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THE ECONOMICS OF OLIVE OIL AND OILSEEDS IN THE MEDITERRANEAN REGION

Over the last two decades the Mediterranean Region's oilseed and edible oil economies have undergone a drastic change. The region has moved from a complete self-sufficiency in edible oil via its olive oil production to one of the principal import markets for oils and oilseeds in the world. The region's imports of liquid oils and oil equivalent of oilseeds has increased from less than 100 thousand metric tons during the early 1950's to more than 600 thousand metric tons during the mid 1960's.[1/] This significant increase in import demand for oils and oilseeds represents more than double the substantial rate of increase in the world liquid oil exports. Adequate exploration and analysis of the elements involved in this kind of change should be of considerable interest and value for the Mediterranean region in appraising its future demand for oils and oilseeds and for the major exporting and trading countries when assessing potential export markets for these products.

After a brief review of the region's major economic indicators and the nature of the commodities under consideration, this paper will be focusing on the discussion of (1) the economic characteristics of edible

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1/ Total 1969 imports of liquid oils and oil equivalent of seeds reached 730 thousand metric tons. This includes 341 thousand metric tons of soybeans and oil, 139 t.m.t. of sunflower seed and oil, 125 t.m.t. of rapeseed and oil, 82 t.m.t. of groundnuts and oil, 30 t.m.t. of sesame-seed, and 13 t.m.t. of cottonseed. Spain in 1969 emerged as the single most important importer of soybeans with more than 1 million metric tons in comparison with only 10 thousand metric tons during the early 1950's. Out of the soybeans imported, Spain for the first time in 1969 exported about 40 thousand metric tons of soybean oil.

oils and oilseeds in comparison with olive oil, (2) the demand for edible oils in the Mediterranean region, and (3) the future outlook for oils and oilseeds in this region.

THE REGION

The Mediterranean region specified in this study comprises the seven major olive oil producing and consuming countries. These are Spain, Italy, Greece, Turkey, Tunisia, Algeria, and Morocco. Traditionally these countries produce and consume about 90 percent of the world's olive oil. All the countries in this region have, to a great extent, homogeneous natural endowments affecting their agricultural activities. Individual countries, however, are at different stages of economic development. Estimated per capita GNP in 1966 ranged between a high of $1030 in Italy and a low of only $170 in Morocco (other per capita incomes are Tunisia, $200; Algeria, $220; Turkey, $280; Spain, $640; Greece, $660). The majority of these countries are experiencing a fairly strong income growth rate and economic change. The overall real income growth of the region over the 15 years (1950-65) averaged about 7 percent per annum while population growth averaged about 2 percent. Almost all of these countries are linked with each other via various economic and trade arrangements with the European Economic Community market organization. Italy is a full member, Greece and Turkey associate members, and Tunisia and Morocco have only recently concluded special trading agreements with the organization. Special associate status is also currently being negotiated with the EEC for Spain and Algeria.

Olive oil is one of the soft or liquid edible oils which include soybean, cottonseed, groundnut, sunflower, rapeseed, sesameseed, and corn oils. Except for olive oil, which has a distinct fruity flavor and is normally used for special edible uses, all of these oils are technically perfect substitutes for edible purposes. However, there is only a limited production of oilseeds in the Mediterranean region. Production includes mainly sunflower seed, in Turkey, and cottonseed, in Spain and Turkey. Olive oil continues to be the main domestic source of edible oil, despite its declining importance in the total oil industry. Domestic supplies of olive oil furnished about 84 percent of the requirements for edible oil in 1950-51 in comparison with only 63 percent in 1965-1966 period. The rest was supplied through imports of various types of liquid oils and oilseeds. Almost half of the retained imports were in the form of soybean oil and soybeans. The remainder was in the form of rapeseed, sunflower seed, groundnuts, and cottonseed oils, respectively, according to their importance.

ECONOMIC CHARACTERISTICS OF OILSEEDS

In addition to their favorable prices, several key characteristics of most oilseeds have contributed to the substantial growth experienced over the last two decades in the production and trade in these commodities worldwide. First, almost all oilseeds are joint-product commodities. The two basic products which can be obtained from most oilseeds are oil for edible uses and meal or cake for animal feeding. The combined value of these two products undoubtedly contributes to the marketability of oilseeds in comparison with other agricultural products. The joint oil/meal

product aspect is becoming more important over time, especially for those oilseeds whose meal component is high in protein, as a result of increasing demand for livestock and livestock products.

On the other hand, oil-olives are essentially a one product commodity, as the protein content of its by product is too low to be of any commercial value. This suggests an advantage for multi-product soft oilseeds over the one-product olive arising from two main sources. First, the multiple end-uses of the final products enhance the value of the oil-seeds. This proposition is based on an assumption of increasing demand for both products and given oil meal yields.[2/] In the last decade, major soft oil importing countries of the Mediterranean countries have shown an increasing tendency to import oilseeds as the result of an increasing demand for meat, translated in the input market as a demand for animal feeds including oilseed meals. Theoretically, the combined value of oil demanded for edible purposes and meal demanded for feeding purposes is equal to the value of the oilseed less the cost of crushing. Hence, in the short-run, the combined value of several oilseeds compares favorably with olive oil. Second, it appears that many importing countries are expanding their oilseed processing industries in order to encourage domestic manufacturing and to conserve foreign exchange. This phenomenon, leads to a persistent and growing demand for oilseeds to be crushed. In fact, the regular flow of oilseed imports is required for the efficient utilization of the new crushing

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2/ On the average, olives yield 18 percent oil, while other oilseeds average as follows: soybeans, 18 percent; cottonseed, 20 percent; shelled groundnuts, 45 percent; rapeseed, 40 percent; sunflower seed, 30 percent, and sesameseed, 52 percent.

capacities. The establishment of new crushing industries in importing countries implies that the shift in demand from oil and meal as processed products to the raw oilseeds would be drastic, as this shift is a function of the availability of these crushing and processing industries. This kind of situation raises the question of the location and size of oilseed processing industries and its impact on the pattern of trade in these commodities.3/

A second important economic characteristic of most oilseeds is their storability over a relatively extended period of time without risking quality deterioration or loss, a characteristic which tends to facilitate handling of the products and reduces costs. Durability of oilseeds has a stabilizing effect on the flow of the products over time, which helps in reducing the excessive seasonal or yearly price variations which might result from surplus or deficit crops. This is in contrast to the high perishability of oil olives, which need immediate processing after harvesting in order to preserve the oil yield and its quality. The perishability of oil olives excludes it from trade channels as an oilseed except in the form of processed olive oil. This perishability also places serious limitations on any large scale production and processing industries of olive oil over a wide geographical area.

A third crucial feature of the oilseed production and marketing economy is its relative responsiveness to the market price of the product and its substitutes. As an annual crop, production plans are usually influenced by

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3/ FAO Commodity Review 1967, Rome 1967, p. 75. The question of the structure and the location of the oil processing industries plays an important role in regulating the form of the commodity traded. For an interesting exposition of this aspect, see: J. Stopforth and J. P. O'Hagan, "Structure of Oilseed Crushing Industry and Factors Affecting its Location, with Particular Reference to the Situation in Developing Countries, Part I and II," FAO Monthly Bulletin of Economics and Statistics, Vol. 16, April 1967 and May 1967, pages 1-9 and pages 1-15.

the most immediate prices and price prospectives. Consequently, substantial adjustments can be made to influence the total supplies of the product within a short period of time as, for example, rapeseed production in Canada, which appears to be rather sensitive to the international market price of rapeseed and to that of wheat as an alternative crop. An opposite feature dominates the marketing and pricing of olive oil where production is predetermined mainly from the existing olive plantations and the climatic conditions affecting their productivity in any given year. This implies that prices are most sensitive to annual supply movement rather than influenced by them. Under normal circumstances it takes about 7 years for an olive tree to start producing the olive fruit; commercial production, however, is usually attained after 15 years. The production-price relationship is, therefore, lagged by at least 7 years. This is reflected in the market place in the form of an inelastic supply which, of course, reinforces price variability from year to year, depending on the given size of production. This variability is often aggravated by the biennial cycle of olive production.

A fourth determining quality of most edible seed oils is their uniformity and recognized commercial standards. Quality is rather crucial in making most seed oils almost completely interchangeable in commercial marketing and is explained by the fact that these oils are derived through similar processing and refining technologies. This implies that markets can be furnished with a regular flow of a homogeneous oil product over extended periods of time via substituting one type of oil or oilseed for others, depending on the supply and price conditions. This situation is in

contrast to the distinctly flavored olive oil where quality differences and product identification problems impose a definite limitation on its marketability and substitutability. The quality of olive oil varies considerably from year to year and from region to region, depending on a complex of environmental and technical factors. From the standpoint of most consumers, subjective measures are still in use in determining the characteristics of a particular lot of olive oil (e.g. taste, country or area of origin, color, and odor). These measures continue to have a significant impact on the pattern of olive oil trade in the Mediterranean region.

Finally, almost all oilseeds produced in the world are economically self-sustained in terms of achieving remunerable prices for agricultural producers without governmental subsidy or control programs. The floor price support program which has existed for soybeans in the U.S., for example has seldom been used as free market prices have maintained a considerable margin over this floor price. No need for such floor price support has risen for rapeseed production in Canada. This is a clear indication of the economic viability of oilseed production industries in comparison with a large number of subsidized or protected farm enterprises. Olive oil is one of these enterprises where market factors are often modified to maintain the economic status of the industry in the face of increasing competition and commercialization. For example, olive oil producer's prices in Italy, the largest consumer and the second largest producer of this product, are protected under the Common Agricultural Policy of the EEC, where the minimum producer's price is more than double the international market price of the product.

THE DEMAND FOR EDIBLE OILS

A country's consumption of food fats and oil is closely associated with its stage of economic development and the size of domestic and/or imported supplies of these products available to consumers. Traditionally the greatest part of the oil which is normally produced domestically is also consumed within the same country. This relationship is apparent in the present and projected level of per capita oil consumption in Mediterranean countries. All these countries have an acute deficit in edible oils. This deficit is defined from the standpoint of (a) a total domestic demand for edible oils substantially greater than domestic supplies, given international market prices for these products, and (b) a per capita level of oil consumption relatively low in comparison with surplus oil producing countries at the same stage of economic development.

The level of per capita oil consumption in the Mediterranean countries is largely determined by the domestic availabilities of olive oil and imported oils. In countries where the olive is considered primarily as a domestic food commodity--such as in Spain, Italy, and Greece--annual domestic availabilities of the product are solely determined by the size of production. While in countries which rely on olive oil as an important source of foreign exchange earnings--such as Tunisia, Turkey, and Morocco--exports market outlets normally compete with domestic market requirements (or needs). This implies that although a country might be considered as a "surplus" country in olive oil supplies in view of international market demand and price of the product in comparison with the domestic market situation, it can also be considered, at the same time, a "deficit" country in edible oil supplies, given the market situation and prices of oils and

oilseeds. Mediterranean countries can appropriately be considered as deficit countries in edible oils. The import demand for edible oils (or oilseeds) to supplement domestic requirements can be illustrated through a static demand model shown in Figure 1.

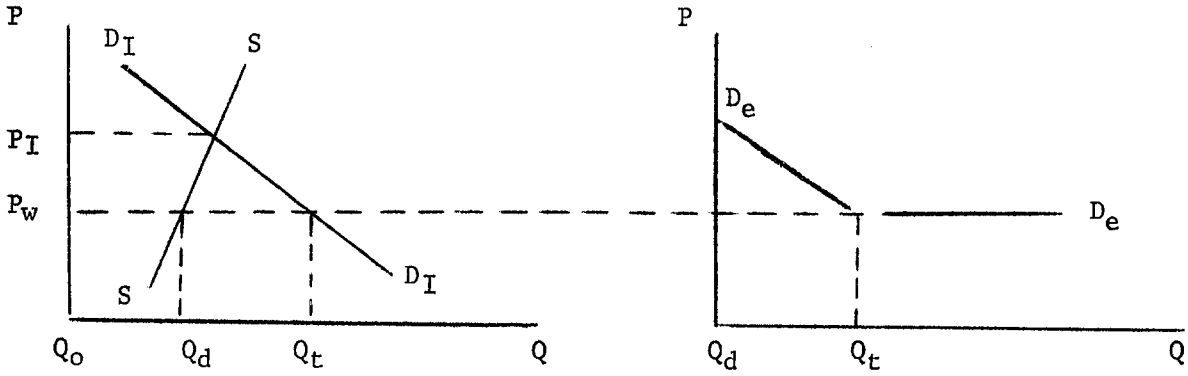

Figure 1. Import Demand for Edible Oils in the Mediterranean Region.

Figure 1 shows the theoretical framework in which the import demand for liquid oils in the Mediterranean region can be tested statistically. This framework is developed on the following assumptions:

1. Some degree of substitution exists between olive oil and other seed oils. The relation (D_ID_I) represents the total domestic demand for all oils in some convenient equivalent unit of measurement. The relation (SS) represents the total regional supply of olive oil, also in an equivalent unit. The equilibrium (P_I) represents the isolation price without trade (imports).

2. Excess demand for edible oils appears with the introduction of trade via the import demand relation represented by (D_eD_e). The world price of seed oil (P_w) is given as an independent variable which is determined outside the Mediterranean region.

3. Given the above, the total quantity demanded would be equal to (Q_oQ_t) of which (Q_oQ_d) is produced domestically and (Q_dQ_t) is imported.

Hence the key variables affecting the import demand for liquid oils are: (a) domestic supply, (b) domestic demand, and (3) world price.

On the basis of the above theoretical framework, an ordinary least squares estimate of total soft oil import demand can be computed. Total imports can be expressed as a linear function of the domestic olive oil production, previous year's olive oil production, the real national income, and average world price of soybean and groundnut oils.[4/] The estimated function is:

$$A_t^{so} = 1172.968 - \underset{(4.740)}{0.476}\, Q_t^o - \underset{(1.725)}{0.152}\, Q_{t-1}^o + \underset{(7.314)}{2.707}\, I_t - \underset{(4.609)}{1.968}\, P_t^{sg}$$

$$R^2 = 0.93$$

The statistical "t" values associated with the individual estimates appear in parentheses directly below the estimated coefficients.

The estimated coefficients are large relative to their standard errors and are reasonable in sign and magnitude. The estimated function supports the hypothesis that soft oil imports are negatively associated with domestic olive oil production. The magnitude of the estimated coefficient of current olive oil production is considerably larger than that of the lagged production. A given change in either olive oil production or world price of soft oil seems to have a definite negative impact on total imports. A given change in real income has a positive net impact on total imports. About 93 percent of the regional variation in total imports is associated with the changes in the specified independent variables (figure 2). From the region point of view the estimated function is an import demand function, whereas from the exporter point of view it can be considered as a regional export demand function.

The above multiple regression estimate has adequately predicted the actual size of imports for the period 1965-70, given values of the four key independent variables. The actual and predicted quantities of these imports are shown in table (1). The difference between actual and predicted values for 1968 is somewhat higher than in other years. This might be explained by the decreasing sensitivity of imports to soybean and groundnut oil price (P_t^{so}) which had decreased substantially in that year without a noticeable impact on imports of these oils. On the other hand, imports are becoming more responsive to oilseed prices and particularly those for soybeans, which account for more than one third of oil imports.

Table (1) Mediterranean Region: Actual and Predicted Total Imports of Oils and Oil Equivalent of Oilseeds, 1965-70 (in thousand metric tons)

Year	Actual Imports	Predicted Imports	Difference
1965	645	641	4
1966	708	714	-6
1967	760	751	9
1968	788	851	-63
1969	749	779	-30

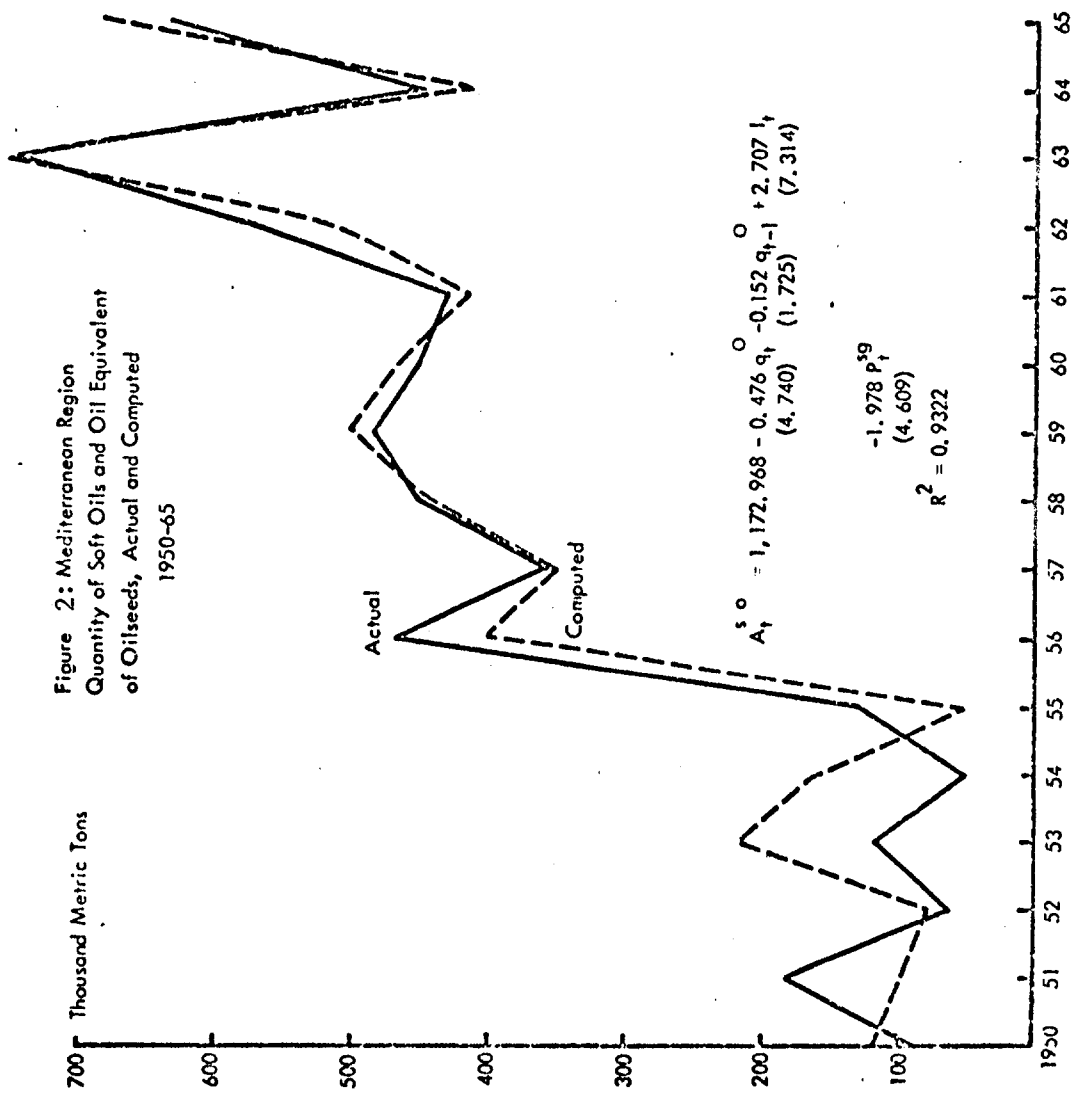

Figure 2: Mediterranean Region
Quantity of Soft Oils and Oil Equivalent
of Oilseeds, Actual and Computed
1950-65

The other aspect of the demand for edible oils in the Mediterranean region is the growing demand for these products over time. As noted earlier, population expansion, income growth, and urbanization are taking place steadily in this region. All these factors have a positive effect on the total demand for edible oils. The rate of growth of demand for liquid oils can be estimated by adding up the joint positive impact of these factors using the appropriate income elasticity of demand for edible oils in the region. Growth of demand for edible oils can be estimated under the assumption of constant price ratios in the following manner:

Per capita demand for liquid oil is equal to

$$\frac{D_t}{N} = A\left(\frac{I_t}{N}\right)^B$$

Total demand for liquid oil is, therefore, equal to

$$D_t = AN^{1-B} I_t^B$$

Given:

Population growth rate $\frac{N_t'}{N_t}$ = 1.40 percent

Income growth rate $\frac{I_t'}{N_t}$ = 6.92 percent

Income elasticity of demand for edible oils = 0.49

Then :

The rate of growth of demand over time $\left(\frac{D_t'}{D_t}\right)$ or total differential of ∂D_t at a point is: $\partial D_t = \frac{\partial D}{\partial N} \partial N + \frac{\partial D}{\partial I} \partial I$

or $$\frac{D_t'}{D_t} = (1-B)\left(\frac{N_t'}{N_t}\right) + B\left(\frac{I_t'}{I_t}\right)$$

The estimated rate of growth of demand for liquid oils calculated via this method yields 4.1 percent per year which represents the aggregate rate of growth for all edible oils including olive oil. This rate of growth of demand is more than double the rate of growth in the regional olive oil production estimated at approximately 2.0 percent.

A similar procedure can be used to estimate the rate of growth in demand for liquid oils in individual olive oil producing countries.

The rising demand for liquid edible oils has materialized because of the substantial increase in per capita consumption of these oils. This tendency has been oriented exclusively toward the soft oils rather than solid or animal fat products. The preference for soft oils as a substitute for or an addition to olive oil is largely due the cooking habits and the type of use embodied in the pattern of olive oil consumption. In recent years olive oil blended with other soft oils has been used rather extensively in many countries of the region. The resulting blend requires no further processing.

Table 2 shows that in the last fifteen years the increase in per capita consumption of domestically produced soft oils was only about 1.1 kilogram. About half of this increase was contributed by olive oil, while the other half by other domestically produced soft oils. On the other hand and over the same period of time, the increase in per capita consumption of imported soft oils from outside the region was 3.1 kilogram. Consequently, it is obvious that the growth in demand for edible oils, as a result of higher per capita consumption, has mainly been filled by imported oils.

Table 2. -- Mediterranean region -- estimates of per capita consumption of Soft oils and their source, average 1950-53, 1957-60, and 1962-65 (kilogram per capita)

Country	Period	Domestically produced		Imported soft oils	Total soft oils	Percent from	
		Olive oil	Other soft oils			Domestic production	Imports
Spain	1950-53	13.2	0.3	0.8	14.3	94	6
	1957-60	11.5	0.7	5.2	17.4	70	30
	1962-65	9.9	1.4	6.7	18.0	63	37
Italy[1/]	1950-53	6.0	0.2	1.1	7.3	85	15
	1957-60	7.4	0.2	2.7	10.3	74	26
	1962-65	9.8	0.2	3.8	13.8	72	28
Greece	1950-53	16.6	2.1	0.7	19.4	96	4
	1957-60	17.9	3.7	1.3	22.9	94	6
	1962-65	19.9	4.5	2.5	26.9	91	9
Turkey	1950-53	2.2	4.3	---	6.5	100	--
	1957-60	2.7	4.4	1.6	8.7	82	18
	1962-65	2.7	4.7	1.7	9.1	81	19
Morocco	1950-53	1.5	0.2	1.7	3.4	50	50
	1957-60	1.7	0.1	3.1	4.9	37	63
	1962-65	1.2	0.2	4.5	5.9	24	76
Tunisia	1950-53	8.5	---	0.3	8.8	97	3
	1957-60	10.5	---	0.2	10.7	98	2
	1962-65	7.1	---	3.7	10.8	66	34
Algeria	1950-53	1.4	---	1.7	3.1	45	55
	1957-60	1.6	---	5.5	7.1	22	78
	1962-65	1.4	---	4.1	5.5	26	74
Region	1950-53	7.0	1.0	0.9	8.9	90	10
	1957-60	7.2	1.3	3.1	11.6	73	27
	1962-65	7.5	1.6	4.0	13.1	70	30

[1/] Italian olive oil imports are added to the domestically produced olive oil.

OUTLOOK FOR OILS AND OILSEEDS IN THE MEDITERRANEAN REGION

The foregoing discussion underlines the principle elements upon which the future demand for oils and oilseeds in the Mediterranean region will be determined. These are: (a) the limitations placed on any drastic expansion in domestic olive oil production, (b) the increasing demand for edible oils as a result of rising incomes and population--also the recent rising demand for high protein animal feed products embodied in oilseeds, (c) the high level and variability of olive oil prices in comparison with the primarily stable and relatively low prices of other seed oils, and (d) the favorable developments which apparently have accompanied trade expansion in edible oils and oilseeds.

There are many peculiarities of the olive tree and the region which will continue to hinder any rapid change in the size of olive oil production. Olive production growth will be mainly dictated by (a) the scarcity of suitable land inputs in most countries of the Mediterranean region to expand cultivation, (b) the increasing high cost of the industry as a labor intensive enterprise with increasing wages and expanding employment opportunities, (c) the lack of technical feasibilities to improve productivity, (d) the availability of other agricultural or industrial alternatives, and (e) the requirements for long-range production plans which entail a need for administrative and control resources over extended periods of time. This implies that any substantial increase in oil olive production can only be achieved via the introduction and expansion of olive plantations as a large scale and integrated industry, rather than via the existing modest family farm enterprises. Obviously, a plantation type of

olive cultivation involves relatively large capital and administrative inputs which would only be available as government or large scale private enterprises if market and profit expectations are considered promising.

The physical and market restrictions facing any important growth in olive oil production are clearly evident when comparing the 2 percent rate of olive oil production growth achieved in the last ten years (1955-1965) with that of other liquid edible oils of about 7 percent. Sixty percent of the regional olive oil production increase was obtained from Italy through regeneration of its less-productive trees and the replacement of inter-cropping of olives with specialized olive farm plantations. At the same time Turkey, Tunisia, Greece, and Morocco achieved only modest increases in their corresponding production while Spain and Algeria experienced a slight decrease.

The demand for oils and oilseeds in the Mediterranean region will remain strong. The rate of increase in demand is expected to be higher in the less developed countries of the region whereas per capita oil consumption continues to be rather low, as in the case of Turkey, Tunisia, Morocco, and Algeria. A combination of high income elasticity of demand and high population rate of growth will place a strong impact on the total demand for oils and oilseeds. On the other hand, the demand for edible oils in the more developed countries of the region, i.e., Italy, Spain, and Greece, might increase at a slower rate than it did in the last fifteen years as per capita consumption approaches the saturation point. Almost all of the import demand for edible oil in these more developed countries is likely to be furnished via domestic processing of imported oilseeds.

This tendency will further be enhanced with the emerging strong demand for high protein feed supplements or the meal embodied in these seeds.

None of the countries of the Mediterranean region has attempted self-sufficiency in edible oil through domestic olive oil production or imports. This policy will most likely be continued. The main reason for this seems to be the relatively high price of olive oil in comparison with other edible oils. Usually the olive oil price is about two and half times that of other substitute soft oils available in the international market. This price difference will probably be continued in view of the high cost of olive production and the strong preference for it among Mediterranean consumers. The availability of other lower priced edible oils will continue to be an attractive alternative to supplement the total demand for edible oils, particularly among low income consumers who find olive oil prices prohibitive.

The facilities which were provided to expand and promote international trade in soft oils and oilseeds will continue to be a major factor in the development of such a trade. The most important contribution of these facilities was the expansion which occurred in oilseed crushing, processing, and storing facilities in the major importing countries--such as in Spain, Italy, and Greece. These facilities will continue to maintain and expand the demand for oilseeds in face of a rising demand for the joint oil meal products. Other trade facilities, such as re-exports, shipping, and quality control of oils and oilseeds will play a more important role in the trade of these products in face of rising demand and competition.

In summary, in assessing the future demand potential for oils and oilseeds in the Mediterranean region, the key issues which might emerge in light of the existing edible oil situation are: (a) the size and importance of this market in the total world market for these products; (b) the form of products in demand--i.e. demand for the raw oilseeds or for the processed oil and meal products; and (c) the nature of price and nonprice competition developments among major producing and exporting countries to supply this market. The activities and policies of both importing and exporting countries of oils and oilseeds to foresee and accomodate future market developments should be rather decisive in shaping the size of trade and trade patterns in these products within this important region.