraging the private sector (through subsidies and other incentives) to play a vital role in the growth and modernization of Saudi Arabia.

TABLE 2.--Second Plan Growth Rates

	Average Annual Plan Projection at Constant Prices	First Year Actuals 1976	Second Year Actuals 1977
Total GDP	10.2	8.4	15.7
Oil Sector	9.7	0.7	15.5
Non-Oil Pri- vate Sector	13.4	16.7	18.0
Agriculture	4.0	4.0	--
Manufacturing	14.0	12.0	--
Construction	15.0	30.0	--
Transport and Communication	15.0	30.0	--
Storage	15.0	23.9	--
Government Sector	12.9	26.1	11.8

SOURCE: Second Development Plan for Projections and Control Department of Statistics, Ministry of Finance, for actuals.

## CHAPTER III

### OIL SECTOR IN SAUDI ARABIA

#### A. Production and Revenues

Saudi Arabia ranks first in oil-exports in the world. The importance of Saudi Arabia's oil sector in terms of both production and revenues is shown in Table 3, p. 14.

The gradual recovery in the world economy, along with some supply restriction, generated a higher demand for oil. This led to an increase of 7.9 percent in world oil production, which rose from 20,116.7 million barrels in 1975 to 21,705.3 million barrels in 1976. Saudi Arabian oil production also increased to 8.5, 7.1, and 8.6 million barrels, respectively, in 1974, 1975, and 1976. The rise in the 1976 production figure contrasts with the fall of 5 percent in 1975 and an insignificant rise in 1974. The level of Saudi's production had increased, by the end of 1976, to a cumulative revenue of more than 100 billion dollars.

The Kingdom's oil revenue, as shown in Table 4, rose by 19.8 percent in 1976 to \$30,747.5 million. Of this total, payments by Aramco amounted to \$29,937.3

TABLE 3.--Crude Oil Production, Oil Revenue and Government Budget

Year	Daily Average (Million Barrels) <sup>a</sup>	Quantity Growth of Daily Average %	Oil Revenues (Million \$U.S.)	Government Budget Revenues (Million S.R.) <sup>b</sup>
1960	1.3		333.7	2786
1961	1.5		377.6	2166
1962	1.6		409.7	2452
1963	1.8		607.7	2686
1964	1.9		523.2	3112
1965	2.2		662.6	3961
1966	2.6		789.7	5025
1967	2.8		909.1	4937
1968	3.1		926.8	5535
1969	3.2		958.6	5966
1970	3.8		1213.9	7940
1971	4.8	25.5	1884.9	11,120
1972	6.0	26.5	2744.6	15,368
1973	7.6	25.9	4340.0	22,810
1974	8.5	11.6	22573.5	98,247
1975	7.1	-16.6	24676.2	95,847
1976	8.6	21.6	30747.5	110,935

SOURCE: Ministry of Finance and Economic Reports, 1977.

<sup>a</sup>ARAMCO Only<sup>b</sup>S.A.: Saudi Riyal

rate in the previous year due to lower growth in the oil sector GDP. It may be noted that the real GDP had already registered an overall growth of 88 percent during the First Plan period (1971 to 1975), implying a compounded growth rate of 13.4 percent per annum. The nonoil private sector has shown substantial buoyancy as its real GDP has manifested an average annual growth of 17 percent per annum during the first two years of the Second Development Plan (1976 to 1980), after having already doubled over the First Plan period.

#### B. Oil as the Springboard for Development

The use of oil as a base for economic development by means of industrialization has been a central point of Saudi Arabian policy for some time. After 1973, the spectacular growth in revenues changed the scale of the operation. More money was available with which to pay for the projects, and the danger of relying on only one source of income became increasingly apparent. For these two reasons, the size and degree of planned diversification increased.

Another change taking place after 1973 was the Saudi Government's objective to exchange oil for industrialization. This plan was formulated because Saudi Arabia was and still is producing far more oil than is needed in terms of immediate expenditure.

The desire for industrialization has its origins in many sources: First, its being the traditional way by which economics have developed; Second, the dependence of the country on the international markets; Third, inflation and political uncertainty rendering accumulated foreign financial investments a dubious means of securing the future of the economy; and finally, the only long-term answer to the inevitable depletion of the petroleum resources being to move the economy away from its exclusive dependence on oil into other fields of economic activity.

Given these basic reasons for the drive to industrialize, to base it on oil was the next logical step. At present the majority of Saudi oil and gas is exported in its crude state, and other needed goods are imported. Therefore, the value added by processing the oil and gas into energy products or petrochemicals is lost to the Saudi economy. To begin to process it locally was expected to provide the needed impetus to the whole economy. The core of the program is "Petromin's Grand Plan," which was finally approved at the end of 1974, at a cost of \$13 billion.

## CHAPTER IV

### FOREIGN TRADE AND BALANCE OF PAYMENTS

Due to a combination of circumstances, including the high rates of oil production and the low absorptivity of the economy, Saudi Arabia's foreign trade and balance of payments presently show, unlike most industrial or developing countries, a trade and a currency surplus which may be termed large according to international standards. However, a combination of factors discussed later in this chapter should help explain that this phenomenon is short-lived and that the trend of rapid decline in this surplus is expected to continue until the surplus is substantially reduced in the near future.

#### A. Exports

As mentioned in previous chapters, Saudi Arabia depends on foreign trade as do few other countries in the world. Oil is the country's only export commodity.

Exports of crude and refined oil by Aramco, Getty, and Arabian Oil Companies generated gross receipts at posted prices of \$38,501.4 million in 1976 compared with \$8,993.9 million in 1974 (Table 5). The value of non-oil

TABLE 5.--Direction of Oil Exports (Million U.S. Dollars)

	1973	1974	1975	1976
Grand Total	8993.9	35622.1	29579.3	38501.4
Crude	8327.6	33500.8	27649.3	36183.3
Refined	666.3	2121.3	1930.0	2318.1
Western Hemisphere Total	1196.5	5677.5	5542.3	8355.7
U.S.A.	369.5	1269.8	1043.1	1816.5
West Europe	4738.6	18346.0	12918.1	15829.2
E.E.C. Total	3881.3	15074.6	10715.3	13012.3
Belgium	162.3	1225.7	882.9	982.9
France	832.4	4102.8	3223.1	4435.4
Germany	300.7	1559.9	1033.3	1210.0
Italy	900.0	3675.7	2254.0	2445.6
Netherlands	835.9	918.0	1514.5	1982.5
U.K.	722.8	3310.3	1764.6	1897.9
Other Western Europe	857.3	3271.4	2184.0	2788.5
Middle East	327.0	1087.3	932.3	1108.8
Other Asia Total	2214.4	8932.8	8850.7	1168.5
Japan	1332.3	5647.9	5827.2	7703.2
Others	517.4	1578.4	1335.9	1523.1

SOURCE: Derived from Aramco Annual Reports.



exports is estimated at about \$81 million in 1976, or less than one-fifth of 1 percent of oil exports.

In 1976 the largest share of the Kingdom's oil exports went as usual to Western Europe. It may be noted that although Western Europe continues to be the largest importer of Saudi Arabian oil, its share has steadily declined from 52 percent in 1974 to 44 percent in 1975 and 41 percent in 1976.

With respect to individual countries, Japan retained its position as the single largest customer. Although trailing far behind Japan, the second largest customer, was France. Countries that showed a notable increase in their share were the United States and the Netherlands.

#### B. Imports

Implementation of the Development Plan, rising personal incomes, high propensity to import, and rising international prices all contributed to an increase in imports (Table 6).

Import increases were witnessed in oil, public, and private sectors. As usual, the largest share of imports was at the initiative of the private sector, followed by the public and oil sectors.

This surge in imports has tended to have a somewhat depressing effect on the high rate of inflation in

TABLE 6.--Imports, c.i.f. (million riyals)

Year	Oil Sector	Public Sector	Private Sector	Total
1972	443	1590	3736	5769
1973	529	1551	6426	8506
1974	748	3590	10237	14575
1975	915	3979	18518	25412
1976	1112	6514	39001	46627

SOURCE: Total imports are derived from IMF Direction of Trade. Oil and public sectors from SAMA sources.

the Saudi economy (the rate of inflation is highest on imported goods and on housing), and it is hoped that the expected further increase in supplies, together with the demand management policy and other measures adopted by the government, such as reducing taxes, subsidies, and reducing the electricity rates, will foster a substantial reduction in the rate of inflation in the economy.

A general picture of the commodity composition may be obtained from the data on imports financed through commercial banks (Table 7).

Saudi Arabia is a food-deficit country. While demand for food, stimulated by higher incomes and growing population, rose at an increasing rate during the last twenty years, changes in tastes and traditional habits

TABLE 7.--Private Sector Imports Financed Through Commercial Banks (Million Riyals)

	1972	1973	1974	1975	1976
Foodgrains	170.0	353.2	597.7	633.5	711.5
Fruits and Vegetables	38.6	54.0	44.4	106.9	91.6
Sugar, Tea and Coffee	110.9	121.8	305.1	475.1	240.5
Livestock and Meat	143.8	159.9	194.0	253.8	314.2
Other Foodstuffs	267.7	323.6	508.0	896.7	1,253.8
Total Foodstuffs	731.0	1,012.5	1,648.9	2,366.0	2,611.6
Textiles and Clothing	286.1	400.8	557.0	1,042.6	1,478.6
Building Materials	236.5	431.6	824.4	918.1	1,906.5
Machinery and Appliances	601.3	744.5	1,446.0	2,980.5	4,514.9
All Other Goods	828.5	978.1	1,876.2	3,477.9	5,646.3
TOTAL	3,110.4	4,121.9	7,616.2	13,280.0	20,216.9

SOURCE: Saudi Arabian Monetary Agency.

accompanying the considerable shift of population toward urban centers, also contributed to this rising demand. Such changes were stimulated by the spread of more efficient marketing channels, a development that reinforced the demand for certain imported foodstuffs in relation to demand in general. Demand for preserved foods, which are not produced domestically, increases as well at a rapid rate.<sup>1</sup>

There has been almost complete dependence on imports in the case of rice, sugar, and topical beverages and major dependence on imported wheat, meat, and some dairy products.

While the volume of foodstuffs financed by the commercial banks in 1976 rose by 10 percent to Rls 2,611.6 million, there has been a consistent decline in the share of foodstuffs in relation to total imports from 25 percent in 1973 to 22 percent in 1974, 18 percent in 1975, and 13 percent in 1976. This is to be expected in a rapidly developing country like Saudi Arabia with its rapid rise in personal income and development outlay.

The level of imports is influenced by the amount of foreign exchange, foreign aid, and loans and reserves. There is not restriction on imports; if there were, the

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<sup>1</sup>Edmond Asfour, Agriculture--Economic Aspects in Saudi Arabia, American University of Beirut, Economic Research Institute, 1965.

imports of food would be affected. Such a development could take place against a background of free market policy. In fact, before 1966 the government subsidized essential food imports to the extent of about 17 percent of their value, although subsidization had been reduced for some commodities.

### C. Balance of Payments

The balance of payments is the account of the country's economic relationships with the rest of the world. The Saudi Arabia balance of international payment was dominated by three accounts. Export of petroleum on current account was the principal source of international receipts. Payments for imports of goods and services were about one-fourth to one-fifth the level of current-accounts receipts in the early 1970s, but the largest payment account was investment income.<sup>1</sup>

One result of the Saudi balance will be a strong position for the Saudi Riyal. The value of the riyal will appreciate against the other major currencies.

In converging riyal amounts to the U.S. dollar, the official exchange rate has been used as follows:

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<sup>1</sup>Donald A. Wells, Saudi Arabian Revenues and Expenditure. Washington: Resources for the Future Baltimore (New York: Johns Hopkins University Press, 1974).

1960 - Nov. 1971	\$1 = 4.5 riyal
Dec. 1971 - Jan. 1973	= 4.145 riyal
Feb. 1973 - July 1973	= 3.73 riyal
Aug. 1973 - July 1974	= 3.55 riyal
Aug. 1975	= 3.52 riyal
1976	= 3.45 riyal
1978	= 3.38 riyal

These figures are according to the market rate for each period. The riyal equivalent value of dollar revenues during next period will, of course, vary with the market rate of exchange.

Saudi Arabia's strong balance of payments position and its strong currency will increase the money supply and will help to protect its real income. The balance of payment position of Saudi Arabia (Table 8) moved in the expected direction of lower current account surplus and smaller increase in official reserves. The sudden spurt in current account surplus and official reserves witnessed in 1974 started declining in the following years as foreign exchange outlays outstripped income. The balance of trade (Table 9) has been increased year after year due to the increase of oil exporting.

It is worth pointing out here that the surplus will probably decline even faster than heretofore expected. This is because the port congestion having been eliminated, imports are expected to rise faster to fulfill the consumer,

TABLE 8.--Balance of Payments (Million riyals)

Current Accounts	1970	1971	1972	1973	1974	1975	1976
A. Total Receipts	10971	17610	23523	34952	130052	113123	149310
B. Payments	10688	13605	17671	27054	50997	64542	101611
C. Balance	283	4005	5852	7898	79055	48671	47699

SOURCE: Derived from IMF.

TABLE 9.--Balance of Trade (Million riyals)

	1968	1969	1970	1971	1972	1973	1974	1975
Imports	4392	4851	4990	5205	6306	8272	13192	18612
Exports	8589	9086	10302	15189	19862	30012	87459	97380
Balance Of Trade	4197	4235	5312	9984	13559	21740	74267	78768

SOURCE: IMF



imports are expected to rise faster to fulfill the consumer, construction, and developmental needs of the economy.

Additionally, rising personal incomes, the Saudi economy's high propensity to import, and the large volume of credit being extended by various government-sponsored credit institutions are bound to induce an accelerated flow of imports.

CHAPTER V  
DESCRIPTIVE ANALYSIS OF THE CONDITIONS  
OF WHEAT AND FLOUR

The objective of this descriptive analysis is to present, before the identification of the most important factors affecting the imported wheat and flour in Saudi Arabia, the basic conditions of production, exports, and imports of wheat and equivalent wheat at the internal and world market level.

A. Wheat Production

1. World Production

World wheat production in 1976 was estimated at 413.4 million tons, 11 percent more than the 1973 production of 366.9 million tons (Table 10). There was a sharp increase of 63.1 million tons (18 percent) over the previous year, 1975. This increase in production was a result of high prices for wheat plus the generally favorable conditions for sowing and cultivation in most of the major producing countries.

The total area devoted to world wheat is estimated at 237.2 million hectares, almost 6 percent more than in

TABLE 10.--World Wheat Production (Million metric tons)

Countries	Average 1970-74	1975/76	1976/77	1977/78
North America		78.04	85.29	77.18 <sup>a</sup>
South America		11.61	16.06	9.57
Europe (EEC)		38.09	39.55	38.55
Western Europe		48.52	51.11	47.86
Eastern Europe		28.48	34.49	34.50
Soviet Union				
(Europe and Asia)		66.22	96.88	90.00
Africa		8.92	10.35	7.99
Asia		95.78	106.99	102.92
Oceania		12.49	12.19	9.51
World Total	346.5	350.06	413.36	379.60

SOURCE: USDA

<sup>a</sup>Preliminary.

1973. The average yield rose to about 4400 Kg./Hect. due to the use of high-yielding wheat varieties.

## 2. Internal Production

The tentative program for Saudi Arabia recommended by the Ford Foundation would plant Mexican wheat in addition to seedlings of domestic durums.

The land presently devoted to irrigated wheat production is estimated at about 95 thousand hectars. Present national average production of wheat is estimated to be around 100,000 tons in the arid years and 150,000 tons in the rainy years (see Table 11). Domestic wheat production amounts to only one-third of the consumption of wheat and wheat products in Saudi Arabia.

TABLE 11.--Wheat Production in Saudi Arabia

	Area 1000 HA	Yield KG/HA	Production 1000 m. ton
1961-65	92	1431	132.0
1966-70	100	1458	145.8
1971	122	1230	150.0
1972	125	1200	150.0
1973	120	1250	150.0
1974	75	1200	90.0
1975	143	1346	193.0
1976	146	1408	205.0

SOURCE: FAO

The important factors affecting wheat production in Saudi Arabia are as follows:

1. The amount of rainfall.
2. Competition with other agricultural crops for limited land resources.
3. Domestic wheat prices higher than prices for new varieties and/or imported wheat.
4. Low hectare productivity (average yield per hectare), which could be improved by growing different varieties of wheat having high productivity, as well as using optimal inputs for wheat production.

Important inputs for the increased production of wheat would include (1) fertilizer, (2) pesticides, (3) some mechanization, (4) improved seed, (5) improved water management, and (6) improved farm management. The development of an agricultural extension and research program to implement items (4), (5), and (6) is discussed in the Ford Foundation reports and adopted in the Agricultural Sector plan (1975 to 1980).<sup>1</sup>

The Ministry of Agriculture and Water has implemented several programs in keeping with its aim to increase grain production. The government offers both

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<sup>1</sup>Ford Foundation.

output and input subsidies. Output subsidies are, in fact, subsidies on land and labor inputs and thereby attract more resources into the production of subsidy goods. Combined with subsidies on inputs, these are expected to substantially expand the production of the subsidized commodities. Existing subsidies appear in Table 12.

## B. Wheat and Flour Exports

### 1. World Exports

The major wheat and flour suppliers can be grouped into five zones: Argentina, Australia, Canada, Western Europe (EEC), and the United States. Wheat and flour supplies are shown in Table 13, which presents the five major exporting countries and their imports and exports for 1974/75 and 1976/77.

World trade in wheat and flour in 1976/77 as measured by exports amounted to 61.0 million tons (excluding EEC intra-trade). World trade fell by 5.5 million tons compared to the previous year, to the lowest level since 1971/72, when it amounted to 52.5 million tons.

In 1976/77 exports in relation to countries with developed economics amounted to 12.2 million tons; 1.6 million tons less than 1975/76.

World trade in durum amounted to 3.1 million tons in 1976/77, about 0.3 million tons less than 1975/76. The

TABLE 12.--Current Agricultural Subsidies

	Year Introduced	Amount
<u>Inputs</u>		
Farm Machinery	1973	45 percent of price
Fertilizers	1973	50 percent of price
Animal Feed (36 percent protein)	1973	50 percent of price
Poultry Farms	1974	30 percent of price
Dairy Farms	1974	30 percent of price
Transportation of 200 or more dairy cattle	1975	Total Cost
<u>Outputs</u>		
Wheat	1973	SR 0.25/Kg.
Sorghum	1973	SR 0.25/Kg
Rice	1973	SR 0.30/Kg
Sheep	1974	SR 10.00/head
Camels	1974	SR 50.00/head

SOURCE: Ministry of Agriculture and Water Bulletin, 1974.

TABLE 13.--Wheat and Flour Supplies in Five Exporting Countries (Million tons: Wheat equivalent)

	1974/75		1976/77	
	Exports	Imports	Exports	Imports
Argentina	1.7	--	6.0	--
Australia	8.6	--	9.7	--
Canada	10.7	--	13.4	--
EEC	7.9	5.8	4.8 <sup>a</sup>	3.7 <sup>a</sup>
U.S.A.	27.7	0.1	25.9	0.1
TOTAL	56.6	5.9	59.8	3.8

SOURCE: World Wheat Statistics (International Wheat Council).

<sup>a</sup>Excluding new crop wheat harvested before July 1.

world trade in durum wheat was 3.8 million tons and 2.8 million tons in 1970/71 and 1972/73, respectively.<sup>1</sup>

Exports from the three major exporting countries, Canada, the United States, and Argentina, amounted to 1.63 million tons, 1.08 million tons, and 0.35 million tons, respectively, in 1976/77. This represents an increase of about 0.1 million tons in exports from Canada, and 0.2 million tons from Argentina, while exports from the United States declined by 0.6 million tons compared to the previous period.

<sup>1</sup>World Wheat Statistic.



World trade in wheat flour in 1975/76 was estimated at 5.23 million tons, compared with 4.89 million tons and 5.65 million tons in 1973/74 and 1970.71 respectively.

## 2. Internal Exports

As mentioned earlier, Saudi Arabia does not produce most of the agricultural products it needs. Since 1978, FAO and USDA reported that Saudi Arabia exported some of its wheat, an amount that does not exceed one or two thousand tons. If a country produces an amount equal to about one-third of its consumption of wheat, we do not expect exports from that country, except in the form of aids or donations to poor countries like South Yemen. Also some producers prefer to sell domestic varieties of their products in Qatar, Bahrain, or Kuwait (countries very dependent on imported wheat) in order to gain more profit in these higher-priced markets.

## C. Wheat and Flour Imports

### 1. World Imports

The United States is the largest wheat exporting country. It accounted for 41.9 percent of the total volume of world wheat trade in 1976/77. Its shipments of wheat and wheat flour amounted to 25.7 million tons in 1976/77.

In 1976/77 there were considerable reductions in shipments to Western Europe (from 4.1 million tons to 2.1 million tons), USSR (from 4.0 million tons to 2.9 million tons) and South America (from 4.4 million tons to 2.9 million tons). As one might expect, costs of shipping grains have increased in the past few years. The rate of increase has been much higher on some routes than others. Major factors are the port facilities and types of carriers involved.<sup>1</sup>

Exports by Canada amounted to 17.9 million tons in 1977/78. The EEC, China, and USSR at 2.4 million tons, 1.9 million tons, and 1.2 million tons were the largest importers of Canadian wheat in 1977/78. The most important importers were India, Japan, and Egypt. Shipments under food aid programs from different countries in 1976/77 are estimated to be higher than the preceding years.

## 2. Internal Imports

Domestic wheat production amounted to one-third of the consumption of wheat and wheat products in Saudi Arabia. The deficit is supplied by importing wheat and wheat flour. Imports of wheat and flour, on a wheat-equivalent basis, more than doubled during the ten years from 1965 to 1975 (Table 14).

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<sup>1</sup>FAO: Review on Agriculture and Development  
12 (January-February, 1979).

TABLE 14.--Imported Wheat and Flour in Saudi Arabia  
(1000 metric tons)

Year	USA	Australia	EEC	Canada	Other	Total
1960-1979 <sup>a</sup>	--	--	--	--	--	203
1970/71	134	119	50	8	3	316
1971/72	138	120	67	5	--	330
1972/73	149	56	90	3	--	298
1973/74						
1974/75	287	67	157	15		526
1975/76	307	88	187	10		592
1976/77	262	54	122	1		449

SOURCE: World Wheat Statistic

<sup>a</sup>Average

The decline of imported wheat and flour in 1968, 1969, and 1973 is explained by the normalization of imports after their decline because of the Middle East wars and the closing of the Suez Canal, as well as the normalization of customs tariff which resulted in a significant rise in imports through official channels.

There is a free and competitive import policy for grains purchased from many sources, depending on prices and quality. The three major exporters of wheat and flour to Saudi Arabia during the period between 1965 and 1975 are the United States (averaging 51 percent),

Australia (averaging 23 percent), and EEC (averaging 51 percent). Canada exported a small percentage of its wheat and flour, estimated at 3.4 percent during the same period.<sup>1</sup>

#### D. Export and Import Prices

The growing imbalance between world supply and demand pointed up a substantial increase in carry-over stocks, especially in the five major exporting countries. In 1971, the export prices of wheats was 15 to 20 percent below those of early 1976.<sup>2</sup> Freezing temperatures, moisture deficiencies, and other severe weather conditions caused problems of transportation, delaying the movement of wheat to ports, thus adding to the upward trend of farm prices. Wheat prices from EEC to some of the third world countries did not decline. EEC export prices were mostly nominal because no export restitution was in effect so that export prices were a direct reflection of those in the EEC domestic market.

The nominal average price received by farmers for all wheat sales is computed monthly by the USDA. In November 1976 it was \$2.45<sup>3</sup> (\$90.02)<sup>4</sup> compared with \$3.58

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<sup>1</sup>World Wheat Statistic.

<sup>2</sup>Ibid.

<sup>3</sup>Per bushel.

<sup>4</sup>Per metric ton.

(\$131.54) in the previous year, and the record high of \$5.52 (\$202.83) in February 1974.

Prices for imported wheat in Saudi Arabia jumped from \$83.8 per metric ton in 1972 to \$188.8 per metric ton in 1976.

CHAPTER VI  
QUANTITATIVE ANALYSIS OF THE DEMAND FOR  
WHEAT AND FLOUR

Most economic studies define the factors affecting quantities consumed of any commodity. These factors essentially include the number of consumers or population, incomes, price of the commodity itself, price of substitute commodities, and the taste of the consumer. The main objective of this chapter is to estimate the demand equation and define the most important factors affecting the demand for imported wheat and flour in Saudi Arabia.

The average per capita consumption of wheat flour was estimated at 48<sup>1</sup> kilograms in 1962 and 1963. During the same period per capita consumption was estimated in Iraq, Jordan, Lebanon, Syria, and Egypt to equal 94.5, 113, 105.9, 114.1, and 72.7 kilograms, respectively. The average per capita consumption of wheat and flour in Saudi Arabia was less than for neighboring Arab countries

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<sup>1</sup>Abdulhamed Attar, Production and Marketing of Wheat, Ministry of Agriculture and Water Studies, 1973.

for various reasons. In 1962 to 1963 income was very low. The rural people in the southern part of the country made their bread from sorghum and millet, and the rest of the people generally used millet instead of wheat flour.

By 1976 the average consumption per capita was about 78 kilograms. This increase resulted from changes in the manner of consumption of the people through the movement of rural people to urban areas and also a market increase in the quantities of wheat flour consumed in the southern region.

By studying the general direction for wheat and flour (equivalent wheat) in the country in the period between 1960 and 1976, we find that the average of imported wheat and flour quantities was 282.75 thousand tons. The average of the annual increase of the quantities imported was about 22.8 thousand tons, about 17.25 percent per annum. The average of imported wheat and flour was about 178 thousand tons in the period between 1956 and 1970, and the average annual increase of imported quantities was 18.6 thousand tons about 10.5 percent per annum.

#### A. The Demand Equation for the Imported Wheat and Flour in Saudi Arabia

##### 1. The Variables Included in the Analysis

From the previous discussion of the general characteristics of production and imports of wheat and flour,

we make the following explanation about the variables that enter into this analysis, taking into consideration the meagerness and inaccuracy of the available data (see Table 15, page 44).

1.1 Price of imported wheat and flour (PIW).--One of the most important factors affecting the demand for wheat in Saudi Arabia is its price. The Kingdom imports large quantities of wheat and flour from foreign markets. It is noted that the price of domestic wheat is a little higher than imported wheat (see Table 16).

From Table 16 it is evident that for 1969 the Riyadh prices for domestic wheat averaged 25 percent above the prices of imported wheat; but because there is no standardization of prices from region to region, it is very difficult to estimate accurately the actual wholesale price of imported wheat. Thus, it will be necessary to analyze the purchase price of imported wheat and flour to estimate the demand equation.

1.2 Quantities of imported wheat and flour (QDW).--As domestic wheat production increases under the program recommended by the Ford Foundation, it may come into direct competition with imported wheat. Quantities of imported wheat and flour should decrease as domestic wheat production increases, as suggested by economic theory.



TABLE 15.--Data Used in the Analysis

Year	QIW	PIW	PIR	QDW	GNP <sup>1</sup>	POP	PG	TPOP <sup>1</sup>
	1,000's/ M. Ton	\$1,000/ M. Ton	\$1,000/ M. Ton	1,000's M. Ton	Mkt. Price	1,000's	1,000's	1,000's
1960	139	59.4	83.5	125	5053	5838	286	5862
1961	111	62.3	87.4	127	5493	5974	217	5992
1962	158	67.8	92.1	135	5970	6263	197	6278
1963	147	75.8	97.4	135	6485	6416	260	6438
1964	190	77.1	111.2	125	7257	6579	283	6603
1965	200	73.9	93.9	148	8058	6750	294	6775
1966	240	75.5	101.5	149	8937	6930	316	6956
1967	182	75.4	88.1	150	10431	7118	319	7145
1968	140	78.8	240.2	130	11625	7316	347	7347
1969	290	80.4	217.7	150	12728	7523	406	7557
1970	320	81.6	183.4	150	13574	7740	420	7775
1971	350	84.0	191.9	150	17242	7960	474	7800
1972	310	83.8	210.1	150	20589	8202	645	8256
1973	517	103.4	213.1	150	30095	8448	608	8499
1974	554	184.2	624.1	90	82350	8702	920	8779
1975	567	185.8	500.1	193	120009	8966	895	9041
1976	465	188.8	419.5	205	145432	9240	719	9300

<sup>1</sup>GNP: Measures at the market price in Saudi Riyal (Million).

<sup>2</sup>TPOP: PG/12 + POP = TPOP (Total Population in 1,000's).

SOURCE: QIW and QDW from USDA. BIW, PIR and POP from FAO. GNP and PG from SAMA.

TABLE 16.--Wholesale Prices for Wheat--Riyadh, 1969  
(Saudi Riyal per kilogram)

Month	Domestic	Imported	Month	Domestic	Imported
Jan.	0.56	0.44	July	0.50	0.69
Feb.	.62	.44	Aug.	.62	.56
March	.75	.50	Sept.	.50	.50
April	.89	.69	Oct.	.67	.50
May	.75	.50	Nov.	.69	.50
June	.75	.50	Dec.	.63	.56

SOURCE: AbdulRahman M. El-Omar, "Alternatives for a Wheat Policy," July 1970.

1.3 Price of imported rice (PIR).--As known economically, whenever prices of substitute commodities increase in relation to the commodity under study (wheat and flour), the consumption of wheat and flour will increase. If the opposite case happened, the consumption of wheat and flour would decrease. It is noticed that the important substitute commodities are rice and macaroni, and perhaps potatoes. The price of rice has been chosen for the analysis because it is more important than the other products as a substitute commodity.

1.4 The population (POP).--As the population increases we expect more consumption. This variable has been entered in the analysis to estimate the demand equation for imported wheat and flour.

1.5 Incomes (GNP).--Price is not the only factor that influences the quantity demanded in the market. Another important factor is the level of income among the consumers in the market. When income increases, consumption will increase and vice versa. In our analysis, income is measured as per capita gross national product because per capita income was not available for the whole period being analyzed.

1.6 Pilgrims (PG/12) + population (POP) = TPOP.--Mecca is the objective of the annual pilgrimage undertaken by Muslims to the Ka bah Sanctuary, also called the "House of God."

Since 1925 the number of pilgrims has increased immensely. In the summer of 1925 the number of pilgrims was estimated at 100,000. In December 1974 there were well over a million people from outside Saudi Arabia who made the pilgrimage. Since pilgrims come from outside the country and spend at least one month, TPOP enter in as variable for the analysis.

1.7 Time trend (T).--A time trend variable is entered to show the effect of variables not explicit in the analysis through time.

Using OLSQ estimates in the TSP (time series Processing) program, different formulations were tried

to estimate the demand for imported wheat and flour equations. The results are summarized in Table 17 (Equations 1-6).

As can be seen from Table 17, most of the equations have high  $R^2$  value; but in most of these the sign of the respective coefficients were not as expected. Given the variables in the equations, we suspect that there is a high degree of multicollinearity in the system of equations.

During 1967/68 imports of all goods declined by 3.3 percent as a result of the Middle East War and the closing of the Suez Canal. Wheat imports declined almost 20 percent below the previous year because of the war. This was followed by a sharp increase in imports during 1969/70. The situation has since normalized, and the growth in imports during 1969/70 followed the normal increase over the last decade. Thus, the decline of wheat imports in 1968/69 was accounted for by a dummy-variable. The results are summarized in Table 17 (equations 7-15).

From these different equations, Equation (11) was chosen as most representative of the imported wheat situation. The bases of this selection were;

- (i) Economic consideration
- (ii) Statistical properties of the equation
- (iii) Knowledge of the Kingdom production and consumption conditions for wheat and flour

TABLE 17.--Demand Equations

Dependent Variable = LQIW	Variables Included in the LOG Form							R <sup>2</sup>	DW	F
	LPIW	LPIR	LQDW	LPOP	LGNP	LTPOP	LT			
<u>Equation 1</u>										
Coefficient	2.263	-.031	.200	15.626	-1.067	-7.626	-.497	-67.961		R <sup>2</sup> = .90
S. Error	(1.482)	(.281)	(.512)	(9.628)	(.871)	(9.403)	(.442)	(41.813)		DW = 2.3
t Statistic	[1.527]	[-.111]	[.392]	[1.653]	[-1.224]	[-.811]	[-1.126]	[-1.625]		F = 11.0
<u>Equation 2</u>										
Coefficient	.563		-.045		-.098	2.632		-19.299		R <sup>2</sup> = .86
S. Error	(.914)		(.375)		(.433)	(1.264)		(10.804)		DW = 1.9
t Statistic	[.615]		[-.120]		[-.226]	[2.083]		[-1.786]		F = 18.1
<u>Equation 3</u>										
Coefficient	.774			2.895	-.200			-21.818		R <sup>2</sup> = .87
S. Error	(.771)			(1.177)	(.370)			(9.655)		DW = 1.9
t Statistic	[1.003]			[2.459]	[-.540]			[-2.259]		F = 28.1
<u>Equation 4</u>										
Coefficient	1.895	-.101		8.376	-.911		-.503	-67.270		R <sup>2</sup> = .90
S. Error	(1.137)	(.281)		(4.209)	(.644)		(.371)	(34.877)		DW = 2.20
t Statistic	[1.003]	[-.458]		[1.989]	[-1.415]		[-1.357]	[-1.928]		F = 17.0
<u>Equation 5</u>										
Coefficient	.741		-.029	2.881	-.185			-21.540		R <sup>2</sup> = .87
S. Error	(.909)		(.365)	(1.239)	(.430)			(10.657)		DW = 2.0
t Statistic	[.815]		[-.078]	[2.324]	[-.431]			[-2.021]		F = 20.0

TABLE 17.--Continued

Dependent Variable	Variables Included in the Log Form									
	LPIW	LPIR	LQDW	LPOP	LGNP	LTPOP	LT	D68	C	
<u>Equation 6</u>										
Coefficient	1.079	.474	.282	9.652	-.604	-6.426	.560	-.757	-25.889	$R^2=.97$
S. Error	(.875)	(.194)	(.289)	(5.609)	(.501)	(5.313)	(.267)	(.168)	(25.317)	DW=1.93
t Statistic	[1.234]	[2.443]	[.976]	[1.720]	[-1.206]	[-1.209]	[.208]	[-4.497]	[-1.022]	F =32.7
<u>Equation 7</u>										
Coefficient	-.033	.462				.325	.195	-.824	.052	$R^2=.96$
S. Error	(.231)	(.162)				(1.225)	(.143)	(.162)	(9.921)	DW=2.30
t Statistic	[-.142]	[2.849]				[.266]	[1.361]	[-5.078]	[.005]	F =49.15
<u>Equation 8</u>										
Coefficient	.237		-.246	2.763			.012	-.577	-18.927	$R^2=.94$
S. Error	(.233)		(.239)	(1.215)			(.158)	(.163)	(9.549)	DW=2.21
t Statistic	[1.019]		[1.030]	[2.172]			[.073]	[-3.531]	[-1.987]	F=32.75
<u>Equation 9</u>										
Coefficient	-.079	.359	-.015	1.903				-.738	-12.888	$R^2=.95$
S. Error	(.237)	(.184)	(.237)	(.683)				(.163)	(4.843)	DW=1.95
t Statistic	[-.332]	[1.949]	[-.604]	[2.785]				[-4.545]	[-2.643]	F =44.80
<u>Equation 10</u>										
Coefficient	-.041	.433		.677			.158	-.803	-2.820	$R^2=.96$
S. Error	(.222)	(.161)		(1.173)			(.138)	(.162)	(9.545)	DW=2.29
t Statistic	[-.185]	[2.672]		[.577]			[1.143]	[-4.954]	[-.295]	F =50.37

TABLE 17.--Continued

Dependent Variable	Variables Included in the LOG Form										R <sup>2</sup>	DW	F
	LQIW	LPIW	LPIR	LQDW	LPOP	LGNP	LTPOP	LT	D68	C			
<u>Equation 11</u>													
Coefficient	-.314			-.340	.385	.267			-.612	4.383			R <sup>2</sup> =.93
S. Error	(.602)			(.285)	(.234)	(.088)			(.177)	(1.766)			DW=2.22
t Statistic	[-.521]			[-1.191]	[1.647]	[3.024]			[-3.451]	[2.482]			F =27.45
<u>Equation 12</u>													
Coefficient	.572			-.183	-1.170	-.573			-.573	-23.191			R <sup>2</sup> =.94
S. Error	(.643)			(.261)	(.303)	(.159)			(.159)	(7.540)			DW=2.21
t Statistic	[.887]			[-.698]	[-.560]	[-.506]			[-.506]	[-3.075]			F = 33.73
<u>Equation 13</u>													
Coefficient	-.708			.476	.028	.224			-.833	2.719			R <sup>2</sup> =.96
S. Error	(.407)			(.147)	(.172)	(.068)			(.155)	(.567)			DW=2.34
t Statistic	[-.174]			[3.228]	[.162]	[3.301]			[-5.366]	[4.791]			F =48.94
<u>Equation 14</u>													
Coefficient	-.049			.511	.694	.213			-.838	2.159			R <sup>2</sup> =.96
S. Error	(.225)			(.140)	(.274)	(.076)			(.149)	(1.049)			DW=2.31
t Statistic	[-.208]			[3.646]	[2.545]	[3.156]			[-5.636]	[2.057]			F =50.33
<u>Equation 15</u>													
Coefficient	-.768			-.307	.694	-.510			-.510	3.802			R <sup>2</sup> =.86
S. Error	(.755)			(.369)	(.274)	(.226)			(.226)	(2.274)			DW=1.20
t Statistic	[-1.017]			[-.630]	[2.545]	[2.262]			[2.262]	[1.672]			F =19.08

Before presenting a detailed discussion of the selected equation, following are brief comments about some of the equations shown in Table 17.

1. Possibly because of the reason of multicollinearity mentioned earlier, we see that in spite of the fact that  $R^2$  is very high (approximately .9 and above), the statistical significance of most of the coefficients is very low (see Equations 1, 8, 12, and 14).

2. In particular, the sign of the price of imported wheat and flour (PIW) and sign of imported rice (PIR) were not used, as suggested by economic theory; since rice is considered actually as a substitute in the Kingdom for wheat and flour (see Equation 1 and 4).

3. In the second group of equations, results were better than the first group (see Equations 7, 9, and 11).

4. Population and total population (Pilgrims/12 + population) contribute with little effect to an increase of imported wheat and flour in most of the equations, because POP, TPDP, GNP, and time trend are highly related to each other and cannot be separated.

5. Durbin-Watson statistic DW, where more or less than the desirable level, which indicates that the residuals are serially correlated (see Equations 1, 4, 8, 11, and 13).



6. Time trend in a number of equations was negative, despite the historical record of increasing quantities of imported wheat and flour.

For reasons discussed in detail below, the following equation (in the LOG form) was chosen (Equation 11).

$$LQIW = \alpha + \beta_1 LPIW + \beta_2 LQDW + \beta_3 LGNP + \beta_4 LT$$

where: QIW = quantity of imported wheat and flour in  
1,000's metric ton.

PIW = price of imported wheat and flour in \$  
per metric ton

QDW = quantity of domestic wheat in 1000's  
metric ton

GNP = GNP at market price in millions of Saudi  
Riyal

T = time trend

Results of this regression using TSP were as follows:

$$LQIW = 4.383 - .314 LPIW - .340 LQDW + .385 LGNP + .267 LT$$

(1.766)	(.602)	(.285)	(.088)	(.177) = SE
[2.482]	[.521]	[1.191]	[1.647]	[3.450] = T Value

$$R^2 = .93$$

$$DW = 2.22$$

$$F_{(5, 11)} = 27.45$$

## 2. Statistical Properties of the Equation

1. Generally, the problem of multicollinearity indicated is possibly behind the low statistical significance of most of the variables.

2. The equation tells us that 93 percent of the variation in the quantity of imported wheat and flour (QIW) is associated with the variables included.

### 3. Discussion of variables

a. The size of coefficient for PIW =  $-.314$ , which indicates that an increase in the price of imported wheat and flour by one unit would be associated with a reduction of the quantity imported by  $.314$  units. T statistics for LPIW is low as expected because of the high GNP for the country.

b. The coefficient for LQDW equals  $.340$  which says that an increase of domestic wheat by one unit would be associated with a reduction of imported wheat and flour by  $.340$  units.

c. The size of coefficient of GNP =  $.385$  which means that an increase of the gross national product by one unit at the market price would be associated with an increase in the quantity of imported wheat and flour by  $.385$  units.

d. Time trend coefficient = .267 which says that for the period in the analysis (from 1960 to 1976) there was an increase in the quantity of imported wheat and flour by .267 units (100's metric tons).

4. As mentioned before, 93 percent of the variation in the quantity of imported wheat and flour which is associated with these variables, the F-test ( $F = 27.45$ ) performed significantly in this regression, further indicating this association of these variables, while the variation in the quantity of imported wheat and flour cannot be of chance (it is not random).

5. Durbin-Watson statistic DW equals 2.22. This value is greater than the desirable level, which indicates that the residuals are serially correlated. This fact needs to be taken into consideration if using the equation for prediction and evaluating the reliability of such estimates.

6. Overall, the statistical properties of this regression seem satisfactory for our analysis.

Although these are some of the problems indicated in the discussion and although the quantity of the data used might not be very accurate, we can still proceed to use it, bearing in mind the danger of extrapolation beyond the range of the data.

d. Time trend coefficient = .267 which says that for the period in the analysis (from 1960 to 1976) there was an increase in the quantity of imported wheat and flour by .267 units (100's metric tons) per year.

4. As mentioned before, 93 percent of the variation in the quantity of imported wheat and flour was explained by these variables, the F-test ( $F = 27.45$ ) was significant in this regression, further indicating the association of these variables.

5. Durbin-Watson statistic DW equals 2.22. This value is within acceptable levels and indicates that the residuals are not serially correlated. This fact needs to be taken into consideration if using the equation for predication and evalauting the reliability of such estimates.

6. Overall, the statistical properties of this regression seem satisfactory for our analysis.

Although these are some of the problems indicated in the discussion and although the quantity of the data used might not be very accurate, we can still proceed to use it, bearing in mind the danger of extrapolation beyond the range of the data.

### 3. Economic Consideration

1. The price of imported wheat and flour (PIW) has the right sign. The price elasticity of imported wheat and flour is the proportional change in the quantity purchased divided by the proportional change in price. The price elasticity is given by:

$$\eta_P^{QIW} = \frac{\Delta QIW/QIW}{\Delta PIW/PIW}$$

It is possible to get the price elasticity directly from Equation 11 (in the log form) by:

$$\eta_P^{QUW} = \frac{\partial \text{Log } QIW}{\partial \text{Log } PIW} = -.314$$

This says that an increase of PIW (price of imported wheat and flour) by 1 percent would lead to decrease of QIW (quantity of imported wheat) by .314 percent.

3. Quantity of imported wheat and flour (QIW) has the right sign. This says that an increase of QDW (quantity of domestic wheat) by 1 percent would lead to decrease of QIW (quantity of imported wheat) by .340.

As we know from our knowledge of the conditions of production and consumption quantities, domestic wheat amounts to only one-third of the consumption of wheat and wheat products; and there is very high demand for both

domestic and imported wheat. There are different uses for these domestic and imported wheats. For example, domestic wheat is largely preferred for local dishes in the country over imported wheat and is priced accordingly. Imported wheat products and bakery goods are also consumed in villages throughout most of the country.

3. The size of coefficient for GNP equals .385 from Equation 11. Small size of this coefficient in some equation is only because the vital size of GNP which comes from oil exporting is very large (approximately 120,000 million riyal; \$1 = 3.40 riyals).

Income elasticity is the proportional change in the quantity purchased divided by the proportional change in income. The income elasticity is given by:

$$\eta_{\text{GNP}}^{\text{QIW}} = \frac{\Delta \text{QIW} / \text{QIW}}{\Delta \text{GNP} / \text{GNP}}$$

or

$$\eta_{\text{GNP}}^{\text{QIW}} = \frac{\partial \text{LogQIW}}{\partial \text{logGNP}}$$

From the last definition, income elasticity equals .385 directly from Equation 11. This says that an increase of GNP by 1 percent would lead to increase of imported wheat and flour by .385 percent.

4. POP and TPOP coefficients contribute with small effect to an increase of imported wheat and flour. The growth rate of imported wheat and flour is estimated at about 17.25 percent annually, compared with the growth rate of population, which is estimated at about 3.0 percent annually. This says the population and pilgrims contributed to the increase of imported wheat and flour during the period between 1960 and 1976.

Generally, all these variables, entered in our analysis, contributed in varying degrees to the increase of the quantities of imported wheat and flour in the period between 1960 and 1976 in Saudi Arabia.

#### B. Demand Projections Up to 1985

The following estimated equation is used for the basis of this projection.

$$LQIW = 4.383 - .314 LPIW - .340 LQDW + .385 LGNP + .267 LT$$

Using the above equation we will keep the prices of imported wheat constant at 1972-76 levels and assuming NP is growing at 13 percent as planned by the government of Saudi Arabia. Domestic wheat production is assumed to increase 16 percent per year.

Using the estimated equation for projections, the following table (TABLE 18) projects the demand for wheat and flour up to 1985. But we are not satisfied with

TABLE 18.--Projected Demand for Imported Wheat and Flour  
(in 1000's M.T.)

Year	Demand
1977	548
1978	580
1979	587
1980	593
1981	598
1982	603
1983	609
1984	613
1985	618

this result because the absence of population in the selected equation.

From the above table, the quantity of imported wheat is projected to increase through 1985. The total increase due to PIW and QDW is less than the increase from GNP and Time trend. The primary increase comes from GNP which comes from the exports of oil. This increase could be overestimated due to the absence of the population variable in the equation. The imports of wheat are increasing at a decreasing rate. This may continue in the future if the quantity of domestic wheat produced under the government's projects continue to increase.



## CHAPTER VII

### SUMMARY AND RECOMMENDATIONS

Saudi's economy is heavily dependent on its export earnings from the oil sector, and how this sector performs directly relates to the funds for development.

With a large and growing gap between food consumption and domestic production, the planners have devoted special attention to easing restraints and increasing productivity. However, the problems facing agricultural development are numerous. They include climatic adversities, the lack of fresh water, small inefficient farms dispersed over a large area, the traditional ways of growing many crops in areas of production, and the relative attractiveness of other sectors.

Dependence on oil exporting and the lack of domestic resources to supply most of the country's needs and services has caused Saudi Arabia to depend on the international market to satisfy its high demand for foodstuffs and other essentials. Consequently, food imports rose an average 13 percent per annum since 1962. This heavy

reliance on imports represents a source of concern for Saudi planners, who are trying to remedy this situation within the framework of the new Five Year Plan (1980-1985). While recognizing that a deeper study on this matter is needed, we may use the available information to identify some important shortcomings of the imported food-stuffs that are affected by the volume of foreign exchange, internal production, and other factors, so needed for development.

By studying the imported quantities of wheat and flour in the period of 1960 to 1976 and estimating the demand equation, we discover that the imports of this commodity have increased about 17.25 percent per annum. This increase is due to the effect, in different degrees, of increases in prices, in incomes, and in the population and pilgrims, and is rendered more acute by a decline in the country's already limited ability to feed itself. The Kingdom faces many problems in order to reduce its dependence on food imports, but the government has defined its policy and strategy to do so. There are three problems facing the use of domestic wheat in order to reduce the quantities of imported wheat, as follows:

1. In order to increase the domestic production of wheat, the Ministry of Agriculture and Water should continue its research and studies to determine new programs

for wheat production, as recommended by the Ford Foundation and other institutions. Wheat farmers and the national economy will benefit.

2. The lack of perfection in the present Saudi Arabian marketing system is demonstrated by the wide spread of prices between local or regional markets at a given point in time. This wide price divergence is a symptom of the problem. An imperfect market exists over space because information does not flow freely. Buyers and sellers, not knowing the distant demand, supply, and price situation, cannot act rationally to correct a market imbalance, thereby benefiting all parties. According to the recommended program to increase the domestic production of wheat, a program will be required for the improved marketing of wheat. A thorough study of the practicality and feasibility of various alternative steps in the implementation of an improved marketing program for wheat is necessary in the initial stages of work. It is assumed that such a study will indicate further requirements for a price stabilization program for the new wheat.

3. Grain silos and flour mills. The implementation of three integrated projects comprising grain silos, flour mills, and animal feed processing plants in Jiddah, Riyadh, Damman, and Gaseem by the Grain Silos and Flour Mills Corporation continues to proceed on schedule. Both

the Riyadh and Dammam were fully operational in early 1978. Both Jeddah and Qaseem are expected to be fully operational by the end of 1979. All the projects are to be equipped with grain silos, flour mills, and millfeed having a capacity of 300,000 tons. All the projects will enable grains to be stockpiled in sufficient quantities to meet the Kingdom's needs for six months and promote the stabilization of grain prices. This, along with Government subsidy, should encourage local wheat production, preserve the quality and freshness of grains and flour sold locally, and increase the production of various types of animal feed, thus contributing ultimately to a rise in the local meat and milk production.

Establishing a wheat marketing board would be designed to stabilize international prices to producers through the offer to purchase at guaranteed prices any quantity of the Mexican-type wheat offered for sale at the established buying stations. The program would be a supporting one and parallel to that of the Ministry of Agriculture for increased production of the Mexican-type wheats. The board would store the purchased grain and later sell it into commercial channels, taking whatever loss is necessary in the process and under conditions of prudent management. In this way there would be a financial incentive for farmers to produce the new Mexican-type wheats with

increased yields, and it would result in increased wheat production for the nation. Any depressing effect of increased production of the types of wheat that are not presently considered most in demand could be anticipated and planned for. The program would assure adequate year-round supplies of wheat, in combination with the program of import and processing, and at the same time stimulate production by offering minimum guaranteed prices to farmers at harvest time and, therefore, throughout the marketing season.

As wheat production increases under the program, it may come into direct competition with imported wheat and flour. It should be feasible, after the necessary preliminary study, to place an import duty against the imported wheat and flour. Such a program should not have as its objective the production of a large income from import duties, nor the exclusion of wheat imports (which will be needed in increasing quantities), but rather the rough equalization of natural economic advantages to domestic producers and the advantages to producers from abroad who ship to Saudi Arabia. The net result of such a program should be a lessening of any subsidy per ton of the new wheats produced in the country, and thus a reduced cost per ton for the government, coupled with some additional income from the import duties.

Finally, the analytical capacity of the Ministry of Agriculture and Water, involving problem definition, limitation of data, analysis of consequences of alternative courses of action, and policy formulation, is inadequate in determining important shortcomings of internal policies directed to the structure and conduct of the imports and domestic production of wheat and affecting negatively its performance. We need to know the domestic production before the total picture could be analyzed for the imported wheat and flour.

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