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Introduction

The U.S. agricultural sector plays an important role in both the American and foreign economies. The high quality inputs used by U.S. farmers coupled with good management have increased the agricultural output throughout the years at a lower cost, resulting in higher farm income and an expansion in the U.S. participation in the world market.

Among the agricultural products cultivated in the United States, soybeans is considered one of the most important crop due to its nutritive value, to the significant contribution it gives to the U.S. value of foreign trade, and because it is a major income earner for American farmers. As shown on Table 1, soybeans and soybean products have had an average contribution to the total value of agricultural exports of 22 percent during the 1969-78 period. Examining this same table, one may observe that excluding the group formed by all other commodities, soybeans and soybean products is the commodity group which have the largest share in the total value of U.S. agricultural exports.

The United States is the largest exporter country of soybeans and soybean products in the world, followed by Brazil. The difference between the market share of these two countries is relatively large, however in the recent years there has been observed a tendency for a reduction in this gap. According to the data reported on Table 2, this tendency has been more accentuated in the soybean meal and soybean oil

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Table 1. - U.S. Agricultural Exports: Value of Selected Groupings.

Billion Dollars

Year	Total	Feed Grains and Products		Wheat and Products		Cotton		Animals and Products		Soybeans and Products		All Others	
		Value	% of Total	Value	%	Value	% of Total	Value	% of Total	Value	% of Total	Value	% of Total
1965	6.2	1.2	(19)	1.2	(19)	0.5	(8)	0.8	(13)	1.0	(16)	1.5	(24)
1966	6.9	1.4	(20)	1.6	(23)	0.4	(6)	0.7	(10)	1.1	(16)	1.7	(25)
1967	6.4	1.1	(17)	1.2	(19)	0.5	(8)	0.7	(11)	1.2	(19)	1.7	(27)
1968	6.2	1.0	(16)	1.1	(18)	0.5	(8)	0.7	(11)	1.2	(19)	1.7	(27)
1969	5.9	0.9	(15)	0.9	(15)	0.3	(5)	0.8	(14)	1.2	(20)	1.8	(31)
1970	7.3	1.1	(15)	1.1	(15)	0.4	(5)	0.9	(12)	1.8	(25)	2.0	(27)
1971	7.7	1.0	(13)	1.1	(14)	0.6	(8)	0.9	(12)	2.0	(26)	2.1	(27)
1972	9.4	1.6	(17)	1.5	(16)	0.5	(5)	1.1	(12)	2.1	(22)	2.6	(28)
1973	17.7	3.6	(20)	4.2	(24)	0.9	(5)	1.6	(9)	3.8	(21)	3.6	(20)
1974	22.0	4.7	(21)	4.6	(21)	1.3	(6)	1.8	(8)	5.0	(23)	4.6	(21)
1975	21.9	5.3	(24)	5.4	(25)	1.0	(5)	1.7	(8)	3.8	(17)	4.7	(21)
1976	23.0	6.0	(26)	4.1	(18)	1.1	(5)	2.4	(10)	4.4	(19)	5.0	(22)
1977	23.7	4.9	(21)	2.9	(12)	1.5	(6)	2.7	(11)	5.8	(24)	5.9	(25)
1978	29.4	6.5	(22)	4.6	(16)	1.7	(6)	3.0	(10)	7.0	(24)	6.6	(22)
1979													
1980													

Source: American Soybean Association

Table 2.

Table 2 — UNITED STATES AND BRAZIL: EXPORTS OF SOYBEANS AND PRODUCTS

Item	United States exports (1000 MT)				Brazil exports (1000 MT)				Brazil's exports as share of U.S. and Brazil (%)			
	1975	1976	1977	1978	1975	1976	1977	1978	1975	1976	1977	1978
Soybeans												
European Community	5,747	7,196	7,508	9,216	2,121	1,436	933	365	27	17	11	4
Other Western Europe	1,466	1,686	1,707	2,277	665	571	625	200	31	25	27	8
Eastern Europe	1/ 137	1/ 847	1/ 799	1/ 1,273	1/ 439	1/ 1,187	1/ 552	1/ 32	76	58	41	4
Other	5,126	5,603	6,181	7,939	108	445	477	62	2	7	7	1
Total	12,496	15,332	16,195	20,705	3,333	3,639	2,587	659	21	19	14	3
Soybean meal												
European Community	2,571	2,817	2,199	2,817	1,618	2,502	3,133	3,934	39	47	59	58
Other Western Europe	207	436	251	562	215	308	321	137	51	41	56	20
Eastern Europe	564	921	507	3/ 1,176	1,015	2/ 1 093	1,230	738	64	54	71	39
Other	441	688	1,177	1,360	286	471	670	610	39	41	36	31
Total	3,783	4,862	4,134	5,915	3,134	4,374	5,354	5,419	45	47	56	48
Soy oil												
Bangladesh	29	24	21	27	11	6	10	7	29	20	32	21
Peo Rep. of China	0	0	62	44	11	6	73	53	100	100	54	55
Iran	68	47	50	118	86	186	115	105	56	80	70	47
Morocco	1	6	5	3	40	26	27	3	98	81	84	50
Peru	18	29	58	63	28	26	7	0	61	47	11	0
Tunisia	10	3/	3	3	16	0	0	0	62	0	0	0
Turkey	6	3	0	3/	34	8	0	0	85	73	0	0
Other	224	401	575	671	38	240	270	336	15	37	32	33
Total	356	510	774	929	264	498	502	504	43	49	39	35

1/ Includes soybean exports to the Soviet Union 2/ Includes soybean meal to the Soviet Union 3/ Less than 500 MT Source: Foreign Agriculture Service

export sector.

Considering the importance of the exports of soybeans and soybean products as a source of income for the United States, the growing competition in this export market, and the need of reliable information about the way export markets are evolving, it becomes imperative to evaluate the growth and change in import market shares of group of countries that import soybeans and soybean products from the U.S. This information, coupled with a projection of future import demand by these group of countries, can help export organizations to better allocate its resources and to develop in advance fruitful export plans.

Methodology

In order to accomplish the above objectives the U.S. export data on soybeans, soybean oil, and soybean meal by country of destination, was utilized to select the countries which combined formed an import group. Specifically, the criterion used to select the countries was based on the quantity imported, during the period of analysis, relative to the imports made by other countries.

The time period upon which the projection analysis is based covers the period from 1965 to 1979, with a few exceptions, where the most recent data was employed.[1] Based on these 15 years of observation, changes which occurred in import demand from the United States, were taken into consideration, to estimate U.S. soybeans, soybean meal and soybean oil

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[1]The reason for this is because in some cases, the importer group had a specific trend during a certain number of years, and then this trend was reversed. Since in order to project into the future one should consider the most recent occurrences, a shorter time period was used to forecast the import demand of some importer group.

exports in 1985 and 1990, to some geographic regions, as well as to the most important importer countries of these regions. The choice of 1985 and 1990 as the projection years is based on the belief that the time horizon is long enough to permit changes or adjustments in export plans, and yet is near enough at hand to anticipate future imports with some credibility.

The projection of import demand for the groups of nations, as well as for some specific countries were developed based on linear trend analysis. The general assumption here is that, the import pattern observed during the period of analysis, is expected to continue into the future. Given that drastic changes in import patterns normally require substantial structural changes, such quantum leaps in purchase are probably unlikely. Thus, an examination of past quantities imported from the United States may provide useful information about what may be expected in the future.

The data used to develop the analysis of this study was derived from the Soya Bluebook, Foreign Agriculture Service, and from the American Soybean Association.

U.S. Soybeans Export: Past and Future

The U.S. soybean export increased more than three times during the period 1965-79, jumping from 227.7 million bushels in 1965, to 767.4 million in 1979. Large part of this increase can be attributed to the steady growth in imports made by the Western European group and by Japan.

The total quantity of U.S. soybeans imported by the group formed by the main Western European importer countries[2] increased from an average

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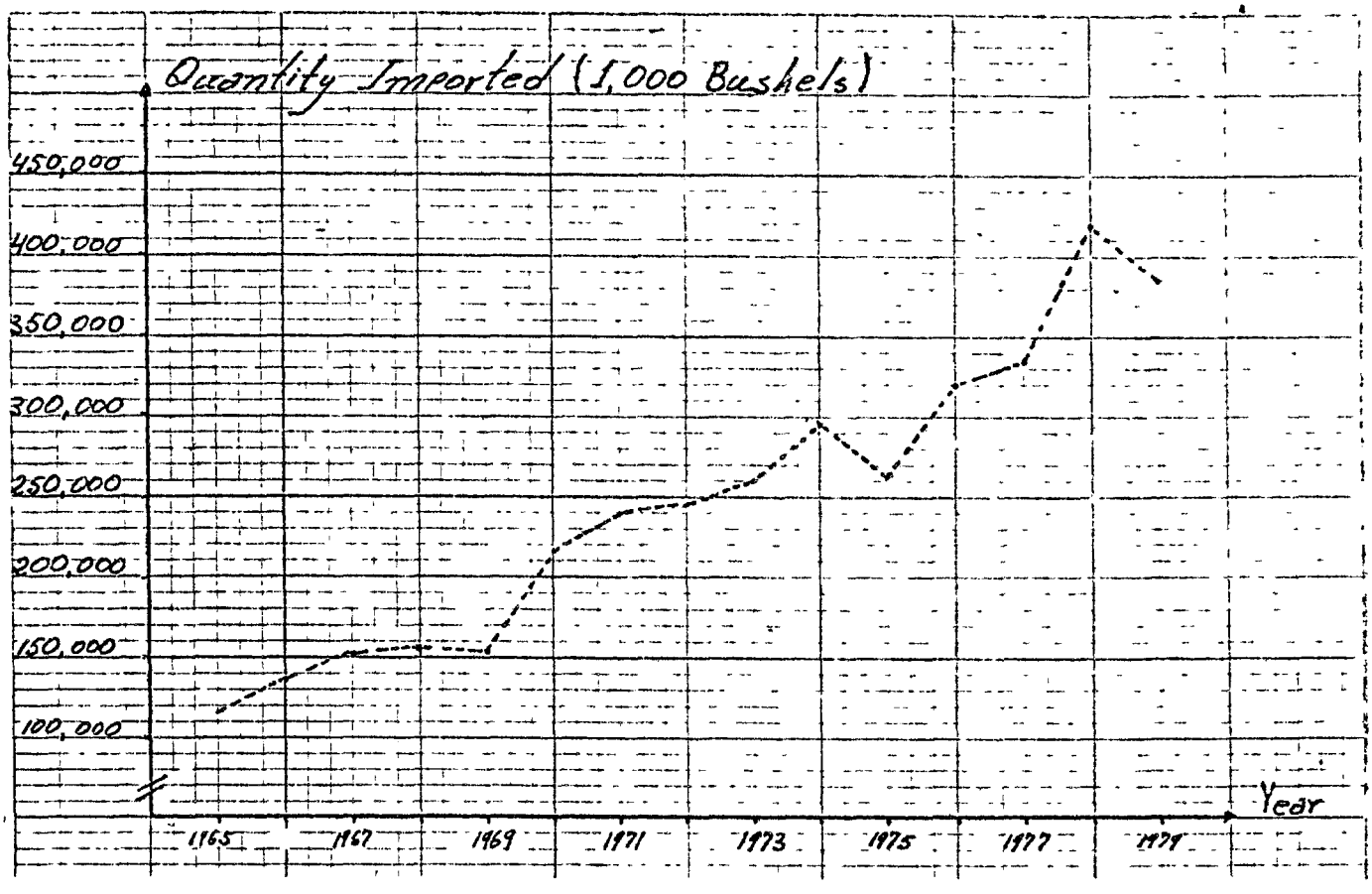
[2]This group is formed by the following countries: Belgium, Denmark, France, West Germany, Italy, Netherlands, Norway, Portugal, Spain, United Kingdom, and Switzerland.

Figure 1. Soybean Imports by the Western European Group from the U.S., 1965-79.



of 134,796 thousand bushels, the the 1965-67 period to an average of 381,096 thousand in 1977-79. This observed increase in the quantity of soybeans imported by this group of countries implied an annual rate of growth in imports of 9.05 percent.[3]

Among the main Western European importer countries, Netherlands, Spain, West Germany, and Italy are responsible for more than 75 percent of the total imports made by the West Europe group. A possible explanation for this significant level of imports made by these four countries, may be their rising standard of living, the expansion on meat and chicken production, and the increase in the oilseed processing capacity.

According to Figure 1, the total quantity of soybeans imported from the United States, by the Western European group, during the 1965-79 period, has trended upward. This same figure shows that even though total quantity imported has trended upward, some small variation with respect to the amount imported in the previous year has occurred as one should expect.

Assuming that the same trend observed during the 1965-79 period will prevail in the future, a line was fitted through the import data given

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[3]The annual rate of growth of imports over the period 1965-77 to 1977-79 was determined through the use of the following compounding formula:

$$B(1 + \Delta)^{\eta} = V_{\eta}$$

where: B = average quantity imported in the base period.

Δ = annual rate of growth of imports.

η = number of years involved.

V_{η} = average quantity imported in the η^{th} period.

Table 3. 1985 and 1990 estimates of the quantity of soybeans that should be imported by selected Western European Countries from the U.S.

Country	Estimated Equation[a]	Coefficient of determination (R^2)	Average quantity imported in the period 1977-79. (thous. bushels)	Future import demand in thousand bushels	
				1985	1990
Netherlands	QM = 3,336.3 + 9,735.3t (0.54) (14.33)	0.94	148,313	207,778	256,454
Spain	QM = 15,880 + 2,858T (4.61) (7.55)	0.81	56,580	75,898	90,188
West Germany	QM = 30,051 + 2,026t (5.55) (3,40)	0.47	52,980	72,597	82,727
Italy	QM = 12,996 + 1,453t (9.73) (9.89)	0.88	31,705	43,509	50,774

(a) The numbers in parenthesis are the T-Ratios.

rise to the following estimating equation:

$$QM = 85{,}030.45 + 20{,}321.71\ t$$

$$(7.16) \qquad (15.57)$$

with a coefficient of determination equal to 0.95, approximately.[4] Making t equal to 21, results in the following estimate of 1985 soybean import demand by the Western European group from the U.S.: 511,786 thousand bushels. This estimate implies an increase of 34 percent over the average quantity imported in 1977-79. Repeating the same process when t equals 26, one obtains 613,395 thousand bushels as the estimate of import demand for the same import group in 1990.

The knowledge about the future imports of soybeans from the U.S. by countries like Netherlands, Spain, West Germany and Italy is very relevant for organizations that plans in advance their future export sales. Giving this importance, a trend line was fitted through the import data of each of the countries mentioned above, in order to forecast how much each of them should import from the U.S. in 1985 and 1990. The resultant linear equations, with their respective coefficient of determination and the corresponding estimates of future quantity demand are presented in Table 3.

According to the above results, it is expected as an increase of approximately 37, 40, 34, and 37 percent respectively, in the quantity of soybeans imported by Italy, Netherlands, Spain and West Germany in 1985, over the respective average quantity imported by each of these countries in 1977-79.

Japan, due to its largest imports of soybeans from the U.S., was chosen to constitute a group by itself. This country alone, has imported

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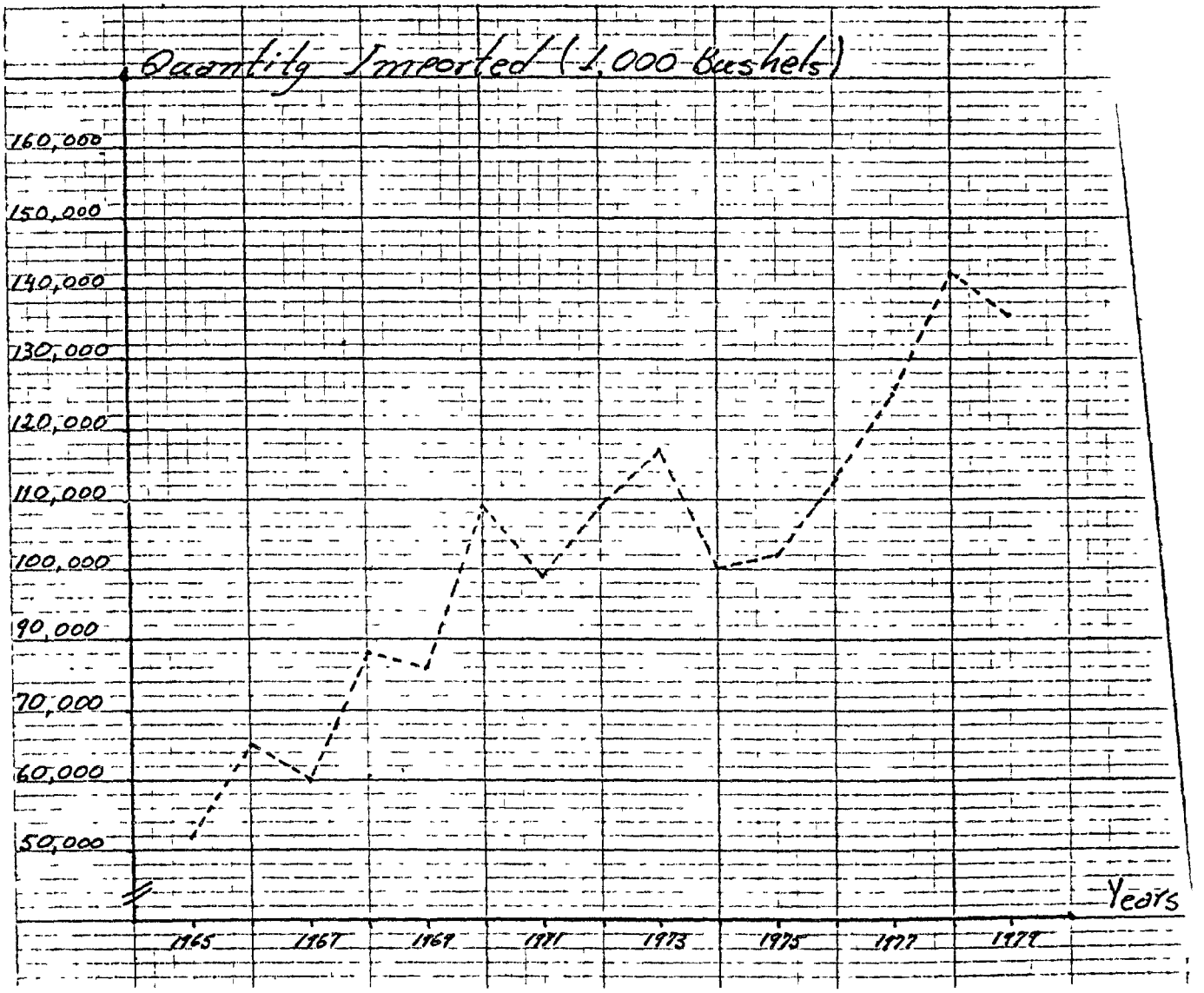
[4]The numbers in parenthesis are the T-ratio. QM stands for quantity imported, and t for time.

Figure 2. Soybean Imports by Japan from the U.S., 1965-79.



approximately 23 percent of the total quantity of soybeans exported by the U.S.

According to Figure 2, this country increased its imports from 52,370 thousand bushels in 1965, to 136, 202 thousand in 1979. That is, an increase of 160 percent. This same figure of soybeans imported by this country, from the U.S., has increased. Assuming that the same general conditions that gave rise to the import pattern observed during the 1965-79 period, will prevail in the future, the following linear equation was estimated:[5]

$$QM = 53{,}457 + 5{,}690\ t \quad , \quad \text{with an } R^2 \text{ of } 0.87.$$
$$(9.50) \quad (9.19)$$

The use of the above equation yielded 172,947 thousand and 201,397 thousand bushels as the estimates of the soybean import demand by Japan in 1985 and 1990, respectively. The comparison of the 1990 estimate, with the average quantity imported by this country, from the U.S., in the 1977-79 period, implied an annual average growth rate of imports of 3.7 percent.[6]

Excluding Japan, there are three Asiatic countries which together account for most of the U.S. soybeans exports to that part of the world. The countries, which were chosen to form the Asian importer group are: Taiwan, Republic of Korea and Singapore.

According to Figure 3, the imports of the Asian group jumped from 6,139 thousand bushels in 1965, to about 56,000 thousand in 1979. That is, it increased more than nine times.

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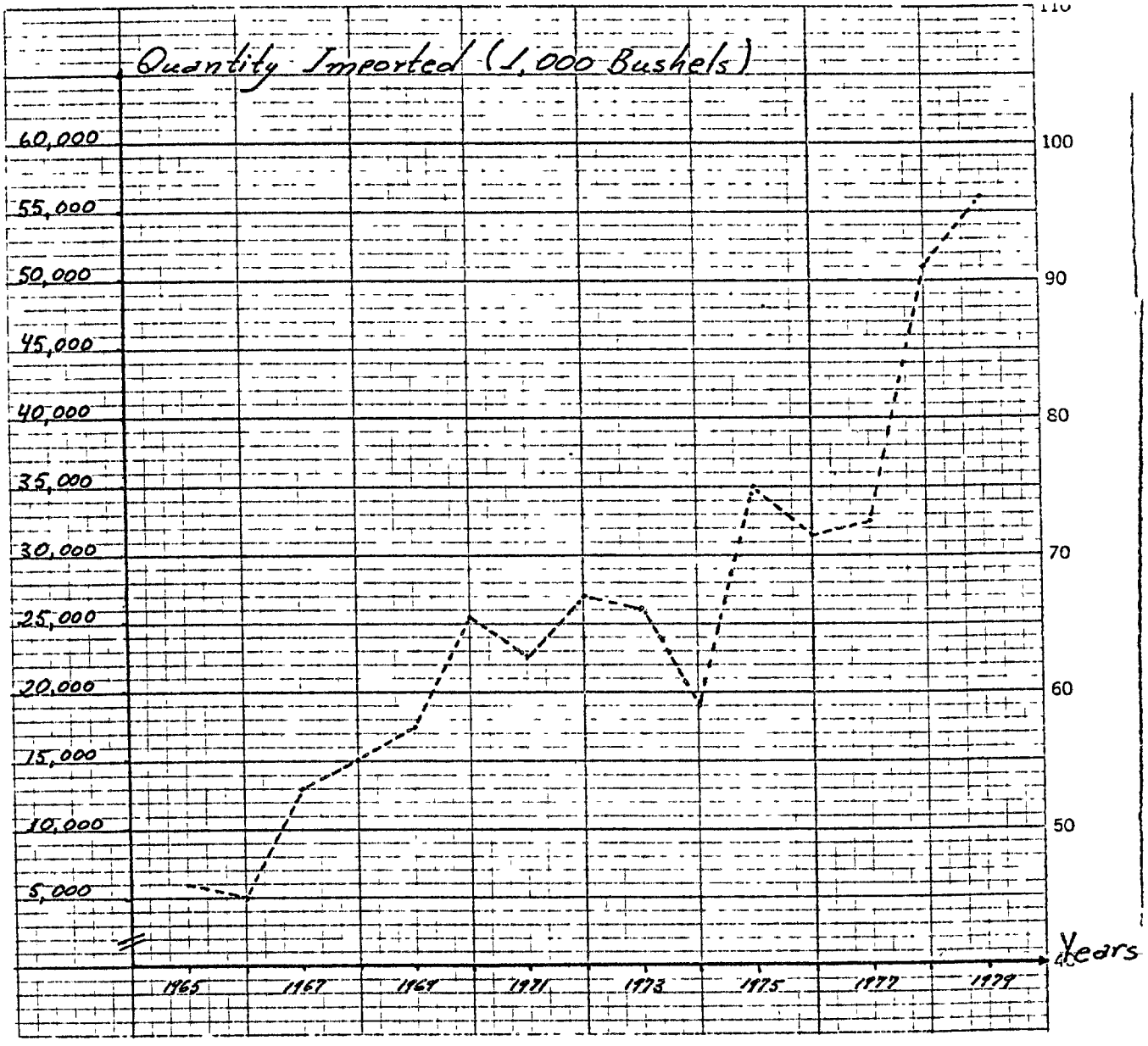
[5]The numbers in parenthesis are the T-ratio.

[6]This annual average growth rate was derived through the use of the expression presented on footnote 3. For this particular case $B = 134{,}385$, $V_\eta = 201{,}397$, and $\eta = 11$.

Figure 3. Soybean import demand by the Asian Group from the U.S., 1965-79.



Among the countries selected to form the Asian group, Taiwan deserves a special attention due to the large quantity of soybeans it has imported from the United States along the years. During the 1965-67 period, this country imported an average quantity of soybeans of 7,796 thousand bushels. After that period, the imports made by Taiwan, followed an upward trend achieving an average of 34,805 thousand bushels in 1977-79. This increase in soybean imports resulted in an annual average rate of growth in the quantity imported of about 13 percent.[7]

Given the importance of Taiwan in the Asian group, it is relevant to derive an estimate of the future import demand by this country. Therefore, a least square regression was performed using the import data, relative to the 1965-79 period. This procedure resulted in the following estimating equation:

$$QM = 4{,}385 + 2{,}140\ t \quad , \quad \text{with an } R^2 \text{ of } 0.83.$$
$$(1.83) \quad (8.10)$$

As mentioned earlier, the number in parenthesis are the T values.

Making use of the above equation, the import demand of American soybeans by Taiwan in 1985 and 1990, is predicted to be 49,325 thousand bushels and 60,025 thousand, respectively. The 1985 estimate implies an increase of approximately 42 percent over the 1977-79 average quantity imported.

Applying the same estimation procedure to the 1965-79 import data of the Asian group,[8] resulted in 64,221 thousand, and 79,091 thousand bushels

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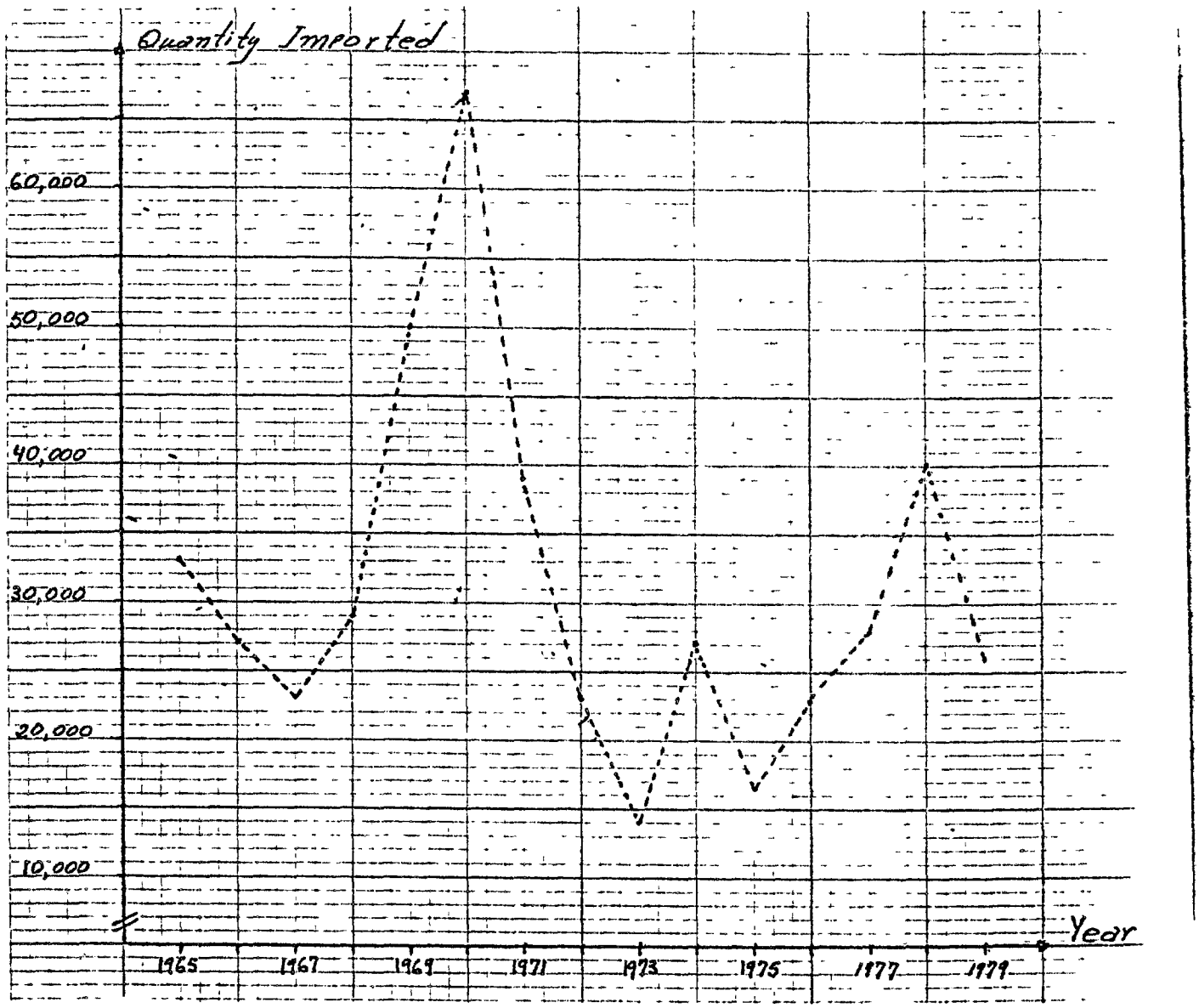
[7]This rate of growth was obtained through the use of the expression outlined on footnote 3, where B = 7,796, V_η = 34,805 and η = 12.

[8]As mentioned previously, this group is composed by Taiwan, Republic of Korea and Singapore.

Figure 4. Soybean Import Demand by the North American Group from the U.S., 1965-79.



as the 1985 and 1990 estimates of future soybean imports.[9]

Another important group of countries which import soybeans from the U.S. is formed by Canada and Mexico. This group will be called here North America.

According to the data pictured on Figure 4, the average quantity of American soybeans imported by the North America group in the 1977-79 period, increased moderately over the 1965-67 period. This same figure depicts the sudden rise in soybean imports occurred in the 1969-71 period. This sharp rise was due mainly to the exports made to Canada. A possible explanation for the boost in exports to Canada during that three years period, could be the renewed growth in poultry and livestock production in European countries and Japan, combined to the fact that Canadian ports are used for transhipment to other countries.

Assuming that the sharp rise of U.S. soybean exports to the North American group, occurred in the 1969-71 period is unlikely to happen in the future, a line was fitted through the aggregate quantity of soybeans exported to Canada and Mexico during the 1972-79 period. This procedure resulted in the following linear equation:

$$QM = \underset{(2.97)}{15,948} + \underset{(1.80)}{1,914}\ t \quad , \text{ with an } R^2 \text{ of } 0.35.$$

This equation in turn, yielded 42,744 thousand bushels and 52,314 thousand, as the 1985 and 1990 estimates of future imports by the North American group, respectively.

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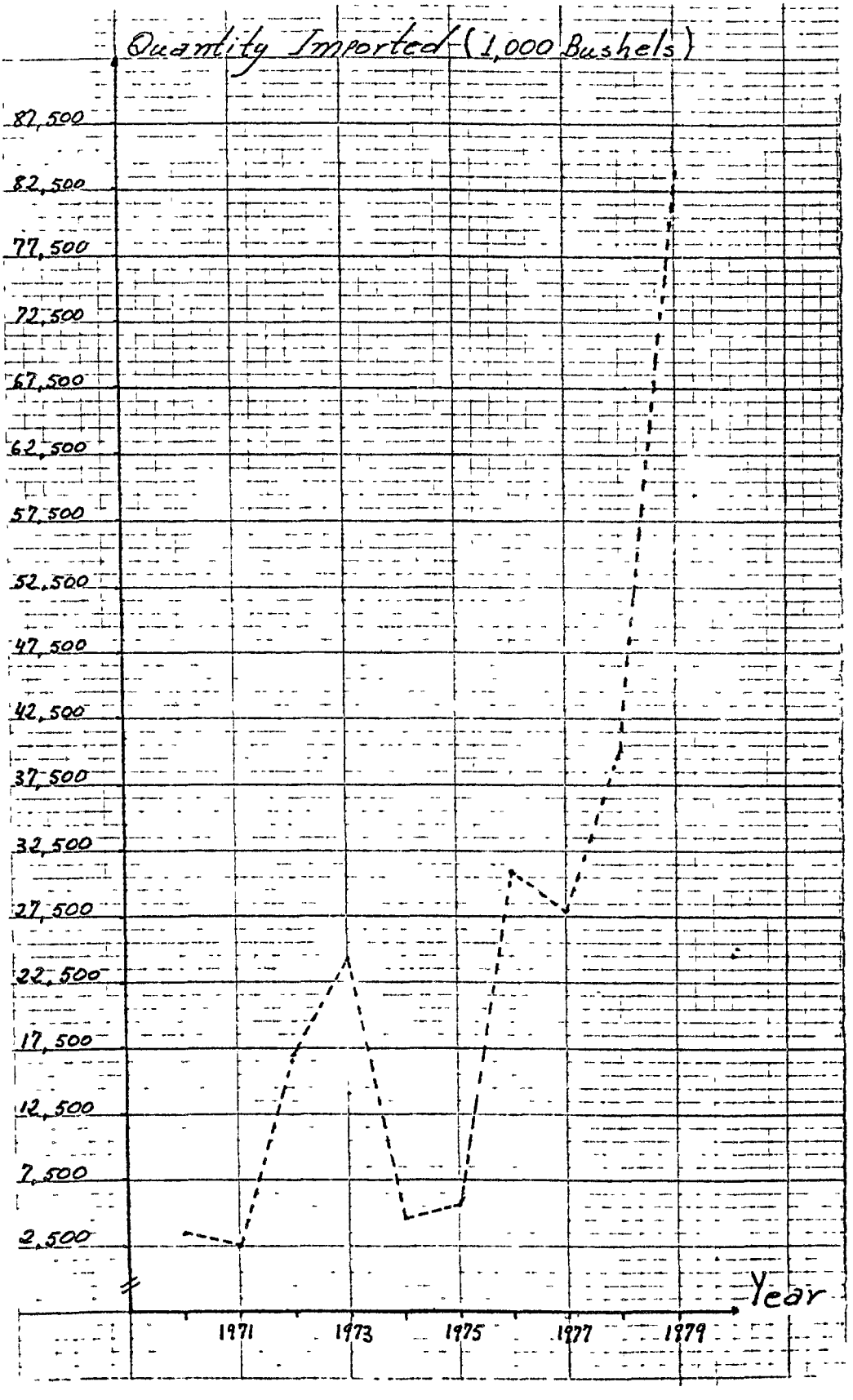
[9]The estimating equation which gave rise to these estimates was

$$QM = \underset{(0.55)}{1,767} + \underset{(8.37)}{2,974}\ t \quad , \text{ with an } R^2 \text{ of } 0.84.$$

Figure 5. Soybean import demand by the Eastern European Group from the U.S., 1970-1979.



The Eastern European group, here represented by Russia, Poland and Romania, is characterized by large variability in the annual quantity of soybeans imported from the United States. According to Figure 5, this importer group imported about 6,000 thousand bushels in the 1970-71 period, then the imports jumped to 41,136 thousand bushels in the next two year period. This same up and down movement in imports was repeated in the following two year period. That is, in the 1974-75 period, total imports fell to 10,148 thousand bushels, and an increase to 56,931 thousand was in turn registered in the 1976-77 period. After this cyclical variation, a steady increase in the quantity imported was observed over the 1977-79 period.

The instability of imports, coupled to the uncertainty about the policy that those communist countries might follow in the future, raise the difficulties associated with an export prediction. However, since all forecast efforts are subject to uncertainty, it is justified to proceed and derive estimates of future U.S. soybean exports to the Eastern European group.

Regressing the aggregate quantity of soybeans imported by Russia, Poland and Romania from the U.S., during the 1970-79 period, against time resulted in the following estimating equation:[10]

$$QM = -11,176 + 6,356\ t \quad , \quad \text{which in turn yielded}$$
$$\qquad\quad (-0.99) \quad (3.50)$$

90,520 thousand bushels and 122,300, as the 1985 and 1990 estimates of import demand by the Eastern European group, respectively.

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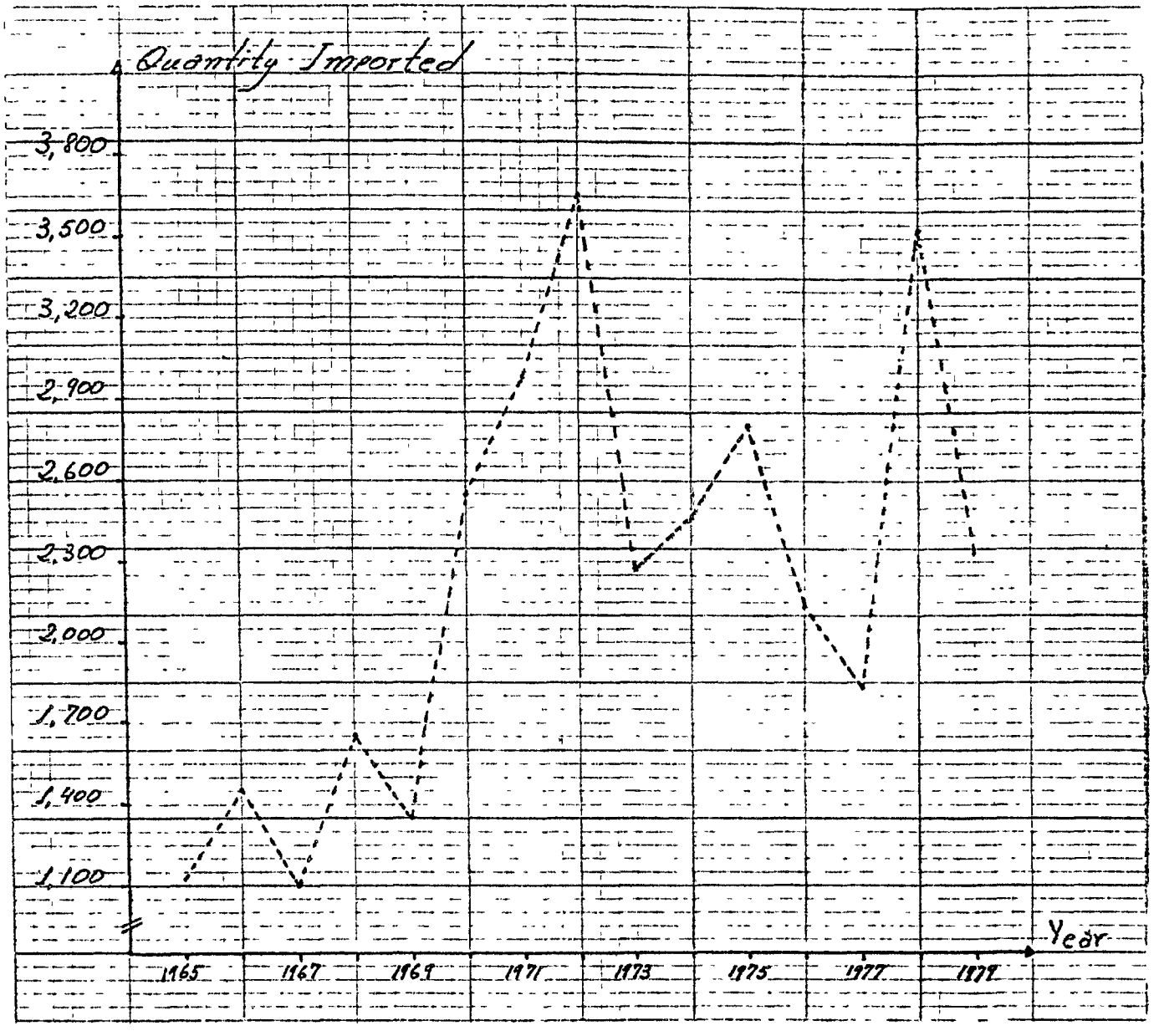
[10]The coefficient of determination was found to be equal to 0.60. The number in parenthesis are the T-statistics.

Figure 6. Soybean Imports by the South American Group from the U.S., 1965-79.



The South America soybean import group, formed by Venezuela and Peru, is ranked in sixth place in terms of the quantity of soybean it imports from the U.S. Looking at Figure 6, one may observe that the soybean imports made by this group, could be described as having two distinct phases with respect to the quantity imported. The first one, covering the 1965-69 period, was marked by an average import level of 1,356 thousand bushels. The second, beginning at 1970 and extending itself throughout the last decade, had an average soybean import of 2,665 thousand bushels.

Assuming that the import pattern registered during the 1965-79 period, will determine the future imports of soybean by the South American group, a trend analysis was performed resulting in the following estimating equation:

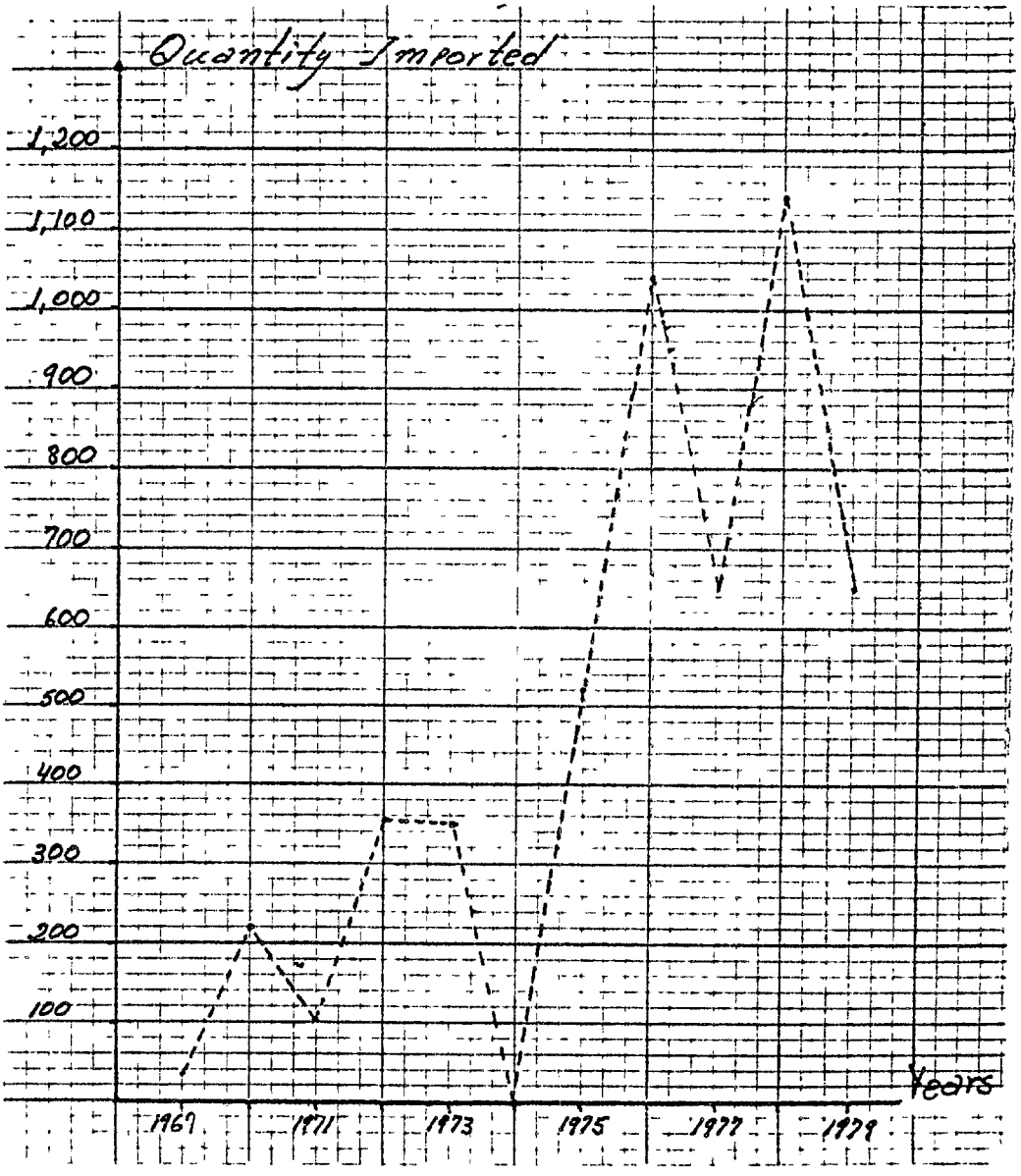
$$QM = 1{,}367 + 108\ t \quad , \quad \text{with an } R^2 = 0.36.$$
$$(3.74)\quad (2.68)$$

According to the above equation, the 1985 and 1990 import level by the South American group should be of 3,635 thousand bushels and 4,175 thousand, respectively. The 1985 estimate implies an increase of 1,035 thousand bushels over the 1977-79 average quantity imported, i.e. a 40 percent rise.

Considering that Venezuela is the largest soybean importer county in the South American group, and that its income has risen significantly in the last years, due to petroleum exports, it seemed desirable to forecast the future soybean imports by this country. However, an unsatisfactory result was obtained when the prediction procedure, employed throughout this paper, was applied to the Venezuelan import data. Therefore, an estimate of future soybean imports by Venezuela will not be reported here.

The Central America soybean import group is here represented by a single country, that is, Dominican Republic. Historically, this country

Figure 7. Soybean Imports by the Central American Group from the U.S., 1969-79.



alone is responsible for more than 85 percent of the soybean imports made by Central American countries from the U.S., except in the last four years when Jamaica emerged as a significant importer. Until 1976, Jamaica did not import soybeans from the U.S. However, after that period, this countries imports increased steadily from 1,057 thousand bushels in 1977, to 2,093 thousand in 1980. This recent emergence of Jamaica in the import scenario could be viewed as a short run phenomenon, or on the other hand it could be an indication that this country is becoming to be a major soybean importer.

Considering that four years is a short period to draw inferences about the future, what one could suggest in this case, is that Jamaica deserves a special attention, since it appears to be a good potential export market for U.S. soybeans.

According to the data graphed on Figure 7, the total quantity of soybeans imported by the Central America group has been characterized by an upward trend during the 1969-79 period. Assuming that this trend will persist in the future, the 1985 and 1990 estimates of future soybean imports by the Central America group, derived by this study was 1,450 thousand bushels, and 1,900 thousand, respectively.[11]

The last soybean import group to be considered here is formed by Mid Eastern and North African countries, that is, Israel, Lebanon and Morocco. According to Figure 8, this group of countries displayed a downward trend in the quantity of soybeans imported from the U.S., during the 1965-70 period. After this period of time, the trend was reversed,

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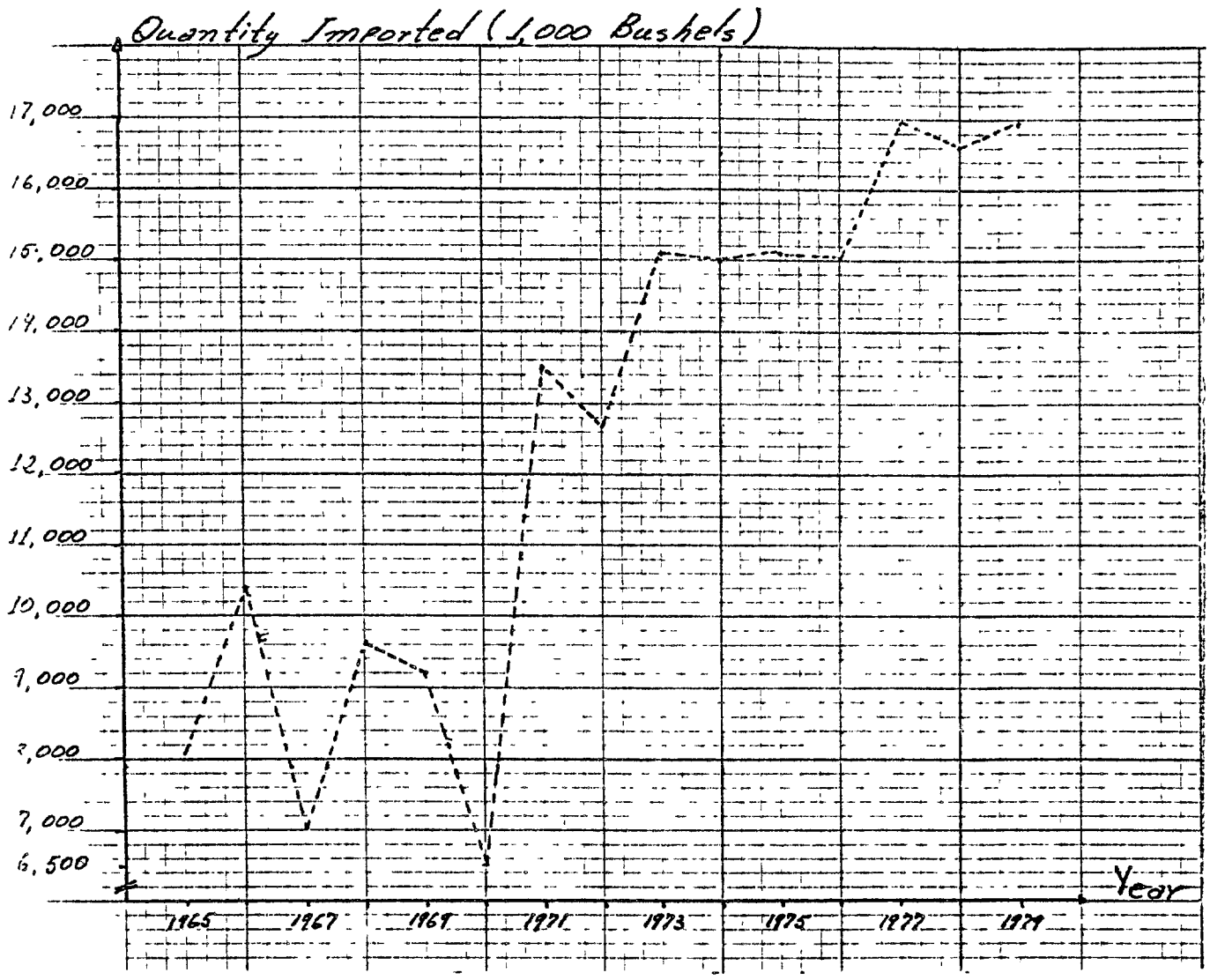
[11]These estimates were derived from the following estimating equation:

$$QM = \underset{(-0.49)}{-80} + \underset{(3.74)}{90}\ t \quad .$$ The R^2 was equal to 0.61.

Figure 8. Soybean Imports by the Mid East-North Africa Group from the U.S., 1965-79.



and as one may observe the imports in creased steadily, with the exception of the years 1972 and 1978.

Supposing that the trend observed during the 1971-79 period will continue into the future, the 1985 and 1990 soybean import demand by this Mid East - North Africa group were derived based on the following equation:

$$QM = \underset{(26.34)}{12,812} + \underset{(5.62)}{486\ t}$$, which had a coefficient

of determination of 0.82. The use of the above equation yielded the following estimates:

1985 import demand: 20,102 thousand bushels.

1990 import demand: 22,532 thousand bushels.

Among the countries selected to represent the Mid East - North Africa group, Israel is the most important, due to the quantity it has traditionally imported from the U.S.

Historically, this country alone has been responsible for more than 75 percent of the total soybean imports made by this group. Therefore, the curve depicted on Figure 8 was largely determined by the import movements of this country.

Given the importance of Israel as an exporter market, and the resemblance of its import pattern to that shown on Figure 8, the same linear trend analysis performed for the group as a whole was applied to the Israel import data. This procedure resulted in the following import demand estimates for Israel:[12]

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[12]The estimating equation for Israel was:

$$QM = \underset{(18.84)}{12,586} + \underset{(1.95)}{232\ t}$$, with an R^2 of 0.35.

Table 4. Summary Table of the Estimates of Future U.S. Soybean Exports by Continent of Destination. Derived by this Study.

Importing Group	Average quantity Imported in the Period 1977-79 (thous. bu.)	Estimates of Future U.S. Exports. (thous. bu.)		Import Market Share (Percent)		
		1985	1990	Average 1977-79	1985	1990
W. Europe	381,096	511,786	613,195	57.45	56.40	55.91
Japan	134,385	172,947	201,397	20.26	19.06	18.36
Asia	46,530	64,221	79,091	7.02	7.08	7.21
E. Europe	49,795	90,520	122,300	7.51	9.98	11.15
North America	31,222	42,744	52,314	4.71	4.71	4.78
Mid East-North Africa	16,834	20,102	22,532	2.54	2.21	2.05
South America	2,600	3,635	4,175	0.39	0.40	0.38
Central America	816	1,450	1,900	0.12	0.16	0.17
TOTAL(2)	663,278	907,405	1097,104	100.0	100.0	100.0

(2) This total refers to the U.S. exports of soybean to the countries which were selected to form the importing groups.

1985 import demand: 16,066 thousand bushels.

1990 import demand: 17,226 thousand bushels.

Now, that the estimates of future U.S. soybean exports, by continent of destination, have being derived, one might combine all this information to make some inference about the evolution of import market shares into the 1980's.

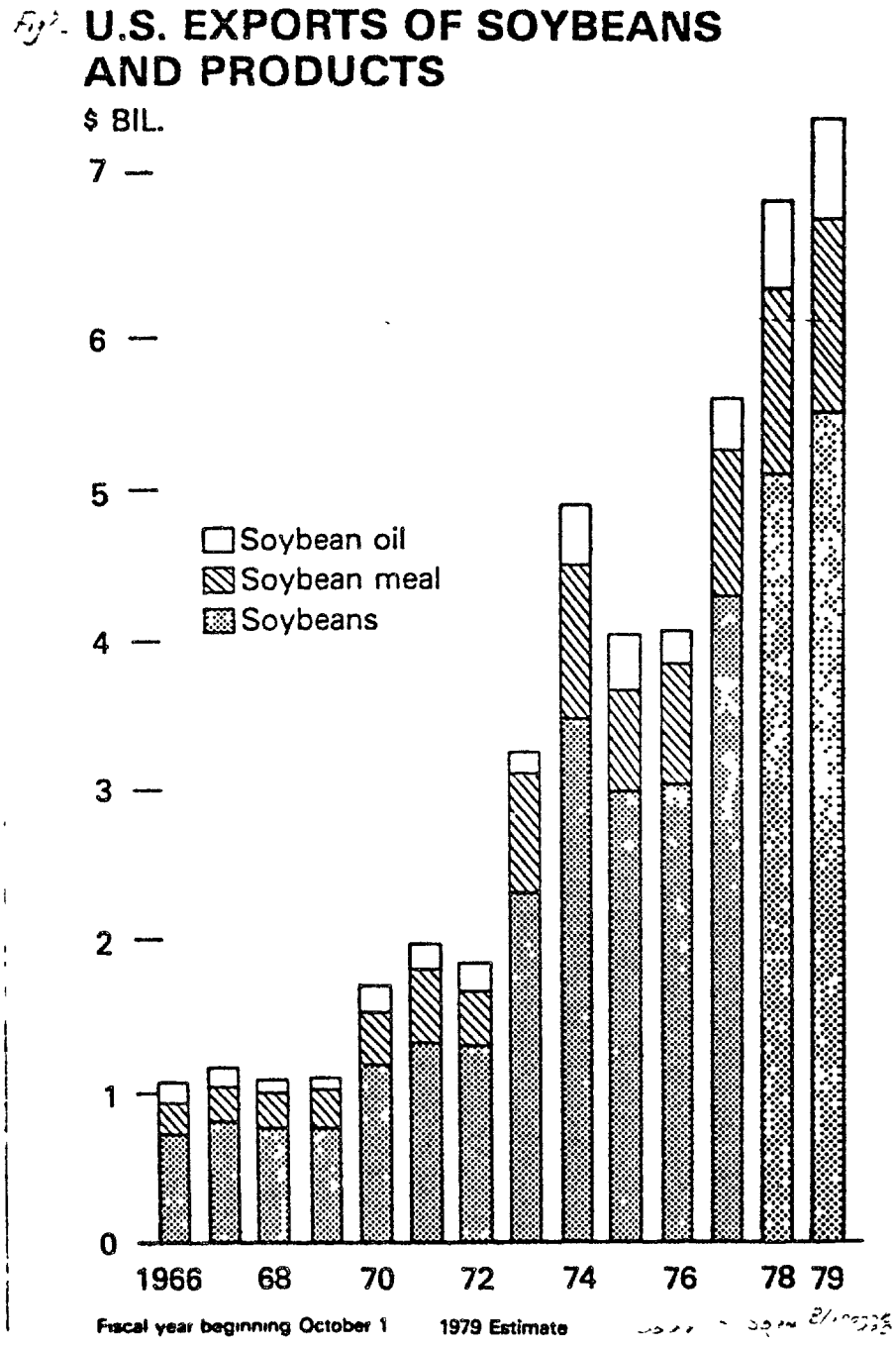
According to the data on Table 4, some changes in import market share are foreseen for the present decade. Specifically, it is expected to decrease in the import market share of the following groups, Western Europe, Japan, and Mid East - North Africa. Among these importing groups, the first two are the ones which should experience a larger reduction in the import market share. In the other hand importing groups like Eastern Europe, Asia, North America and Central America should increase their import market share.

The major change in import market share foreseen by this study, is the increase of the Eastern European import participation over the total quantity of soybeans, that the U.S. should export to the world, until the end of this decade. A possible reason for this relative increase in the import market share of the Eastern European group, may be the recent suspension of the grain embargo.

Projections of U.S. Soybean Meal Exports

Soybean meal is the second most important product in terms of its participation in the total value of U.S. exports of soybeans and its products. According to Figure 8 below, soybean meal is responsible for 15-25 percent of the total value of exports, while the exports of whole beans has a share of 70-75 percent. The remaining 5-10 percent is attributed

Figure 8.


U.S. EXPORTS OF SOYBEANS AND PRODUCTS
$ BIL.
7
6
5
4
3
2
1
0
Soybean oil
Soybean meal
Soybeans
1966
68
70
72
74
76
78
79
Fiscal year beginning October 1
1979 Estimate

to soybean oil exports.

U.S. soybean meal exports increased steadily in the last two decades. Specifically, it increased from an average quantity exported of 2,464 thousand short tons in the 1965-67 period, to 5,946 thousand in 1977-79. This increase represents an annual growth rate of exports of 7.6 percent.[13]

The soybean meal export pattern registered during the 1965-79 period can be attributed to factors such as: expectation about profit margins on the part of livestock and poultry producers; increase in the crushing capacity in foreign countries; variation in the number of cattle placed on feed, as well as in the number of hogs and poultry; soybean meal price compared to feed grains price, particularly to corn; changes in the feeding rate; fluctuations in the U.S. dollar value relative to European currencies and to the Japanese yen; and, competition from foreign produced commodities, particularly Brazilian soybean meal.

The fact that soybean meal is used to feed livestock, hogs and poultry, and that the Western European group[14] is formed by countries which have a high level of income, and hence a large consumption of livestock products, makes this group the most important soybean meal export market. Historically, over half of U.S. soybean meal exports go to Western Europe.

According to Figure 9, the U.S. exports of soybean meal to this group increased steadily from 1965 to 1971. After that period, the exports

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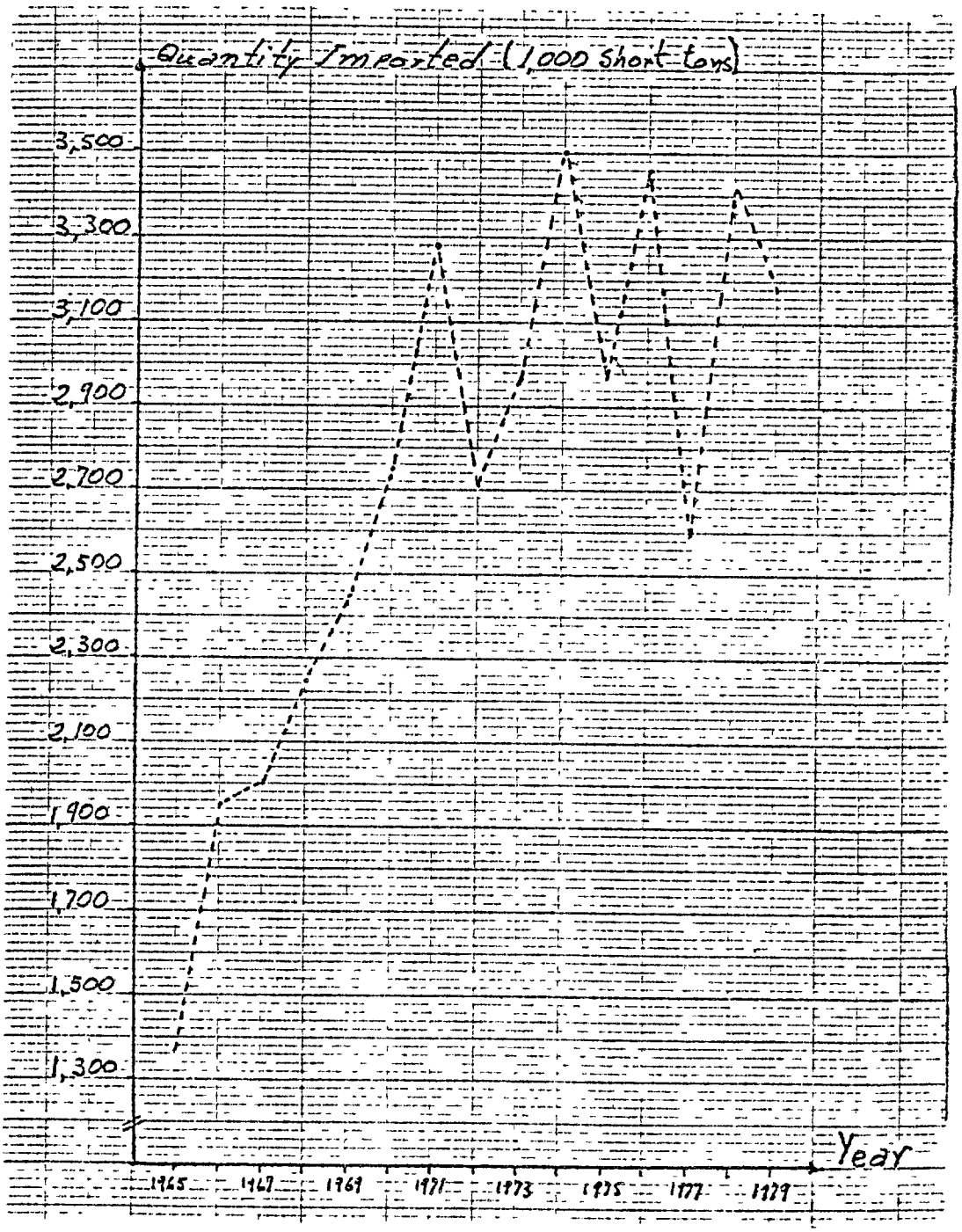
[13] For the procedure used to obtain this annual rate of growth see footnote 3.

[14] In terms of soybean meal exports, the Western European group was formed by the following countries: Belgium, Denmark, France, West Germany, Ireland, Italy, Netherlands, Spain, and United Kingdom.

Figure 9. Soybean Meal Imports by the Western European Group from the U.S., 1965-79.



fluctuated around the mean quantity exported of 3,121 thousand short tons, registered during the 1971-79 period.

Supposing that the factors which gave rise to the import pattern observed in the last decade, will prevail in the future, a least square regression was performed having quantity imported in the 1970-79 period as the dependent variable, and time as the independent variable. The result of such procedure was the following estimating equation:[15]

$$QM = 2,910 + 32\ t.$$
$$(12.67) \quad (0.85)$$

The use of the above equation yielded 3,422 thousand, and 3,582 thousand short tons, respectively as the 1985 and 1990 estimates of future import requirements of soubean meal by the Western European group. The comparison of these estimates with the average quantity imported in the 1977-79 period (3,064 thousand short tons), suggests that the future import demand by this export group will not grow rapidly. Specifically, the data indicates that the quantity demanded by the Western European group in 1985 should increase approximately 12 percent over the 1977-79 average imports, while an expansion of 17 percent over the same base period is expected for 1990.

Among the countries selected to form the Western European group, four of them deserve special attention due to the large quantity of soybean meal that they have individually imported from the U.S. throughout the years. These countries are West Germany, Netherlands, Italy and France.

Traditionally, West Germany has been the largest export market for American soybean meal in the world. In the 1965-67 period, this country

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[15]The corresponding coefficient of correlation was 0.08.

imported an average quantity of meal of 441 thousand short tons, and in 1977-79 it reaches a level of 955 thousand, which corresponds to 18 percent of the total exports of meal made by the U.S. during that three year period.

From the standpoint of U.S. exports of soybean meal to the Western European group, Netherlands is ranked second in terms of export volume. According to the statistical data, this country import market share increased from 18 percent in 1965-67, to 23 percent in the last three years of the 1970's. However, a more significant expansion in import market share in this group was registered by Italy, since its participation rose from 9 percent to 23 percent over the same time period as Netherlands. This sharp increase in import market share, may be an indication that in the near future, Italy will take the place presently occupied by Netherlands in the in the export market scenario.

Among the four most important importer countries of the Western European group, France is the only one which displayed a different import pattern in the last four years of the 1970's. During the 1965-74 period, this country's imports like those made by West Germany, Netherlands and Italy were characterized by an upward trend. However, after 1974 the quantity of meal imported by France decreased systematically reaching a low record of 125 thousand short tons in 1977, while the other three countries maintained their trend. After 1977, the imports made by France increased to a maximum of 406 thousand short tons in 1979, but still below the import levels observed during the 1966-76 period.

Given the individual importance of these four countries in the Western European import group, it seems desirable to assess the future import level of each of them in 1985 and 1990. Therefore, a trend line analysis was performed, and the resulting estimating equations, with the

respective estimates of future import demand are reported in Table 5.

According to the results presented in that table, West Germany will continue to be the leading importer country, followed by Netherlands, which is expected to have a significant increase in its meal imports, as indicated by the percentual increase over the 1977-79 average foreign demand.

The estimates of future import demand derived for France showed a substantial increase over the average quantity imported during the 1977-79 period. However, this increase is significant only when compared to that period average (252 thousand short tons), since historically the annual imports made by this county during the 1965-79 period exceed those estimates.

Italy on the other hand, is expected to continue its upward trend increasing its imports in 1985 and 1990 by 40 and 72 percent, respectively, over the average 1977-79.

The Eastern European group, formed by Poland, Yugoslavia, Czechoslovakia, Hungary and Romania, is the second most important in terms of the quantity of soybean meal it imports from the United States. According to Figure 10 the imports made by this group increased steadily during the 1965-73 period, except in the years of 1971 and 1972, when a small reduction occurred. The years after 1973 were marked by large fluctuations in the import demand. Despite this up and down movements in the quantity imported, it may be asserted that during the 1965-79 period an upward trend in the U.S. meal exports to that group was observed.

Assuming that this upward trend will extend into the future, the 1985 and 1990 estimates of U.S. soybean meal exports to the Eastern European group was found to be of 1,381 thousand, and 1,691 thousand

Figure 10. Soybean Meal Imports by the Eastern European Group from the U.S., 1965-79.

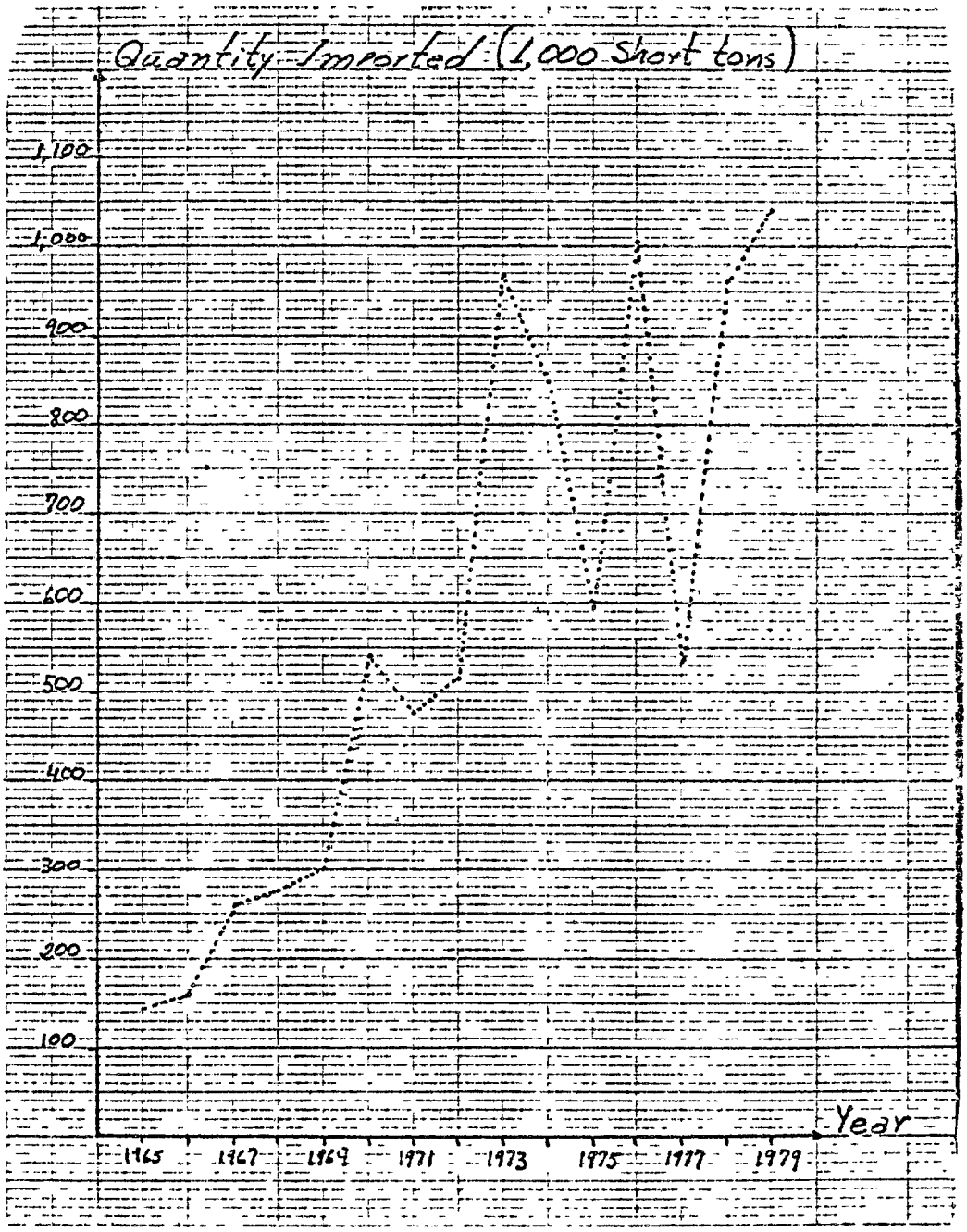

Table 5. 1985 and 1990 estimates of U.S. soybean meal exports to selected countries.

Countries	Estimating Equation(2)	R^2	Regressing Period	Average Imports 1971-79 (000 st)	Estimates of Future Exports			
					1985		1990	
					Quantity (000 st)	Percentage Δ over the 77-79 Average	Quantity (000 st)	Percentage Δ over the 77-79 Average
W. Germany	QM = 459 + 45t (4.44) (4.00)	0.55	1965-79	955	1,404	47	1,629	71
Netherlands	QM = 153 + 71t (1.32) (3.08)	0.61	1972-79	695	1,147	65	1,502	116
Italy	QM = 52 + 44t (1.06) (8.01)	0.83	1965-79	695	976	40	1,196	72
France	QM = 559 - 3t (4.74) (-0.2)	0.003	1965-79	538[b]	496	-8[c]	481	-11

(a) The number in parenthesis are the F ratios.
(b) Average quantity imported during the 1965079 period.
(c) Percentage Δ over the 1965-79 average soybean meal imports.

Table 6. 1985 and 1990 Estimates of U.S. Soybean Meal Exports to Selected Countries of the Eastern European Group.

Selected Countries	Estimating Equation[a]	R^2	Regressing Period	Average Imports 1978-80 (000 st)	Estimates of Future Exports			
					1985		1990	
					Quantity (000 st)	Percentual Δ over the 78-80 Average	Quantity (000 st)	Percentual Δ over the 78-80 Average
Poland	QM= -41 + 31t (-0.83) (5.61	0.71	1965-79	431	610	42	765	77
Yugoslavia	QM = 130 + 1t (4.0) (0.17)	0.002	1965-79	138	151	9	156	13

(a) The number in parenthesis are the T-statisics.

short tons, respectively.[16] The 1985 estimate implies an increase of 537 thousand short tons over the 1977-79 average imports, i.e., a rise of 64 percent.

Two countries which belong to the Eastern European group, can be distinguished with respect to their individual contribution to the volume of imports made by this group as a whole. These countries are Poland and Yugoslavia.

The average quantity of soybean meal imported by Poland increased from 43 thousand short tons in 1965-67, to 382 thousand in 1977-79. That is, it increased almost nine times in 15 years. Yugoslavia on the other hand, did not expand its imports by the same rate as Poland. However, in general the annual meal imports made by this country from the U.S., exceeded 100 thousand short tons. This import level is what makes this country an important export market.

Following the same approach used in this paper, with respect to countries which are distinguished in each exporting group, the estimates of future import demand for Poland and Yugoslavia were derived and reported in Table 6.

According to that table, Yugoslavia should have a moderate increase in its meal imports, compared to the 1978-80 period. Poland on the other hand, might expand its imports, over that same base period, by 42 percent in 1985.

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[16]These estimates were obtained from the following equation:

$$QM = \underset{(0.90)}{79} + \underset{(6.36)}{62\,t}\ , \text{ with an } R^2 = 0.76.$$

Canada and Mexico were chosen to form the North American group. Between these two countries, Canada is the one which has the largest import share. For instance, in the 1977-79 period, this country had an average contribution to the total quantity imported by this group of about 72 percent. However, the data from which it was drawn was not adjusted for transhipments. Thus, in reality the import share of Canada should be a little smaller, but still larger than Mexico's.

Given the relative importance of Canada in the North American group, its future import demand was estimated by regressing the quantity imported during the 1965-79 period against time. This procedure resulted in the following linear equation:[17] $QM = 182 + 11\,t$, which in turn

(5.43) (3.03)

yielded the 1985 and 1990 estimates of U.S. soybean meal exports to Canada. That is:

1985 estimate: 413 thousand short tons.

1990 estimate: 468 thousand short tons.

The comparison of these estimates with the 1977-79 average imports made by Canada, suggests that the U.S. meal exports to that country in 1985 and 1990 should be 2, and 15 percent higher, respectively.

Once the estimates of future import demand for the individual countries in the North American group have been obtained, the analysis should proceed with the objective of deriving the 1985 and 1990 estimates for the group as a whole. That is what will be done next.

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[17] This equation had an R^2 of 0.41. The number in parenthesis are the T-ratios.

According to Figure 11, the quantity of soybean meal imported by the North American group, during the 1965-79 period, described an upward trend. However, this same figure shows that during the years of 1973 and 1974 the imports reached a lower level than the one registered in 1968. After reaching these low points, the quantity imported increased annually, with the exception of 1978, when a reduction of 85 thousand short tons was observed over the previous year.

Considering the import pattern described by the North American group during the 1965-79 period, two separate linear regression equations were estimated over different time spans. One regression covered the most recent developments of the soybean meal export market, that is 1973-79; while the other considered a longer historical period, 1965-79. From these two regressions, the one which covered the 1965-79 period was chosen to be the estimating equation, since the estimates it provides seems more reasonable. According to this equation,[18] the 1985 and 1990 imports of soybean meal by the North American group from the U.S., should be 586 thousand, and 686 thousand short tons, respectively.

Japan, due to its significant level of meal imports from the United States, forms a group by itself.

According to Figure 12, the imports made by this country during 1965-79, could be divided in two distinct periods, with respect to the volume imported. The first, from 1965 to 1972, would be characterized by import levels inferior to 85 thousand short tons; the second, on the other hand, covering the remaining years of the 1970's, was marked by annual

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[18]The estimating equation is:

$$QM = \underset{(3.05)}{166} + \underset{(3.33)}{20\,t}\ , \quad \text{with an } R^2 = 0.46.$$

Figure 11. Soybean Meal Imports by the North American Group from the U.S., 1965-79.

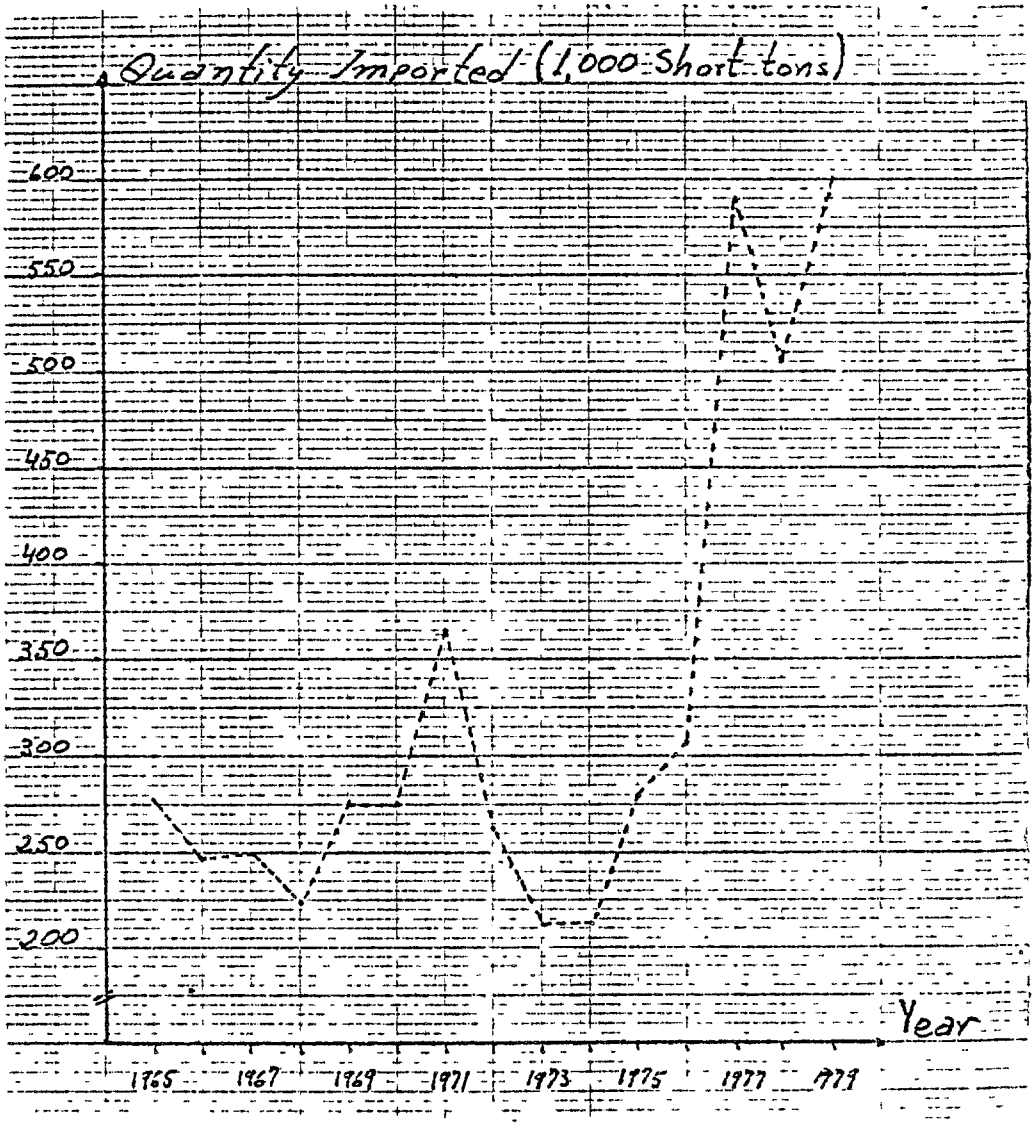


Figure 12. American Soybean Meal Imported by Japan, 1965-79.

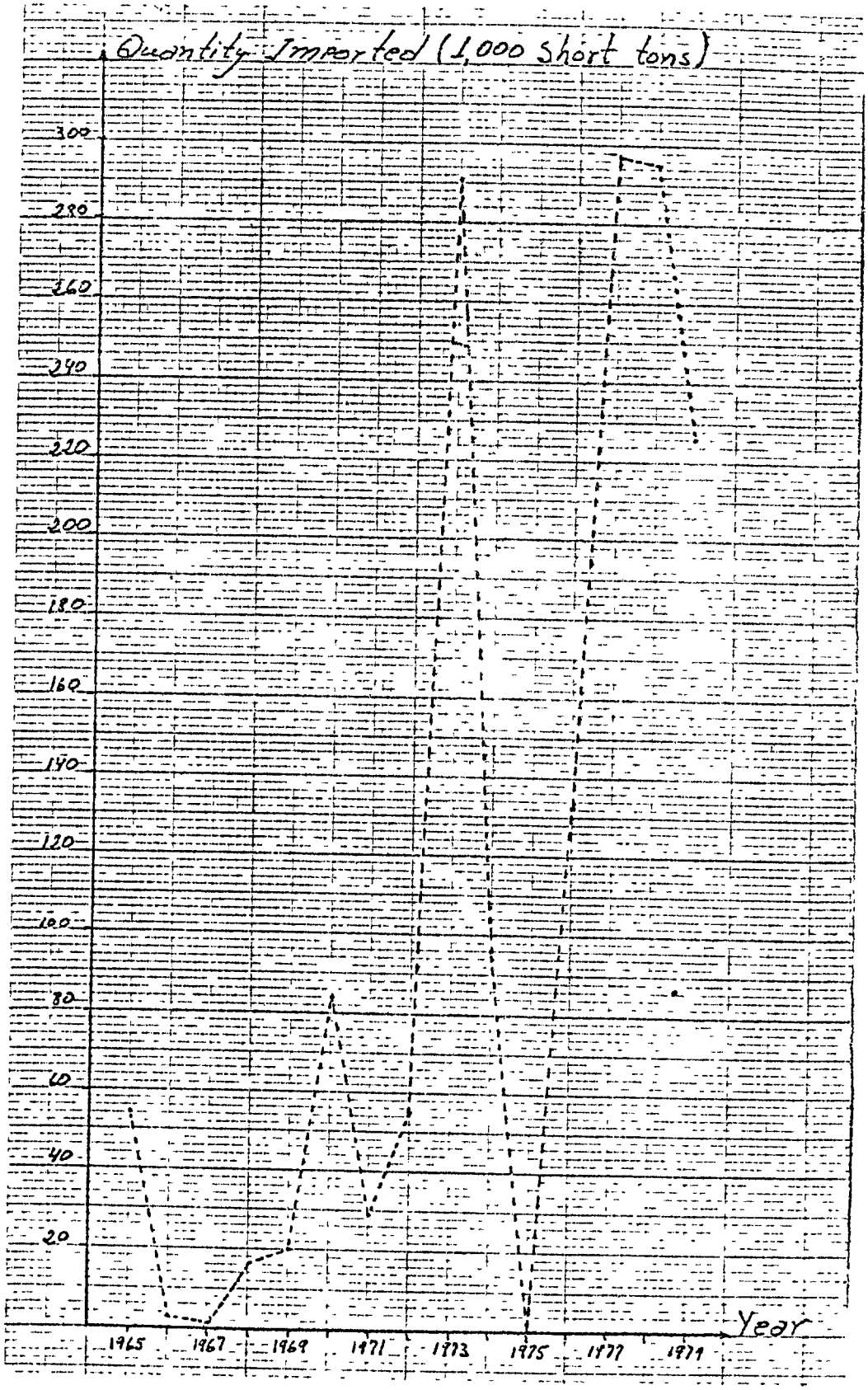
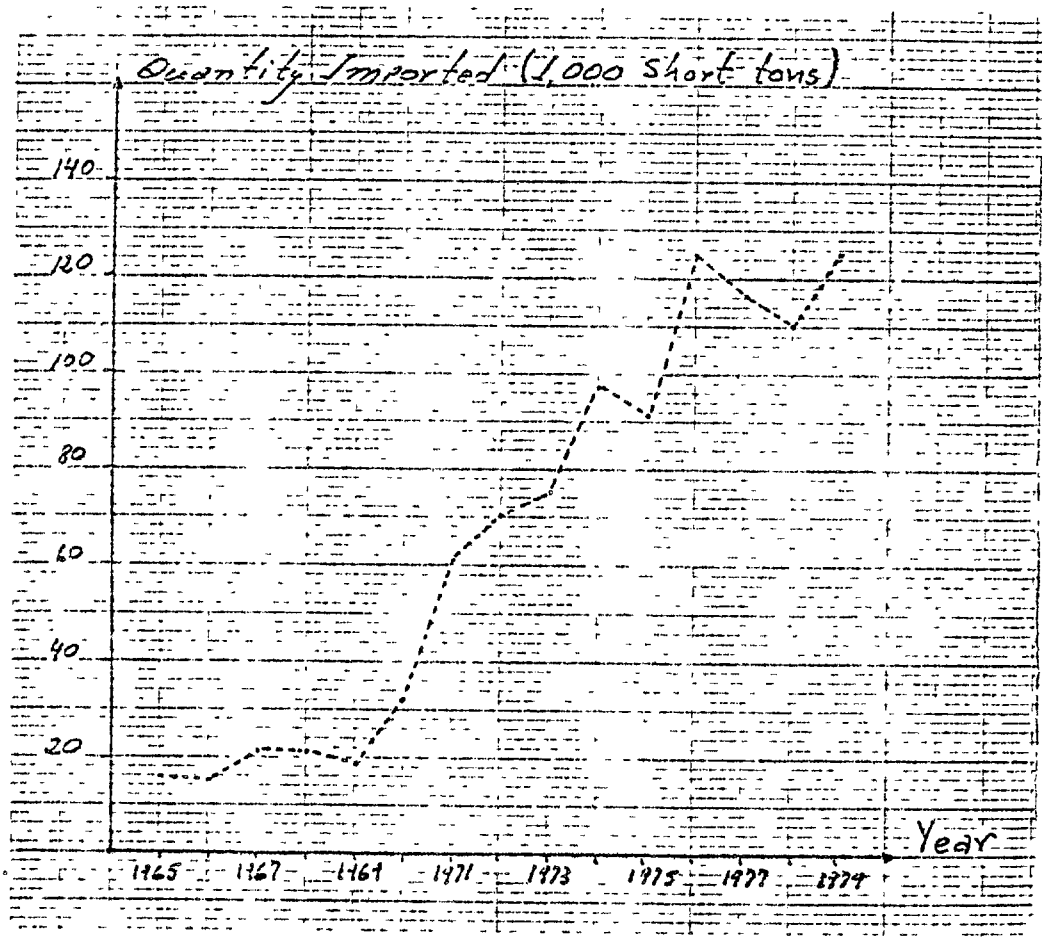


Figure 13. American Soybean Meal Imported by the Central America Group, 1965-79.



imports well above 95 thousand short tons, except in 1975 when this country did not import a significant amount of soybean meal from the U.S. A possible reason for this insignificant import level, may be the extremely competitive Brazilian meal price in that specific year.

Considering the objective of this paper, the last four observations relative to the first import period, were combined to the ones registered during the second period, forming the time series to which a trend line was fitted. This procedure yielded the following estimating equation:

$$QM = \underset{(-0.32)}{-18} + \underset{(3.03)}{22\,t}\ , \text{ with an } R^2 \text{ of } 0.48.$$

The use of the above equation yielded 378 and 488 thousand short tons as the 1985 and 1990 estimates of U.S. meal exports to Japan, respectively.

The 1990 estimate, implies an annual rate of growth of imports of 5 percent,[19] over the 1977-79 average quantity imported.

From the point of view of U.S. soybean meal exports, the Central American group is ranked fifth in order of importance. According to Figure 13, the imports made by this group increased steadily through the time, with the exception of few years when a short reduction took place.

This import group, differs from those previously presented, in the sense that it is formed by 7 countries,[20] and none of them had an annual import level superior to 40 thousand short tons, during the 1965-79 period.

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[19] For an explanation of the procedure used to obtain this annual rate of growth, see footnote 3.

[20] The following countries were chosen to form the Central American group: Costa Rica, Dominican Republic, Guatemala, Honduras, Jamaica, El Salvador, and Trinidad.

This observation indicates that, this group compared to others, is formed by countries which have traditionally imported small amounts of meal from the U.S. One of the reasons for this low import pattern, is that the Central American group is formed by low income countries. However, it should be noticed that even though the income level has been low in those countries, it has increased over the years, what suggests that this group should increase its imports of meal in the next future.

Assuming that the general conditions that gave rise to the imports made by this group, during the 1965-79 period, will persist during the current decade, a least square regression was performed resulting in the following two estimates of future meal import demand:[21]

1985 estimate: 181 thousand short tons.

1990 estimate: 226 thousand short tons.

The above estimates represent an increase of 55 and 93 percent over the 1977-79 average imports.

Among the seven counties selected to form the Central America group, Trinidad is distinguished as the largest potential export market for American meal. This country increased significantly its imports during the 1968-79 period. Supposing that the same factors which supported this increase will prevail in the future, the 1985 and 1990 estimates of soybean meal exports by the U.S. to Trinidad was found to be respectively 13, and 23 thousand short tons larger than the 1977-79 average imports

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[21] Estimating equation: $QM = \underset{(-1.19)}{-8} + \underset{(13.22)}{9\,t}$, $R^2 = 0.93$

(27 thousand short tons).[22] That is, an increase in the import level of 48 and 85 percent.

Venezuela, is the only country in South America, that have imported significant amounts of soybean meal from the United States. Therefore, it will be the single representative of this geographic region.

Until 1974, Venezuela was not considered a major export market for U.S. meal. According to the U.S. export data by country of destination, Venezuela did not import American meal during the 1966-70 period. However, after the 1971-73 period, when it imported an average quantity of 15.7 thousand short tons, a significant rise in import demand took place, as illustrated in Figure 14.

Looking at that figure, and recalling the beginning date of the oil crisis, it seems legitimate to associate that historical phenomenon, with the import pattern depicted on that graph. Specifically, it may be asserted that the rise in the petroleum price, registered in 1973 and thereafter, increased significantly the level of income in Venezuela, and hence changed its demand for soybean meal to feed livestock and poultry.

Considering that, unlikely the crude oil prices will have a different annual rate of increase in the next years from the one observed in the 1971-79 period, a linear trend analysis was performed over that time span to project U.S. meal exports to Venezuela. According to that procedure, in 1985 the U.S. should export 415 thousand short tons to that country, while for 1990 it is expected an export level of 570 thousand.[23]

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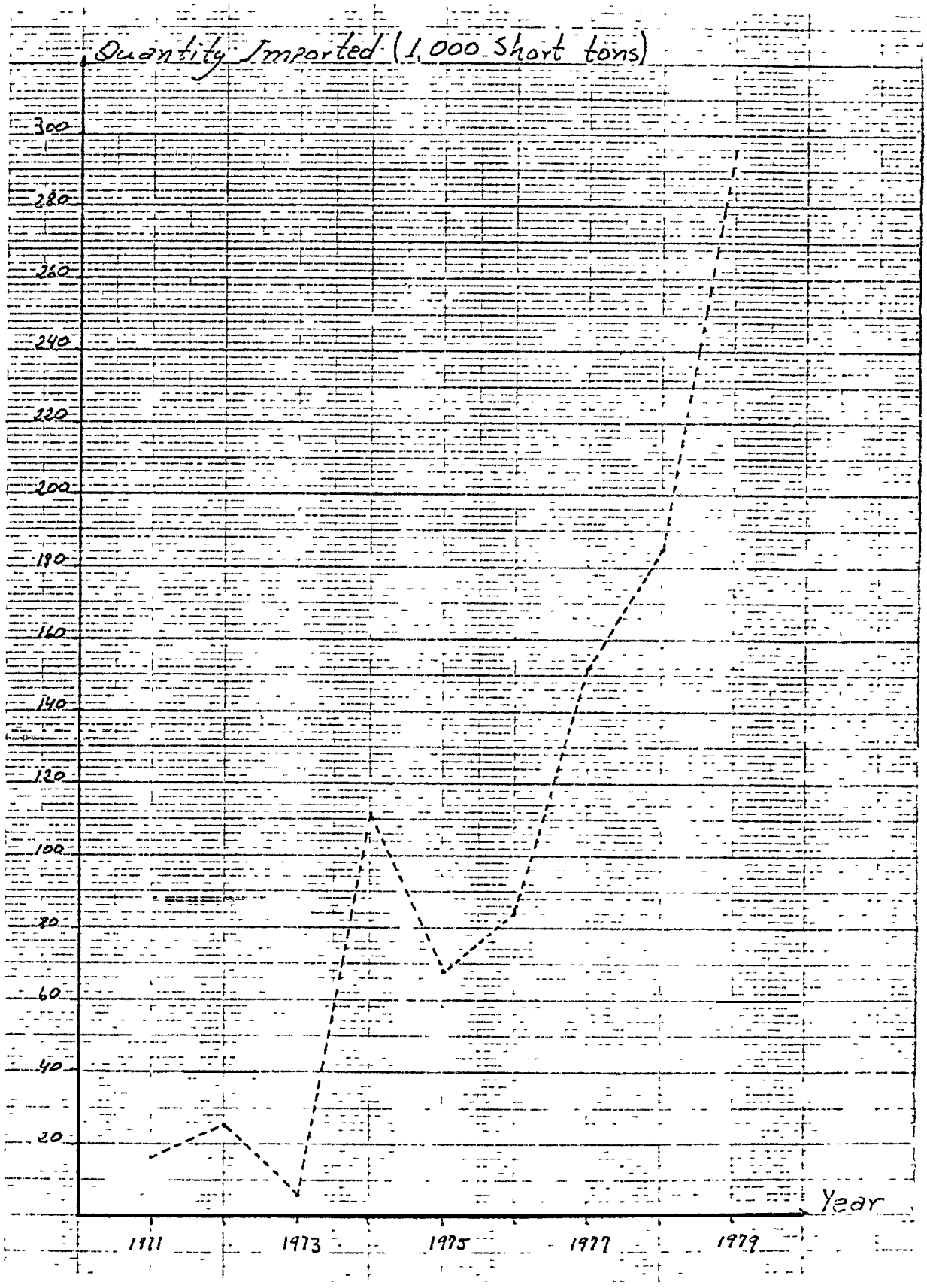
[22] Estimating equation: $QM = \underset{(2.09)}{4} + \underset{(7.58)}{2\,t}$, $R^2 = 0.85$.

[23] Estimating equation: $QM = \underset{(-1.6)}{-50} + \underset{(5.5)}{31\,t}$, $R^2 = 0.81$.

Figure 14. American Soybean Meal Imported by Venezuela, 1771-79.



These estimates, when compared to the 1977-79 average imports seems to suggest a large increase. However, this expectation is reduced if the preliminary data relative to the 1980 imports is considered, since it is 11 and 53 percent lower than the 1985 and 1990 estimates, respectively.

The next group to be considered here is the Mid East - North Africa, which is formed by Egypt, Iran, Jordan, Kuwait, Lebanon, and South Arabia.

This group until recently, did not seem to be a promising export market for U.S. meal, since its imports were relatively low. However, given that this group is formed by some of the major crude oil exporting countries, the energy crisis favored their economic situation in such a way, that the group became an object of attention on the part of the soybean meal exporting countries.

According to Figure 15, it may be suggested that the positive effect of the oil crisis on the U.S. exports of meal to the Mid East - North Africa group, was not felt immediately after 1973. Specifically, it appears that only three years passed, the new income levels experienced by this group influenced significantly its meal imports from the U.S.

Assuming that the major developments in the U.S. meal exports to Mid East - North Africa have taken place already, i.e. no breakthrough in the rate of growth of exports to that group is expected to occur, the following estimates of future import demand were obtained:[24]

1985 estimate: 196 thousand short tons.

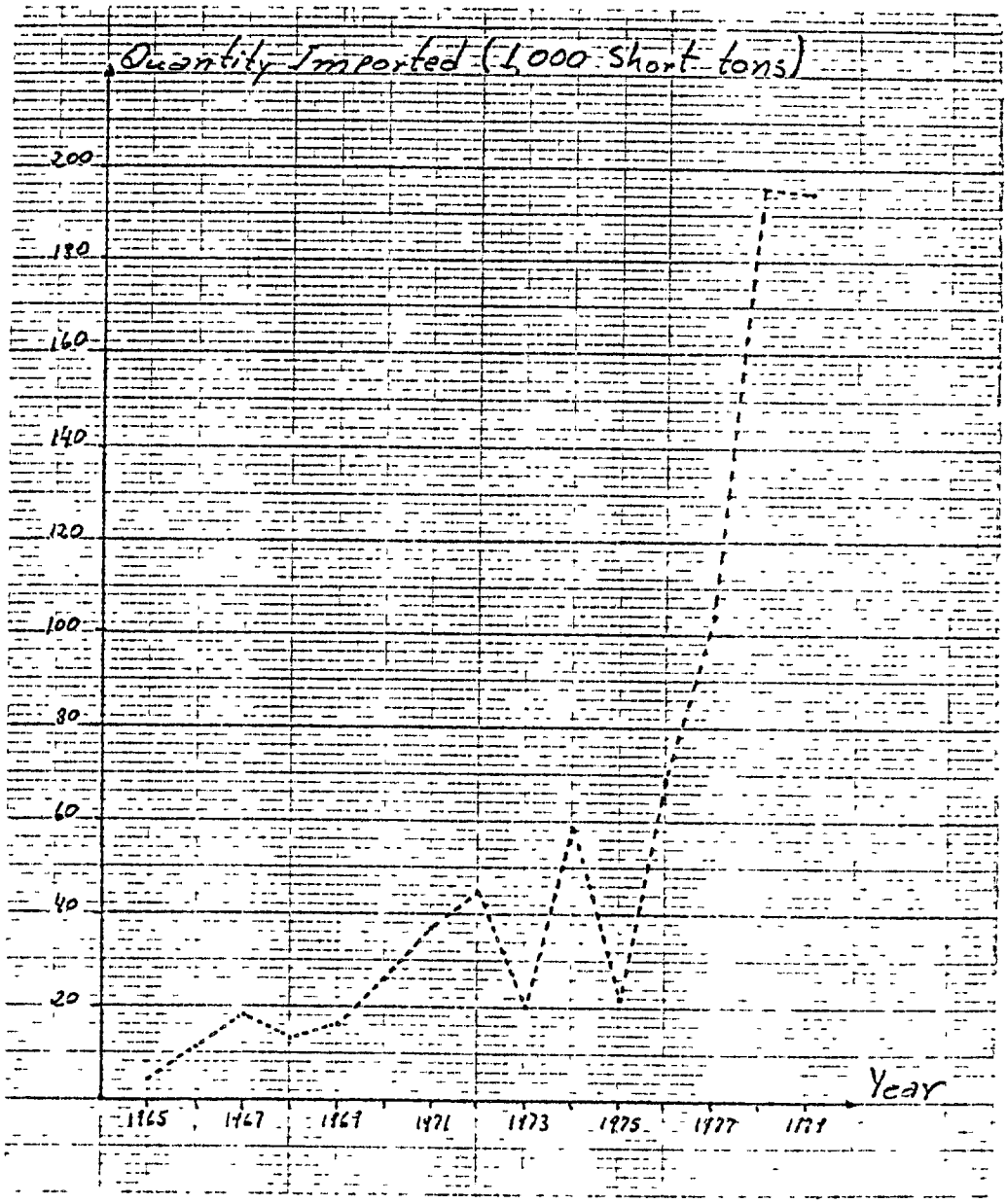
1990 estimate: 251 thousand short tons.

---

[24]These estimates were derived from regressing quantity imported in the 1965-79 period, against time. The regressing equation is,

$$QM = \underset{(-1.7)}{-35} + \underset{(5.0)}{11}\, t \quad , \text{ and the } R^2 = 0.65.$$

Figure 15. American Soybean Meal Imported by the Mid East-North Africa Group, 1965-79.



The 1985 estimate is approximately the same as those observed in 1978 and 1979, however, it is 85 percent larger than the preliminary estimate of the 1980 import level.

The Asiatic group, formed by Philippines and South Korea, have described a cyclical movement in its meal imports from the U.S. during the 1965-80 period (see Figure 16). That is, it has alternated its import trend successively. Another observation that may be inferred from the import data of this group is that, not only the trend has varied, but also the number of years required to reverse it. As shown on Figure 16, it took 7 years for the Asiatic group to reverse its import trend during the 1965-76 period. However, in the 1976-80, the trend was reversed after the first 4 years.

This instability in the direction of the import trend, as well as in the number of years necessary to complete a full cycle, i.e. to move from the lowest point in the upward trend, to the last point in the downward trend, raise some difficulty to extrapolate U.S. exports of meal to the Asiatic group. Given this difficulty, the 1985 estimate of import demand is expected to be the same as the sample average imports observed during the 1965-80 period. That is, 39 thousand short tons. The addition of one standard error, obtained over that same period, to the 1985 estimate yielded 74 thousand short tons, which is regarded to be the quantity of soybean meal that the Asiatic group might import from the U.S. in 1990.

The last soybean meal importer group to be considered here is Oceania, which is formed by a single country, Australia.

Historically, this group is not a major export market for U.S. meal, and according to Figure 17, its importance has declined even more in the last decade.

Figure 17. American Soybean Meal Imported by the Oceania Group, 1965-79.

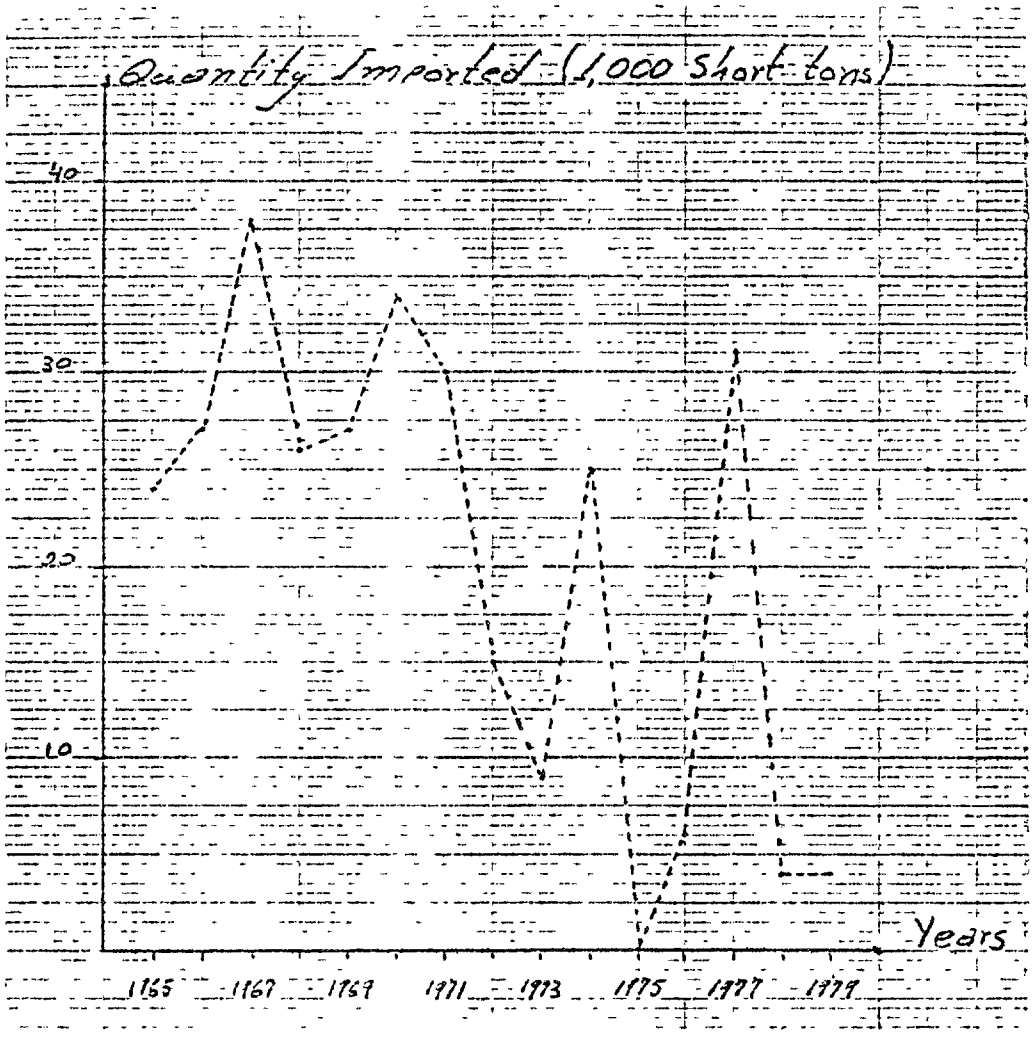


Figure 16. American Soybean Meal Imported by the Asiatic Group, 1965-80.

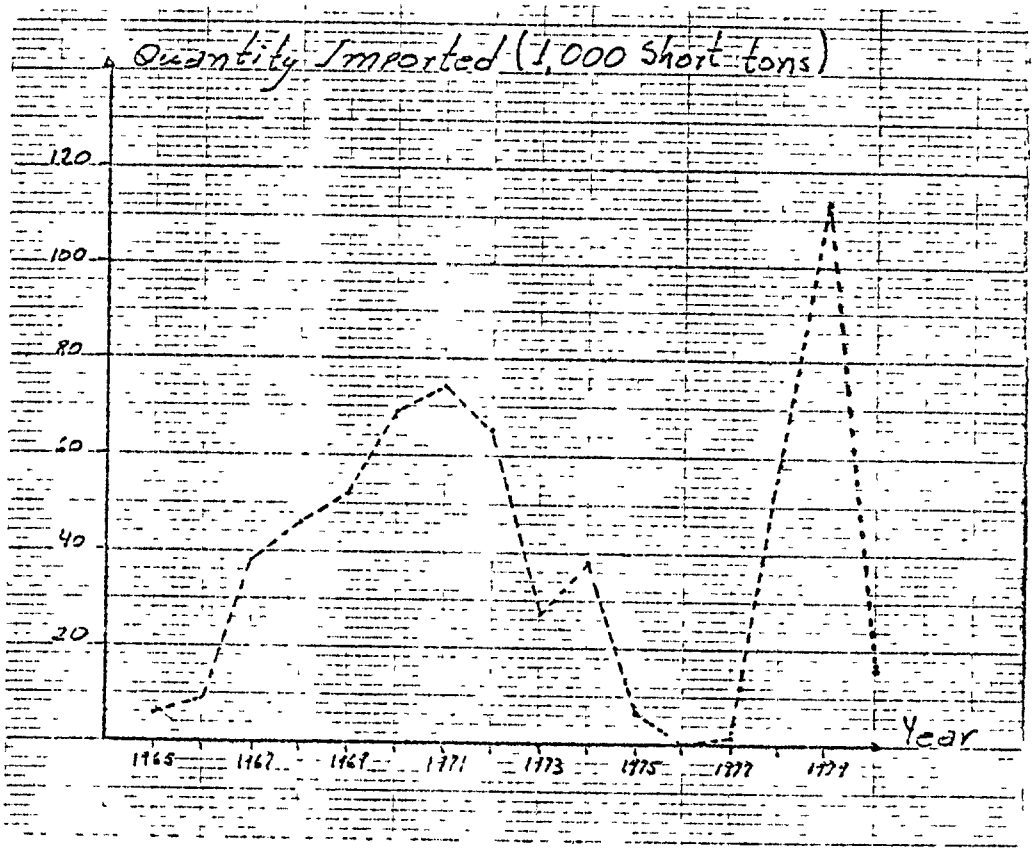


Table 7. Summary table of the stimates of future U.S. soybean meal exports by country of destination, 1985 and 1990.

Importing Group	Average Imports in the period 1977-79 (000 st)	Estimates of Future U.S. Exports				Import Market Share (Percent)		
		1985		1990				
		Quantity (000 st)	Percentual Δ over the 77-79 Average	Quantity (000 st)	Percentual Δ over the 77-79 Average	Average 1977-79	1985	1990
Western Europe	3,064	3,422	12	3,582	17	57.70	51.87	47.33
Eastern Europe	844	1,381	64	1,691	100	15.89	20.93	22.35
North America	566	586	4	686	21	10.66	8.88	9.07
Japan	273	378	38	488	79	5.14	5.73	6.45
Central America	117	181	55	226	93	2.20	2.74	2.97
South America	211	415	97	570	170	3.97	6.29	7.53
Mid East - North Africa	165	196	19	251	52	3.11	2.97	3.32
Asia (excluding Japan)	58	39	-33	74	28	1.09	0.59	0.98
Oceania	13	-	-100	-	-100	0.24	-	-
TOTAL[(a)]	5,311	6,598		7,568	100.00	100.00	100.00	100.00

(a) This total does not refer to the U.S. meal exports to the world, but rather to the selected countries which were chosen to form those importing groups.

Assuming that the downward trend observed during the 1965-79 period will persist in the next years, it is very likely that Oceania will not import soybean meal in 1985.

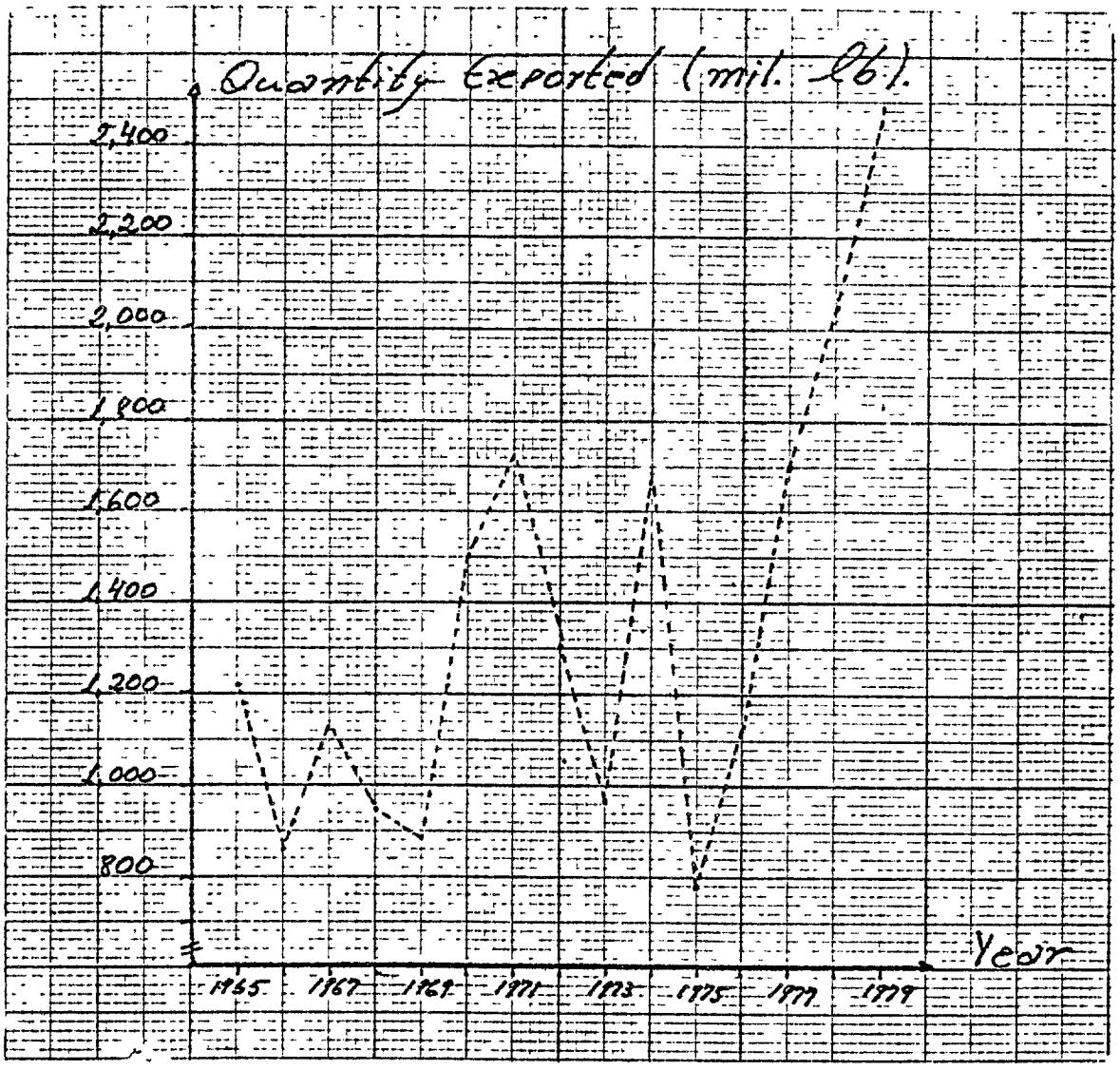
Before concluding this section, it seems desirable to gather in a single table the information about future import demand, derived for each importing group, and then observe what it suggests about the possible changes in the import market share of the group of countries under investigation. This summary was constructed and is Table 7.

According to the previous table, the Western European group should continue to increase its soybean meal imports throughout the current decade. However, a reduction in its market share is expected to be observed. This reduction is directly associated with the layer import requirement that Eastern Europe, South America, Japan, and Central America might have in the near future, as the results of this study suggests.

The expected increase in the Eastern European import market share, could be explained by a more favorable foreign policy, oriented towards the communist countries. In the other hand, income and population growth seem to be the driving forces for larger import market shares of Japan, South America, and Central America.

The remaining three importing groups, that is North America, Mid East - North Africa, and Asia should have a smaller import market share in 1985 than during the 1977-79 period, but as the analysis suggests it tends to get larger afterwards.

Figure 18. Total U. S. Exports of Soybean Oil, 1965-79.



Projections of U.S. Soybean Oil Exports

Among the U.S. exports of soybeans and products, soybean oil is the least important in terms of its share in the total value of exports of this commodity group. Specifically, the exports of soybean oil have contributed with 5-10 percent to the total value of exports of soybeans and products.

In contrast to the rate of growth of U.S. exports of soybeans and soybean meal, the volume of soybean oil exported did not grow significantly in the last two decades. A possible explanation for this fact, may be the tough competition from increased foreign commodities, particularly Brazilian soybean oil, and that the large volume of U.S. soybeans exported is yielding a substantial quantity of oil in those countries where the beans are being crushed.

Figure 18 depicts the U.S. export pattern of soybean oil observed during the 1965-79 period. According to that figure, despite the wide fluctuation in the total exports of American soybean oil, a moderate upward trend in the export pattern can be verified. This seems to suggest that, total U.S. exports of soybean oil might continue to grow at a slow pace in the future. The underline assumption here is that, the demand and supply conditions existent during the 1965-79 period will not be dramatically altered.

Among the group of countries that import soybean oil from the United States, the Asiatic group[25] is distinguished as the most important, due to the large amounts it has imported from this country. During the 1977-79

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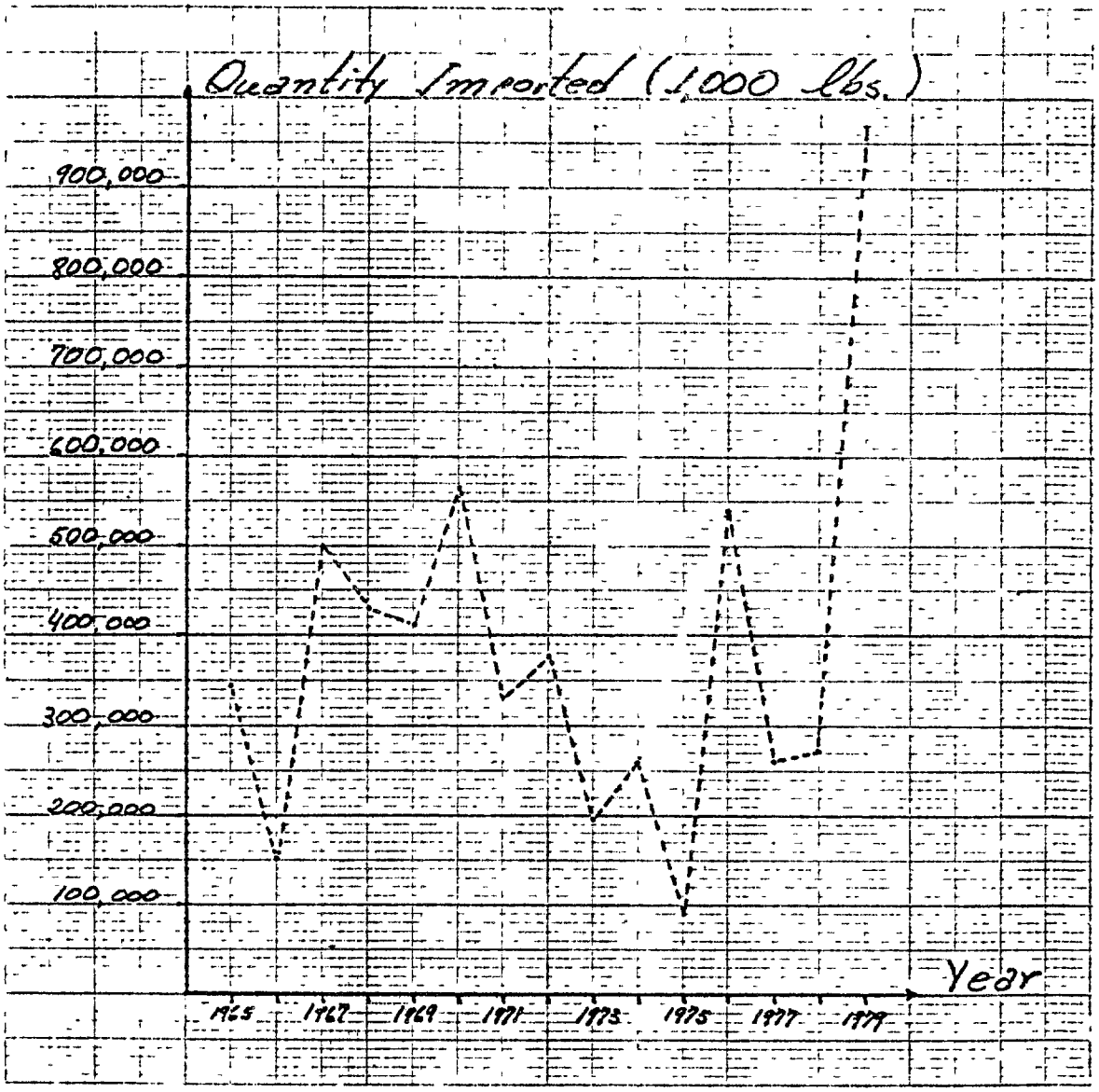
[25]Three countries, which together account for more than 75 percent of the total imports made by the Asiatic Continent, were chosen to form this group. These countries are: India, Pakistan, and Bangladesh.

Figure 19. American Soybean Oil Imported by the Asiatic Group, 1965-79.



period this group alone imported an average quantity of 502,095 thousand pounds, which corresponds approximately to 40 percent of the total U.S. exports fo soybean oil in that period.

According to Figure 19, the import trend displayed by the Asiatic group during the 1965-79 period is not well defined, since three different trends may be observed in that short period of time. Specifically, the 1965-70 period which described an upward trend, was followed by a downward trend period, 1970-75, and thereafter an upward trend was observed. Considering this variation in the import trend, a line was fitted through the data relative to the 1965-79 period, in order to project the 1985 and 1990 quantity of soybean oil that should be imported by the Asiatic group from the U.S. This procedure resulted in 502,608 thousand, and 564,497 thousand pounds, respectively, as the 1985 and 1990 estimates.[26] A comparison between the 1985 estimate and the 1976-78 average imports indicates an increase of 42 percent over that period.

Among the countries selected to form the Asiatic group, Pakistan and India deserve special attention, due to the large quantity of soybean oil that they import from the U.S. The imports made by Pakistan increased from an average of 151,193 thousand pounds observed in 1965-67, to 262,560 thousand in 1977-79. Besides showing a significant increase in its imports during the 1965-79 period, the quantity of soybean oil imported by Pakistan dropped below 120,000 thousand pounds only in 1966 and 1975. This fact serve to illustrate that this country unlike many others, have maintained a high level of import demand.

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[26] Estimating equation: $QM = \underset{(2.58)}{305.691} + \underset{(0.72)}{9.377}\ t$; $R^2 = 0.04$

Giving the important position occupied by Pakistan in the soybean oil export market, it is desirable to project its future import requirements from the U.S. in the coming years. Therefore, a trend analysis was performed, assuming that the demand conditions that gave rise to the import pattern observed during the 1965-79 period, will prevail in the future. This analysis resulted in 290,393 thousand, and 324,183 thousand pounds, respectively, as the 1985 and 1990 estimates of soybean oil import demand for Pakistan.[27] The 1985 estimate imply an increase of 11 percent over the 1977-79 average imports.

India is the second most important Asiatic country in terms of the volume of soybean oil that it imports from the U.S. The import data relative to the 1965-79 period reveals that, from 1965 until 1972 this country imported an average of 179,737 thousand pounds of American soybean oil. However, the following years when compared to that period were characterized by lower import levels.

The Indian government, recognizing its large dependence on foreign soybean oil to meet domestic demand, took recently some policy action to stimulate its domestic production of oilseed. For instance, the 25 percent increase in the domestic oil requirement for vanaspati is expected to lead to an increase in the price of many domestic oilseeds, and hence stimulate production.

The fact that India registered a lower import level of soybean oil in the 1973-79 period than in 1965-72, and that its government is taking actions to increase domestic production. suggest that this country should

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[27] Estimating equation: $QM = \underset{(2.84)}{148,475} + \underset{(1.18)}{6,758}\ t;\ R^2 = 0.10$

reduce its imports in the next years.

In order to predict the future import level of this soybean product by India, a linear regression was applied to the 1965-79 import data. According to that estimation procedure, the U.S. should export 88,662 thousand pounds in 1985 to that country, while in 1990 the export level should rise to 68,012 thousand.[28] The former estimate represents a reduction of 47 percent over the 1977-79 average imports, however that quantity still large compared to other countries imports.

From the standpoint of the United States, South America is an important market for American soybean oil. This importance is not attributed solely to the volume exported to that group, but also to the rate that the exports have increased. According to Figure 20, the quantity imported by the South American group[29] increased from 61,975 thousand pounds in 1965-67, to an average of 331,894 thousand in 1977-79. This expansion represents an average annual rate of growth of 15 percent.[30]

Assuming that the same factors that contributed to the import pattern observed during the 1965-79 period, will persist in the current decade, a linear trend analysis was performed in order to project the future U.S. exports of soybean oil to the South American group. According to that analysis, this country should increase its exports by 24 percent above the

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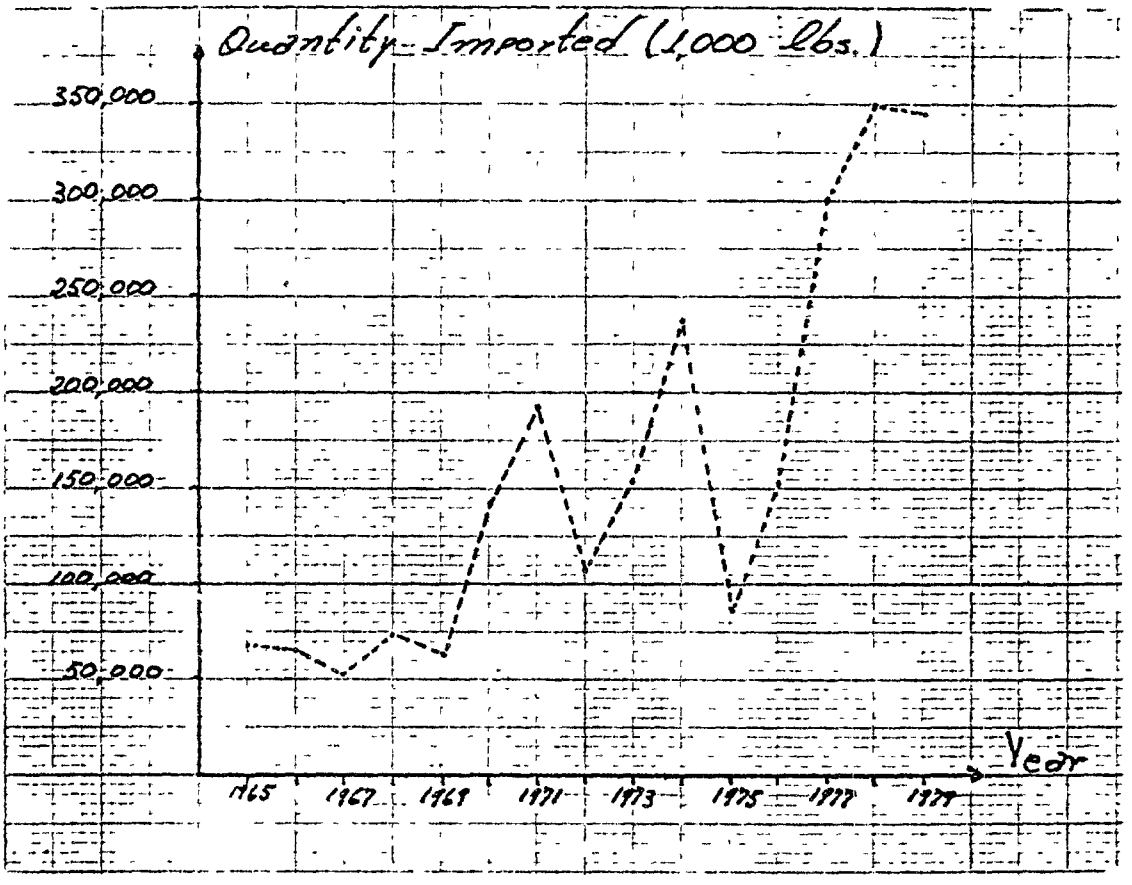
[28] Estimating equation: $QM = \underset{(2.26)}{175,392} - \underset{(-0.49)}{4,130}\ t$; $R^2 = 0.02$

[29] This group is formed by Peru, Colombia, Ecuador, and Chile.

[30] This average annual rate of growth was obtained through the use of the expression reported on footnote 3. For this specific case B = 61,975; V_η = 331,894; and η = 12.

Figure 20. American Soybean Oil Imported by the South American Group, 1965-79.



1977-79 average. Specifically, it should export 411,871 thousand pounds of soybean oil.[31] In 1990 the export level should expand to 508,871 thousand pounds.

Peru, Colombia, and Ecuador are the three most important countries in the South American group. Peru can be characterized as the largest importer of American soybean oil among those countries, since in the 1969-78 period its import levels were always above those registered by Colombia and Ecuador.

The quantity imported by Colombia grew at a moderate pace during the 1965-75 period. However, after 1975 its imports increased significantly, jumping from 16,920 thousand pounds to 183,615 thousand in 1979. This recent expansion in the level of imports seems to suggest that Colombia is an important potential market to be explored by American exporters of soybean oil.

Ecuador like Colombia, expanded its quantity imported significantly in the 1976-79 period. Specifically, it increased its 1965-75 average imports of soybean oil of 18,376 thousand pounds, to 46,590 thousand in 1976-79. This recent expansion may be an evidence that Ecuador is growing in importance as an exporter market for American soybean oil.

Considering the individual importance of Peru, Colombia, and Ecuador as soybean oil export markets, a linear trend analysis was performed for each of them, in order to project the future U.S. exports of this soybean product to those countries. The results of these analyses are reported on Table 8.

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[31] Estimating equation: $QM = \underset{(0.14)}{4.471} + \underset{(5.47)}{19,400}\ t$; $R^2 = 0.70$

Table 8. 1985 and 1990 estimates of U.S. Soybean Oil exports to selected countries of the South American Group.

Selected Countries	Estimating Equation[a]	R^2	Regression Period	Average Imports 1977-79 (000 lbs.)	Estimates of Future Exports			
					1985		1990	
					Quantity (000 lbs.)	% over 77-79 Av.	Quantity (000 lbs.)	% over 77-79 A
Peru	QM = 10,094 + 6,893t (0.50) (3.12)	0.43	1965-79	107,244	154,847	44	189,312	77
Colombia	QM = 35,526 + 13,887t (1.60) (4.26)	0.67	1969-79	126,793	200,553	58	269,988	113
Ecuador	QM = 653 + 3,156t (0.19) (8.21)	0.84	1965-79	47,960	66,929	40	82,709	72

a) The numbers in parenthesis are the T-statistics.

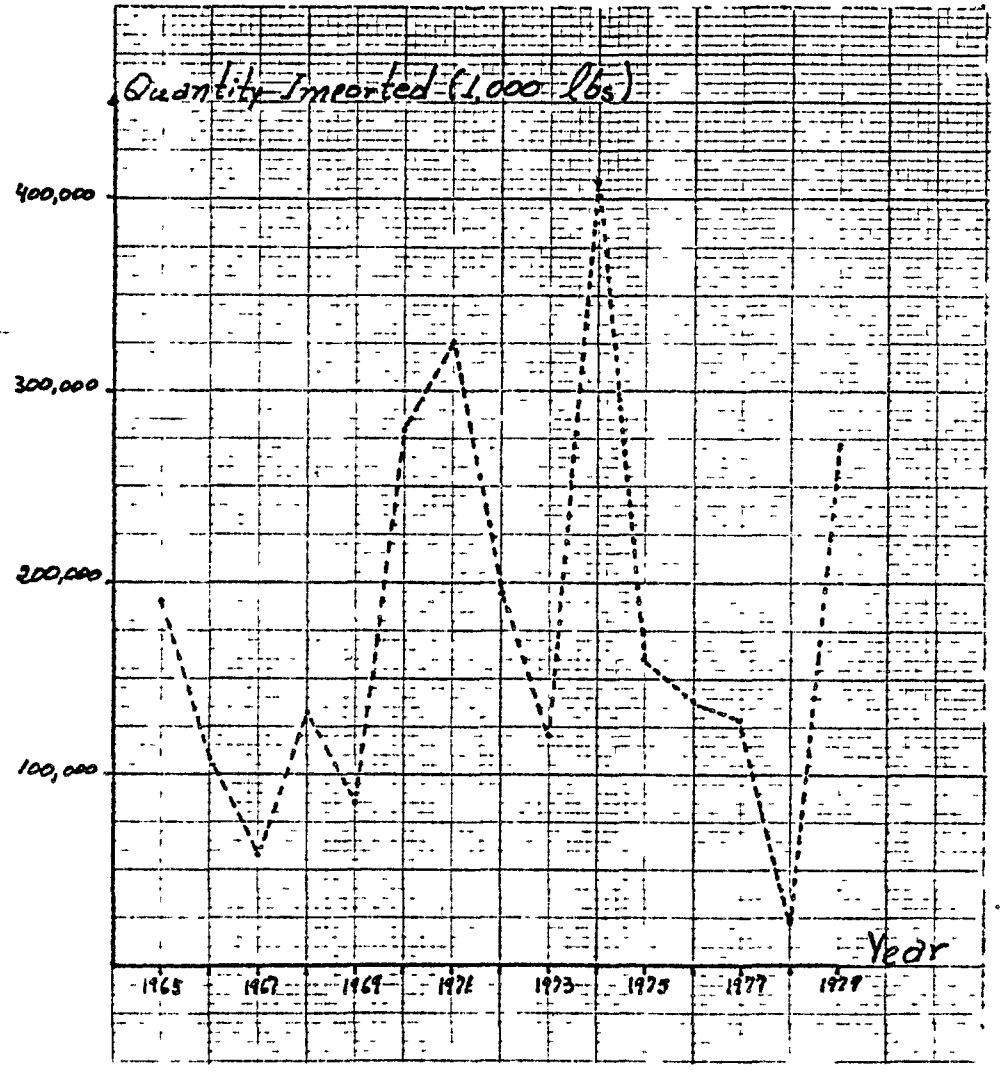
According to the estimates obtained, Colombia should increase its soybean oil imports from the U. S. by 58 percent in 1985, as compared to the 1977-79 average. Peru and Ecuador in turn, are expected to expand their imports by 40, and 44 percent over the 1977-79 average imports, respectively.

The next soybean oil import group to be considered here is the Mid East-North Africa. This group, formed by Iran, Israel and Morocco, can be characterized by describing an upward import trend during the 1965-79 period. According to Figure 21, after 1974 the aggregate quantity imported by those three countries declined steadily until 1978, when the lowest import level registered in the 1965-79 period was then observed. In 1979, the imports moved back to the normal levels following the upward trend. However, the preliminary data relative to the quantity imported in 1980 indicated that, an import level as low as that observed in 1978 should take place.

The fact that the quantity of soybean oil imported by the Mid East-North Africa group described an upward trend during the 1965-79 period, and that more recently some low import levels have been observed, seems to suggest that it is likely that the future U.S. exports to this group should continue to grow in the next years, however at a lower rate than in 1965-75.

Considering the importance of the Mid East-North Africa group as an exporter market for U.S. soybean oil, a line was lifted through the 1965-79 export data, in order to project the future import demand by that group.

Figure 21. American Soybean Oil Imported by the Mid East-North African Group, 1965-79.



The result of such procedure was the following [32]:

1985 estimate: 208,458 thousand pounds
1990 estimate: 221,165 thousand pounds

The 1985 estimate implies an increase of 47 percent over the 1977-79 average imports.

Among the countries chosen to form the Mid East-North Africa group, Iran is historically the largest importer of soybean oil from the U.S. During the 1965-69 period, this country imported an average of 43,434 thousand pounds. After this period, the Iranian import demand for American soybean oil was characterized by import levels above 100,000 thousand pounds, with the exception of three years, 1972, 1973, and 1978 when lower levels were observed.

Assuming that the import trend observed during the 1965-79 period will continue into the future, a linear regression analysis was performed resulting in 207,407 thousand, and 244,912 thousand pounds respectively, as the 1985 and 1990 estimates of soybean oil import demand for Iran.[33] Excluding the year of 1978 from the 1976-79 period, due to the abnormal import level that was observed, the 1985 estimate represents an increase of 38 percent over that specific period.

The Central American group, formed by the Dominican Republic, Haiti, Jamaica, Panama, and Netherlands. Antilles grew significantly in the last two decades an export market for American soybean oil. According to Fi-

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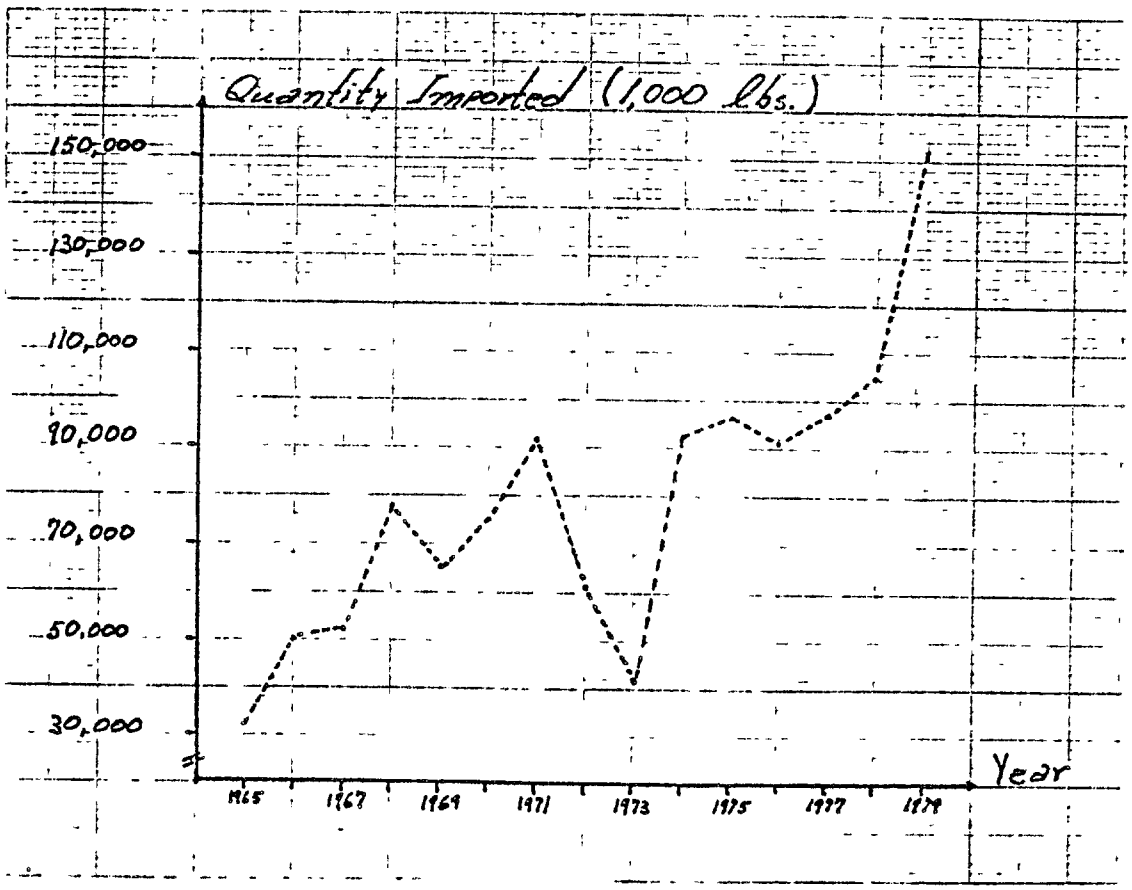
[32] Estimating equation: $QM = 155{,}097 + 2{,}541\ t$; $R^2 = 0.01$
(2.61) (0.39)

[33] Estimating equation: $QM = 49{,}886 + 7{,}501\ t$; $R^2 = 0.13$
(1.02) (1.40)

Figure 22. American Soybean Oil Imported by the Central American Group, 1965-79.



gure 22, the U.S. exports of this soybean product to this importing group increased from 32,881 thousand pounds in 1965, to 152,709 thousand in 1979. That is, it increased 4.6 times in 15 years. Good part of this increase can be attributed to the imports made by the Dominican Republic and Haiti, which are the largest importers in this importing group.

Considering the importance of the Central American group as a growing market for U.S. exports of soybean oil, it seems desirable to project its import requirements. Therefore, a least square regression over the 1965-79 export data was estimated resulting in the following linear equation:[34]

$$QM = \underset{(3.56)}{36,048} + \underset{(4.84)}{5,393}\ t, \text{ with an } R^2 \text{ of } 0.64.$$

Making use of the above equation, the 1985 and 1990 estimates of import requirement by that importing group were found to be 149,301 thousand, and 176,266 thousand pounds, respectively. The 1985 estimate is 26 percent larger than the 1977-79 average imports, while the 1990 estimate represents a 49 percent increase over that same period.

Following the same projection technique used to project the future import demand by the Central American group, the 1985 import requirements by the Dominican Republic and Haiti were derived. The results of such procedure are reported in Table 9.

According to that table, the Dominican Republic should import 48,854 thousand pounds of soybean oil from the United States in 1985, while Haiti should demand 45,832 thousand in that same year.

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[34] The numbers in parenthesis are the T-statistics.

Table 9. 1985 and 1990 estimates of U.S. Soybean Oil exports to selected countries of the Central American Group.

Selected Countries	Estimating Equation(2)	R^2	Regression Period	Average Imports 1977-79 (000 lbs.)	Estimates of Future Exports			
					1985		1990	
					Quantity (000 lbs.)	% over 77-79 Av.	Quantity (000 lbs.)	% over 77-79 Av
Dominican Rep.	QM = 11,579 + 1,775t (1.54) (2.15)	0.26	1965-79	40,732	48,854	20	57,729	42
Haiti	QM = 10,237 + 1,695t (4.11) (6.18)	0.75	1965-79	35,900	45,832	28	54,307	51

a) The numbers in parenthesis are the T-statistics.

The North American group,[35] like some other importing groups, increased substantially its soybean oil imports from the U.S. after 1969. Before that year, the annual quantity imported by that group, hardly exceeded 40,000 thousand pounds. However, the subsequent period was marked by import levels above 52,000 thousand pounds, with the exception of 1972 and 1979.

The North American soybean oil import pattern, described an upward trend during the 1965-79 period, as shown on Figure 23. Assuming that this trend will extend into the future, the 1985 import requirement by that group was obtained by regressing its quantity imported during the 1965-79 period on time. This procedure resulted in the following estimating equation: $QM = 24,644 + 6,304\ t$, which when used yielded 157,028 thousand, and 188,548 thousand pounds as the 1985 and 1990 estimates of soybean oil import demand.

Among the two countries that form the North American group, Canada is distinguished for having the largest import share. Besides having the largest import share in the group, this country increased significantly its foreign demand for U.S. soybean oil during the 1965-79 period. Specifically, its imports expanded from an average of 30,993 thousand pounds in 1965-67, to 55,116 thousand in 1977-79. Supposing that the trend observed in that 15 years period will persist in the current decade, a linear trend analysis was performed to project the quantity of soybean oil that this country should demand from the U.S. in the future. According to that analysis, Canada should import 75,637 thousand pounds in 1985, and

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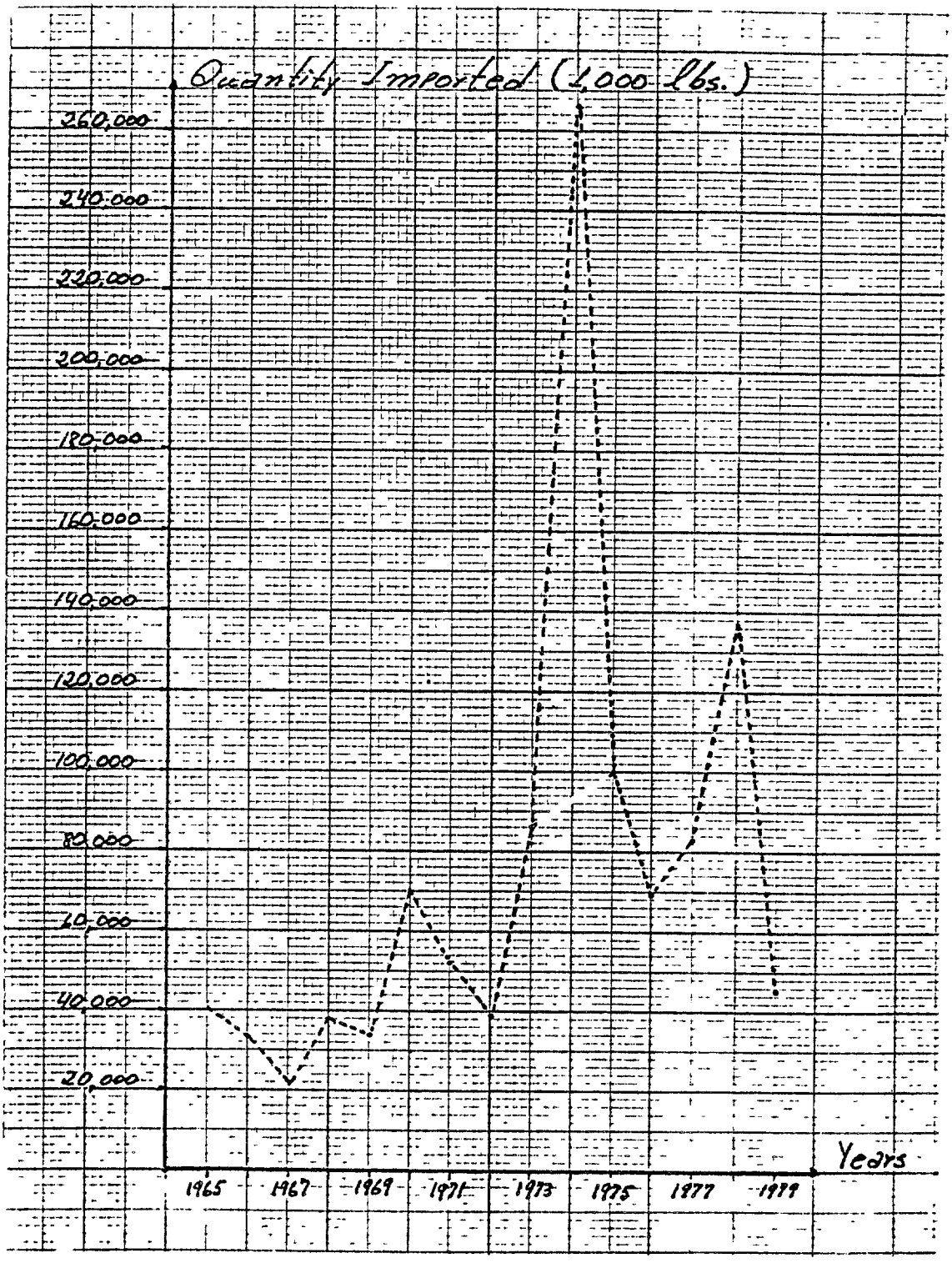
[35] This group is formed by Canada and Mexico.

Figure 23. American Soybean Oil Imported by the North American Group, 1965-79.



87,157 thousand in 1990.[36] The 1985 estimate represents an increase of 37 percent over the 1977-79 average imports.

The Oceanic group,[37] unlike other importing groups became to be a more attractive market for American soybean oil in 1974. Before then, its imports did not exceed 13,000 thousand pounds (see Figure 24), what compared to the quantity imported by other groups is considered low. However, during the 1974-79 period, a substantial increase in the quantity of soybean oil imported by Oceania was verified. Specifically, the imports rose from 10,793 thousand pounds in 1973, to 58,332 thousand in 1979.

The fact that the import demand of the Oceanic group expanded considerably in the last six years of the past decade, suggests that this group constitutes a good potential market to be explored in the future. In order to project the import requirement by this group from the U.S. in 1985 and 1990, a linear trend analysis was performed over the 1965-79 period. That analysis yielded 71,216 thousand, and 90,546 thousand pounds, as the 1985 and 1990 estimates of foreign demand, respectively.[38]

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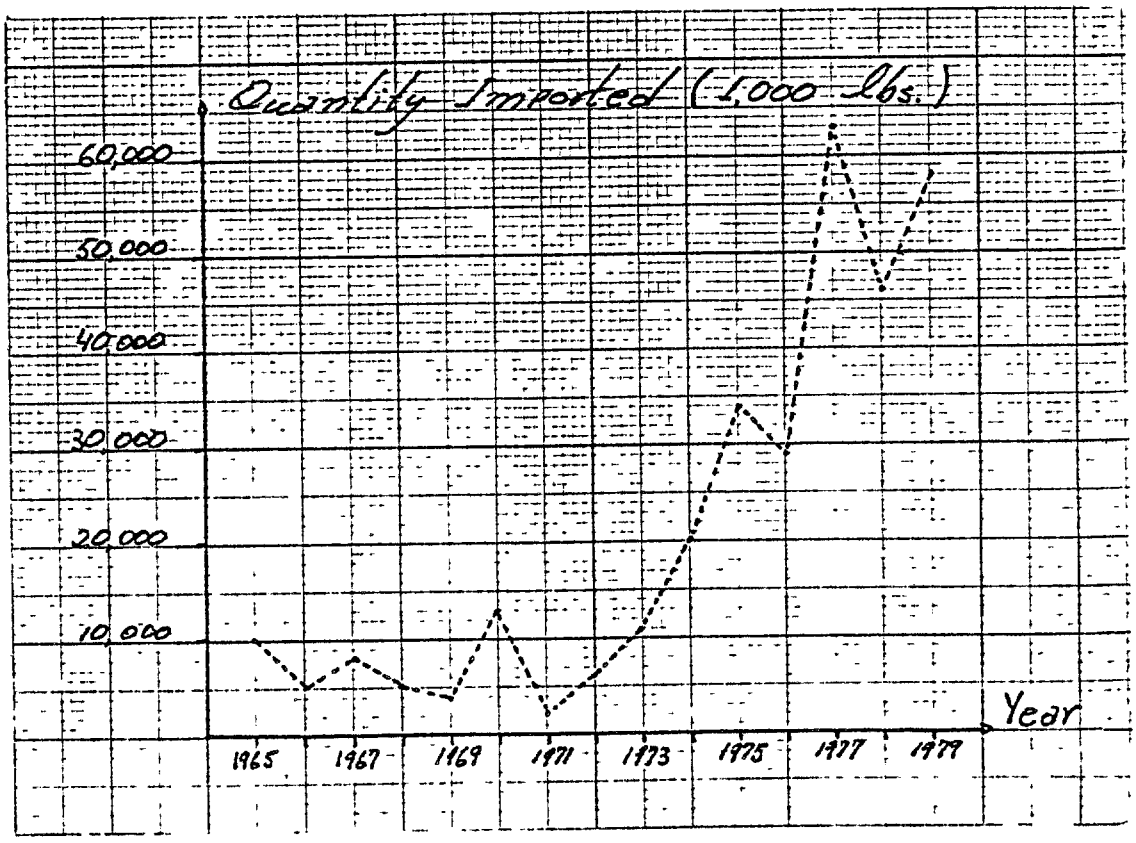
[36] Estimating equation: $QM = 27{,}253 + 2{,}304\ t$; $R^2 = 0.45$
(4.25) (3.26)

[37] This group is formed by Australia and New Zeland.

[38] Estimating equation: $QM = 9{,}970 + 3{,}866\ t$; $R^2 = 0.70$
(-1.56) (5.50)

Figure 24. American Soybean Oil Imported by the Oceanic Group, 1965-79.



A comparison between these estimates and the 1977-79 average import level imply an increase of 27, and 62 percent above that three year average.

Australia is the country in the Oceanic group which was responsible for 77-92 percent of the total imports of soybean oil made by that group from the U.S., during the 1974-79 period Considering the large import share that Australia has in the importing group, its foreign demand for soybean oil was derived through the use of the same projection procedure employed for the group, i.e. a linear trend analysis. According to that analysis, the United States should export 57,308 thousand pounds of soybean oil to Australia in 1985, and 72,428 thousand in 1990.[39] The 1985 estimates represents an expansion of 28 percent above the 1977-79 average import level.

The Eastern European importing group[40] can be characterized as an unstable market for American soybean oil, due to both the frequency that the import trend was altered during the 1965-79 period, and to the annual variation in the quantity imported. According to Figure 25, during the 1965-69 period, this importing group described a downward movement in its imports of soybean oil from the U.S. In the following four years, 1969-72, an upward trend was observed, which in turn was reversed giving rise to a downward trend.

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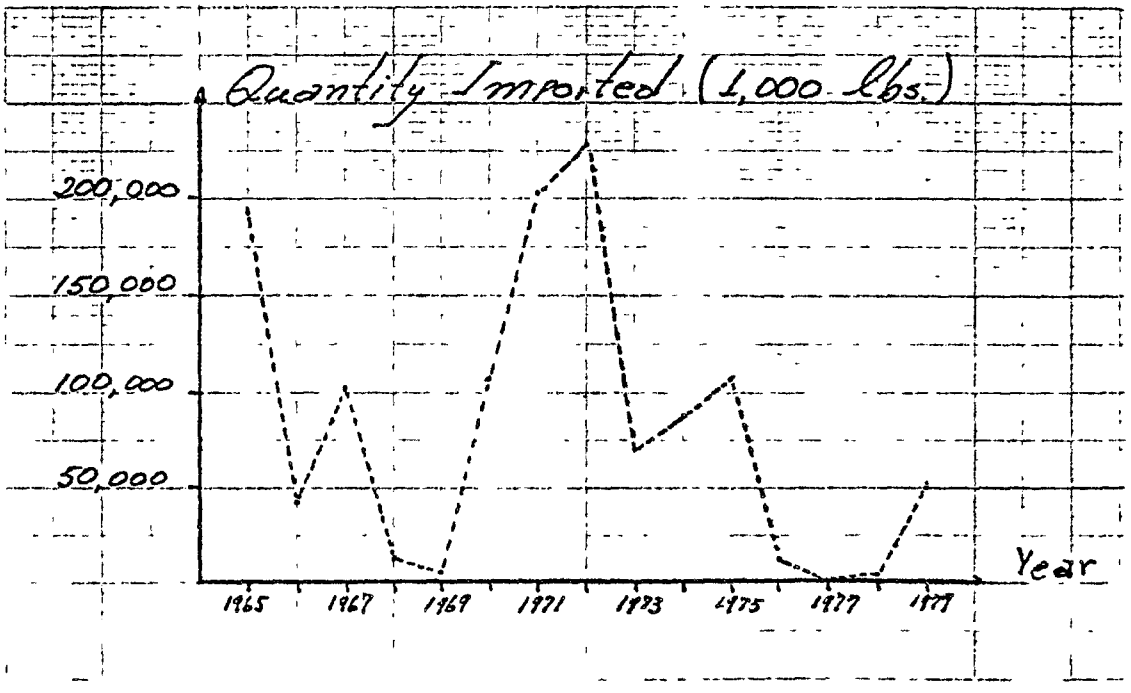
[39] Estimating equation: $QM = -6,196 + 3,024\ t$; $R^2 = 0.69$
(-1.22) (5.42)

[40] This group is formed by Poland and Yugoslavia.

Figure 25. American Soybean Oil Imported by the Eastern European Group, 1965-79.



In addition to the different import trends observed in the 1965-79 period, Figure 25 also depicts the annual variability in the quantity imported. For instance, from 1972 to 1973 the import level was reduced by 157,172 thousand pounds, that is 69 percent. The same comparative analysis can be applied to other two year periods and a similar conclusion is reached.

Considering the unstable characteristic of the Eastern European group, it is difficult to predict with certainty how much soybean oil this group should import from the U.S. in the future. However, a reasonable indication can be obtained by regressing the quantity imported during the 1965-79 period on time. That was the procedure adopted in this paper, and the results obtained are the following ones:[41]

1985 estimate of future imports. 31,005 thousand pounds
1990 estimate of future imports: 14,050 thousand pounds

A comparison between the above estimates against the 1976-79 average imports (excluding 1977 due to its abnormal characteristics), indicates that an increase of 39 percent over that period is expected to occur in 1985. However, in 1990 the quantity imported should be 24 percent lower than that observed average.

The fact that both countries that form the Eastern European group described an irregular import pattern in recent years,[42] does not en-

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41 Estimating equation: $QM = 102{,}216 - 3{,}391\ t$; $R^2 = 0.05$
(2.66) (-0.79)

42 Poland did not import significant amounts of soybean oil from the U.S. during the 1972-75 period, as well as in 1977. The same thing happened with the import demand of Yugoslavia during the 1976-79 period.

courage a projection analysis at the country level. Therefore, the future import demand analysis developed so far for distinguished countries within the importing groups, was not performed for the Eastern European group.

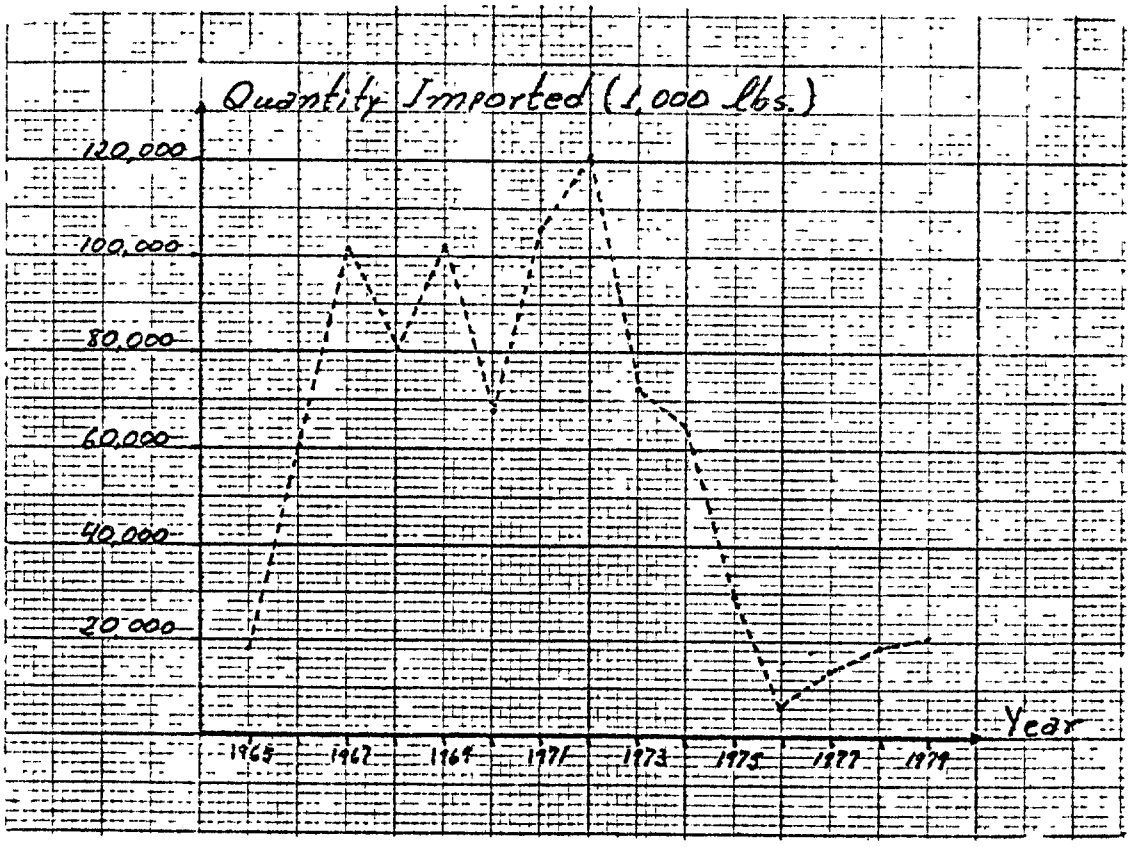
The African importing group, which is formed by Tunisia, Guinea, Sierra Leone, Ghana, Liberia, and Tanzania was not a major market for American soybean oil in the last six years of the 1970's. According to Figure 26, this group described an upward import trend during the 1965-72 period. However, the subsequent period, 1972-1976 was characterized by a steady decline in the quantity imported, and from 1977 on a moderate sign of recuperation became evident.

Considering the import levels observed in the last seven years of the 1970's (a steady decline in the quantity imported followed by a modest increase), the estimate of the 1985 import requirement by the African group is assumed to be equal to the 1974-79 average. That is, 25,811 thousand pounds. This estimate prepresents an increase of 44 percent over the low 1977-79 average imports.

In order to obtain the 1990 estimate of import demand for the African group, a standard deviation for the 1974-79 import data was calculated, and then added to the 1985 estimate. This procedure resulted in 46,613 thoudand pounds which is regarded to be the 1990 import demand by the African group.

Among the six countries chosen to form the African group, Tunisia distinguishes as the largest importer of soybean oil from the U.S. Considering that its import pattern follows closely the one depicted on Figure 26, the same projection procedure used for the African group is assumed to hold for Tunisia. Therefore, the 1985 estimate of import

Figure 26. American Soybean Oil Imported by the African Group, 1965-79.



demand for that country was found to be 9,361 thousand pounds, which is the same as the 1975-79 average imports. The addition of the standard deviation obtained over that same period (1975-79), to the 1985 estimate resulted in 17,839 thousand pounds, which is the expected quantity of soybean oil that Tunisia should import from the U.S. in 1990.

The 1985 estimate imply an increase of approximately 19 percent over the 1977-79 average imports.

The last importing group to be considered here is the Western European, which is formed by West Germany, Netherlands, United Kingdom, and Turkey. The fact that this group is the largest importer of soybeans (whole) in the world, and that it has a substantial crushing capacity, imply that it is the least important exporter market for American soybean oil. According to Figure 27, the quantity imported by this group from the U.S. fluctuated quite a bit during the 1965-79 period. In addition to this, the import level did not exceed 45,000 thousand pounds in any of those years.

Assuming that the same demand conditions that gave rise to the import trend observed during the 1965-79 period will prevail in the future, the 1985 and 1990 soybean oil import requirement for the Western European group were derived based on a linear trend analysis developed over that fifteen year period. According to that analysis,[43] the U.S. should reduce its exports to that importing group by 35 percent in 1985,

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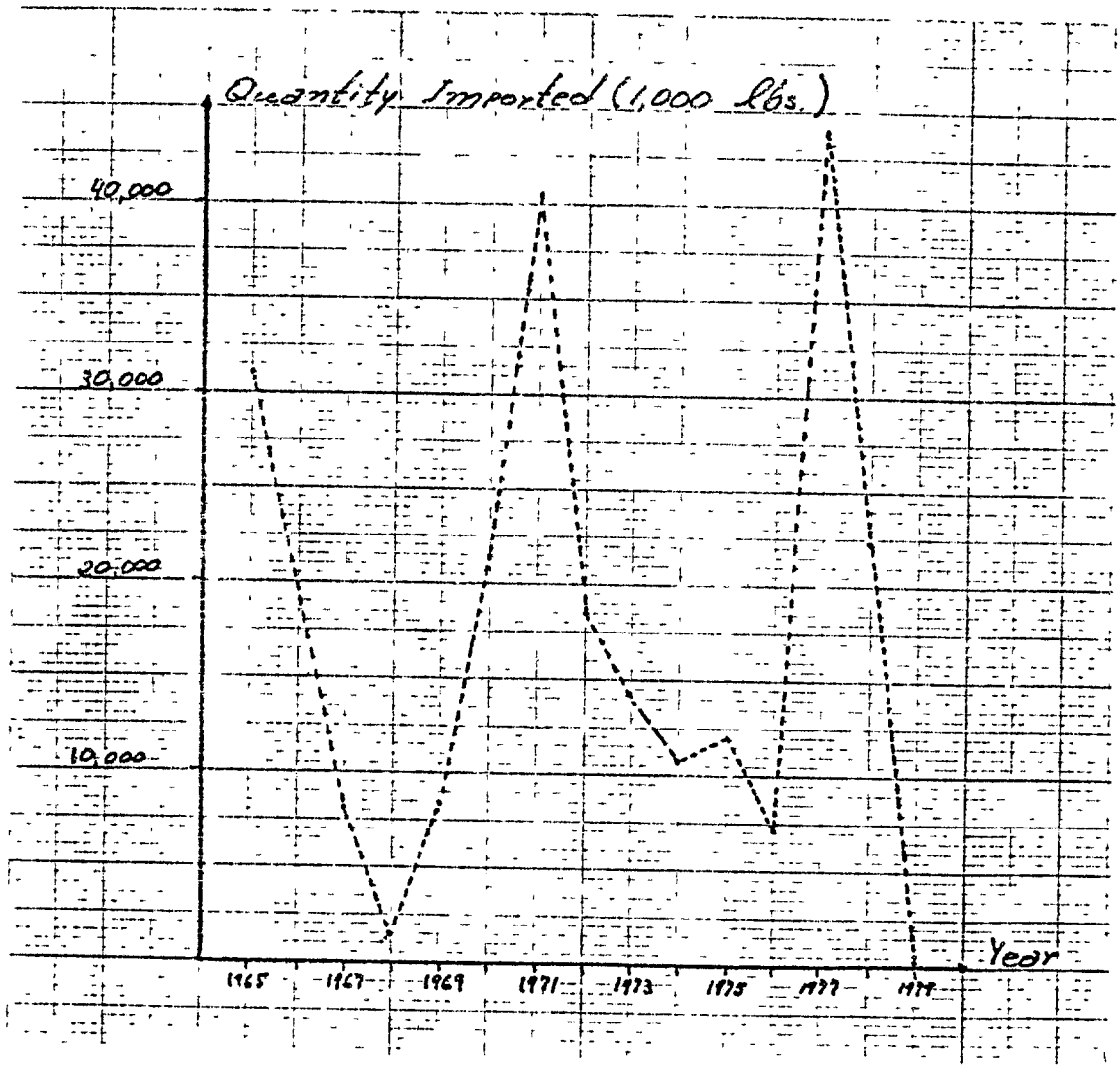
[43] The estimating equation obtained through that procedure was:

$$QM = \underset{(4.95)}{19,421} - \underset{(-2.11)}{4,465}\, t \; ; \; R^2 = 0.25$$

Figure 27. American Soybean Oil Imported by the Western European Group, 1965-/9.



exporting 12,365 thousand pounds. Following the same trend, the export level projected for 1990 is 10,685 thousand pounds.

In order to synthesize the informations derived in this section of the paper, and to assess the attendant changes in the import market share implied by the projections performed, a summary table was constructed and reported below.

According to that table, the import market share of the Asiatic group should experience a moderate decline in the current decade. Good part of this decline may be attributed to the downward import trend registered by India during the 1965-79 period, as well as to its recent governmental policy, oriented towards larger domestic oilseed production.

The Eastern European importing group, should increase its import market share in 1985 above its 1977-79 average share. However for 1990, a lower import share than the one observed during that three year period is expected to take place. This fluctuation in the import market share reflects the unstable characteristic of the Eastern European group discussed previously.

The Western European group, due to its large crushing capacity, and to the volume of soybeans (whole) that it should import from the U.S. in the future (see Table 4), might continue to import small amounts of soybean oil, therefore reducing its import market share.

The other importing groups, that is South America, Mid East-North Africa, Central America, North America, Oceania, and Africa are expected to have larger import market shares than their respective average share observed in 1977-79. Among these groups, North America, Mid East-North Africa, and South America are distinguished for having the largest expected increase in import market share.

Table 10. Summary Table of the estimates of future U. S. Soybean Oil exports by Continent of Destination, 1985 and 1990.

porting Group	Average Imports in the period 1977-79 (000 lbs.)	Estimates of Future U. S. Exports				Import Market Share (Percent)		
		1985		1990		Average	1985	1990
		Quantity (000 lbs.)	Percentage over the 77-79 Av.	Quantity (000 lbs.)	Percentage over the 77-79 Av.	1977-79		
sia	502,095	502,608	0.1(6)	564,497	12	38.60	32.02	31.00
outh America	331,894	411,871	24	508,871	53	25.51	26.24	27.94
d East-North Africa	141,378	208,458	47	221,165	56	10.87	13.28	12.14
ntral America	118,414	149,301	26	176,266	49	9.10	9.51	9.68
rth America	92,030	157,028	71	188,548	105	7.08	10.00	10.35
ceania	56,065	71,216	27	90,546	62	4.31	4.54	4.97
stern Europe	22,298(c)	31,005	39	14,050	-36	1.71	1.98	0.77
rica	17,875	25,811	44	46,613	161	1.37	1.64	2.56
stern Europe	18,889	12,365	-35	10,685	-43	1.45	0.79	0.59
TAL(2)	1,300,938	1,569,663		1,821,241		100	100	100

) This total does not correspond to the U. S. exports of soybean oil to the world, but rather to the exports to the countries chosen to form the importing groups.

) This increase seems low because the quantity imported in 1979 exceeded the previous imports significantly (see Figure 19). If the 1985 estimate was compared with the 1976-78 average imports, the resultant increase would be 42 percent.

) 1976-79 average excluding 1977, since in that year the quantity imported by the Eastern European group was insignificant (see Figure 25).

A final conclusion that can be derived from Table 10 is that, with the exception of the change in the import market share projected for the Asiatic group, all other expected changes are not significantly large. In summary, the soybean oil export market should not depart too far from the pattern observed during the 1977-79 period.

VI. Summary and Conclusions.

The U.S. agricultural sector has an important participation in the economic performance of the American economy. Among the various crops grown in this country, soybean is distinguished for being one of the major income earner for American farmers, as well as for its contribution to the total value of U.S. foreign trade. In terms of agricultural exports, soybeans and soybean products is the commodity group which have the largest share in the total value exported.

Considering the important position occupied by soybeans and its products in the U.S. export sector, and the growing competition in the world export market of these commodities, the growth and change in import market share of groups of countries that import such products from the U.S. were assessed.

Several different approaches could be employed to meet the objective proposed in this paper. Each approach has alternative policy worth or importance, and differential time expenditures and data requirements. Considering the central topic of this study, and the constraints under which it was developed the methodology employed consisted basically of export projections through the use of linear trend analysis. From those projections, the growth and change in import market shares were derived.

The projection of the U.S. exports of soybeans (whole) by continent of destination was the subject of Section III. According to the results derived from the analysis performed in that section, the Western European, the Japanese, and the Mid East-North African importing group should have a reduction in their soybean import market share. On the other hand, an increase is foreseen for Eastern Europe, Asia, North America, and Central America.

The analysis for soybean meal, developed on Section IV, showed that Eastern Europe, South America, Japan, and Central America should expand their import market share. The Western European group should continue to increase its imports of soybean meal from the U.S., however, at a lower growth rate than those importing groups.

Unlike the results obtained for soybean and soybean meal, the analysis performed for soybean oil revealed that few changes should be realized in the way that total U.S. exports of this soybean product should be distributed among the importing groups in the future. Specifically, the analysis showed that a reduction in the import market share of the Asiatic group is expected to occur, while Mid East-North Africa, North America, Africa, and South America should expand their individual share.

As with any research endeavor, there are limitations associated with this analysis. The methodology used to project U.S. exports of soybeans and their products may be viewed as limitation given the underlying assumptions. However, since applied research requires some level of abstraction to make the problem tractable, the analysis reported in this paper appears acceptable considering the constraints under which the research was conducted.