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SUPPLY AND DEMAND PROSPECTS FOR PHILIPPINE COCONUT OIL
AND IMPLICATIONS ON INTERNATIONAL TRADE
(A PRELIMINARY ANALYSIS)

by

EVELYN M. LACHICA

A.B. Economics, Far Eastern University, 1968

A MASTER'S REPORT

Submitted in partial fulfillment of the .

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... to my beloved mother who unfailingly guided
me through the years, this work is lovingly
dedicated.

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The completion of my graduate studies couldnot have been possible had it not been for the aid of my sponsoring agency, the Agency for International Development (USAID), my program Specialist in Washington, D.C., Mr. Don Gehres, Dr. Vernon Larson, Programs Director, International Agricultural Programs, Kansas State University, the Bureau of Agricultural Economics, Department of Agriculture and the National Economic Development Authority (NEDA).

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Errors that remain are the responsibility of the author.

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The Philippines is almost wholly dependent upon agricultural exports for foreign exchange. In recent years, the coconut industry alone has accounted for 58.4 percent of the country's foreign exchange earnings.

Under the direction of the Philippine Coconut Authority (PCA), a major long-term program is under way to upgrade the industry and increase coconut production. Because copra and coconut oil compete with other fats and oils in the world markets, an understanding of these markets is important for the success of the Philippine program.

The objectives of this study are to examine the factors which influence the Philippine coconut oil trade in the world markets, to determine the impact of changing demand within importing countries and to analyze the trade barriers affecting the industry. The preliminary analysis in this study will serve as basis for more in-depth study by the author upon her return to her post in the Philippines.

Demand and supply factors were subjected to multiple regression analysis in order to evaluate the future markets for Philippine coconut oil and the implications for international trade with importing countries. Demand and supply models were formulated to reflect the impacts of competing products such as Malaysian

palm oil. Time series data on volumes, prices and incomes for a 16-year period were used to make the empirical analysis.

Results of the study indicate that Philippine coconut oil faces several problems in international markets. Demand in the major importing countries is income inelastic, so that future quantities demanded will not increase proportionately with increases in purchasing power. Competitive oils and synthetics will be purchased instead of coconut oil when relative prices favor doing so. Recent changes in tariff policies by importing countries and market associations have worked to the relative disadvantage of Philippine coconut oil. International marketing policies and programs by the Philippines have not been in tune with the changes and developments in the world markets.

The present program to increase the efficiency of the Philippine coconut industry and insure more stable supplies of coconut oil in world markets will likely ward off further substitution against coconut oil in the major importing countries. However, the Philippines needs to develop more effective intelligence in the world fats and oils markets and to plan export policies and programs to maintain market shares. These steps are necessary in order to insure future sales of coconut oil for foreign exchange earnings and stable incomes for the small coconut producers in the Philippines.

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CHAPTER I

INTRODUCTION

The Philippines accounts for 58.4 per cent of the total world coconut production and supplies over 90 percent of U. S. coconut oil imports (Table 1). The coconut industry is the second largest foreign exchange earner for the Philippines.

However, one of the major problems of the industry has been the stagnation of coconut production. For a long time, production has remained short of potential consumption causing the price of coconut oil to be relatively higher than that of any other vegetable oil. While there have been cyclical variations with corresponding changes in prices, these changes have been caused more by weather conditions than by changes in productivity. This is attested by a current Oil Situation Report.¹

... imports of coconut oil into the United States during October-May, 1977 totalled 789 million pounds, down from 858 million pounds last year. Reduced coconut oil production in the Philippines, as a result of inadequate rainfall last year, is a primary factor behind the smaller imports.

¹ United States Department of Agriculture, Fats and Oils Situation, Vol. 286, (USDA:ERS, February, 1977), p.9.

Table 1. Distribution of Net Lauric Oil Exports
and Imports, 1961 - 1970

Item	Quantity (1000 m.t.)	Percent
DISTRIBUTION OF EXPORTS		
<u>Coconut Oil and Copra</u>		
Philippines	7,262	58
Ceylon	1,063	9
Indonesia	1,219	10
Oceania ^{a/}	1,732	14
ROW ^{b/}	<u>1,170</u>	<u>9</u>
Total	12,446	100
<u>Palm Kernel and Palm Kernel Oil</u>		
Nigeria	1,683	48
Sierra Leone	256	7
Congo	452	13
French W. and Eq. Africa	560	16
ROW ^{b/}	<u>567</u>	<u>16</u>
Total	3,518	100
Total Exports	<u>15,964</u>	
DISTRIBUTION OF IMPORTS		
<u>Combined Lauric Oils</u>		
United States	3,957	25
European Economic Community	5,268	33
United Kingdom	1,593	10
Japan	771	5
ROW ^{b/}	<u>4,374</u>	<u>27</u>
Total Imports	<u>15,963</u>	<u>100</u>

^{a/} Include French Pacific Islands, Fiji, New Guinea

^{b/} Rest of the World Residual

Source: World Oils and Fats Statistics, Prepared by Economics and Statistics Department, Unilever Limited, for the Congress of the International Association of Seed Crushers, various issues. (Also in Walter C. Labys, Dynamic Commodity Models: Specification, Estimation and Simulation (Massachusetts: Lexington Books D.C. Heath and Co., 1973). pp. 151.

The high demand for coconut oil has been maintained largely because of its special properties not possessed by other vegetable oils (high fatty acid content), which makes it indispensable for many industrial purposes and for food production. High prices resulting from the shortage in production relative to demand, have, enabled the industry to earn high profits. However, they have encouraged the market substitution of competitive oils, especially palm oil.

The danger of substitution has darkened the future of the coconut industry in the Philippines (Table 2). The threat comes from two potential substitutes, vegetable oils and synthetics. International trade in fats and oils is of substantial importance to both developing and developed countries. As a greater variety of fats and oils are produced in the world, the scope for an actual extent of substitution in fats and oils markets is increased.

World Supply of Edible Fats and Oils

Almost all countries of the world whether developed or developing, produce some kinds of fats and oils. Developing countries are the sole exporters of coconut, palm oil and palm kernel oils while developed countries export soybean, cottonseed, sunflower, linseed, olive and fish oils. Sunflowerseed oil is exported mainly by Eastern Europe and soybeans are exported largely by Mainland

TABLE 2. WORLD PRODUCTION OF OILS FROM 1960-1976,
WITH PROJECTIONS THROUGH 1994.

IN 1000 METRIC TONSI

LOGARITHM PROJECTION -

PERIOD	COTTONSEED OIL	PEANUT OIL	SOYABEAN OIL	SLATFLOWER OIL	RAPESEED OIL	COCCNLT OIL	PALM KERNEL OIL	PALM OIL	TOTAL
1 1960	2150	2525	3295	1665	1105	1960	440	1249	14385
2 1961	2163	2610	3290	1630	1190	2195	435	1246	15246
3 1962	2185	2680	3850	2425	1215	2035	405	1255	16250
4 1963	2250	2510	3810	2380	1060	2130	415	1263	16758
5 1964	2355	3005	3880	2290	1095	2270	420	1256	16611
6 1965	2755	3384	3934	3134	1496	2160	436	1257	19556
7 1966	2757	3260	4624	2577	1466	2246	427	1300	19057
8 1967	2461	3303	5056	3497	1745	2105	373	1185	19725
9 1968	2417	3399	5275	3720	1877	2150	375	1376	20589
10 1969	2716	3087	5925	3706	1522	2010	401	1526	20853
11 1970	2605	3302	6089	3802	1525	2172	439	1732	22070
12 1971	2654	3377	6266	3612	2508	2514	462	1925	23318
13 1972	2929	3535	6750	3438	2596	2878	454	2131	24911
14 1973	3111	2921	7413	3551	2474	2434	436	2238	24576
15 1974	3168	3133	6382	4520	2410	2227	497	2627	27964
16 1975	3280	3162	8318	3594	2625	2895	516	2942	27712
17 1976	2766	3706	10164	3592	2862	3343	524	3665	30522
18 1977	3210	3515	10095	4791	3136	2802	484	2540	33973
19 1978	3285	3555	10826	5025	3350	2862	489	3133	32533
20 1979	3361	3603	11609	5279	3578	2924	465	3339	34198
21 1980	3438	3648	12448	5542	3822	2987	501	3558	35964
22 1981	3518	3693	13349	5818	4083	3051	506	3791	37828
23 1982	3559	3735	14515	6107	4361	3117	512	4040	39790
24 1983	3683	3786	15350	6411	4655	3184	518	4304	41855
25 1984	3768	3833	16461	6725	4976	3253	524	4587	44131
26 1985	3855	3881	17651	7064	5315	3323	530	4888	46537
27 1986	3945	3925	18528	7415	5678	3395	536	5208	49024
28 1987	4036	3978	20258	7784	6005	3469	542	5590	51721
29 1988	4129	4027	21766	8171	6478	3543	548	5914	54576
30 1989	4225	4077	23241	8578	6920	3619	555	6332	57617
31 1990	4323	4128	25029	9034	7392	3697	561	6715	61846

	1991	1992	1997	1998	1999	2000	2001	2002
LCG YPAR	5.67	5.63	5.49	5.75	5.80	5.66	5.58	6.64
P(1)	0.06	0.05	0.07	0.05	0.05	0.06	0.05	0.07
RSQ	0.4609	0.4101	0.6388	0.3269	0.4520	0.3663	0.4137	0.3096
SYX	0.31	0.31	0.26	0.36	0.30	0.44	0.28	0.24
SB	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.01

SOURCE:

UNITED STATES DEPARTMENT OF AGRICULTURE-FOREIGN AGRICULTURE SERVICE. 'WORLD AGRICULTURAL PRODUCTION AND STATISTICAL REPORT', (1977). INCLUDES RECORDED PRICES FOR YEARS 1960-1976.

China, Brazil and the United States.²

Soybean oil accounts for 24 per cent of the total world's production of vegetable oils (Table 2). Soybean and palm oil have increased in production, and both account for 55 per cent of world's trade of fats and oils.

Production of Malaysian palm oil could increased sharply resulting in lower prices of fats and oils, including Philippine coconut oil prices.³

In major importing areas, such as Western Europe, about 45 per cent of the total fats and oils requirements are met by domestic products and these are in competition with supplies from exporting countries, which are often offered at lower prices. To provide protection to their domestic primary producers, European countries resort to price support schemes, quotas, tariffs, taxes, etc. which ultimately influence the demand for imported oils, including Philippine coconut oil.

²American Soybean Association, American Soybean Digest Blue Book, 1972.

³U.S.D.A. Fats and Oils Situation Report, 1977.

The Problem

Today, Philippine export policy favors coconut oil over copra. However, Philippine coconut oil exports to the European Economic Community (EEC) are subject to a 10 per cent ad valorem duty for the edible form and 5 per cent for the inedible form. A duty of one per cent per pound is imposed on the Philippine coconut oil exports to the United States (Table 3). These duties are unfavorable for Philippine coconut oil exports due to the following reasons:

- a) Copra is admitted duty-free in both U.S.A. and European markets while the duty of coconut oil varies from 8 to 20 per cent, depending upon the amount of processing required. This pattern discourages domestic processing of copra into coconut oil in the Philippines.
- b) Member countries of the European Economic Community (EEC) can trade coconut oil among themselves duty-free; this has worked against the dutiable oil coming from the Philippines;
- c) Palm oil is admitted duty-free in the United States. This further increases the price spread between coconut oil and palm oil in U.S. markets. Thus encouraging market substitution against coconut oil.

Thus, the oil milling industry in the Philippines is not fully utilized despite the natural economic advantage it enjoys in the market.⁴

⁴Food and Agriculture Organization, The Coconut Industry in Asia: Regional Plan Harmonization and Integration Studies, No. 1 (United Nations: New York, 1969), pp. 42-43.

Table 3. Tariff Schedules of the United States Annotated
(Converted to the Brussels Tariff Nomenclature)
Animal and Vegetable Fats and Oils

Item	Unit	1/	2/
Fixed vegetable oils, fluid or solid, crude, refined, or purified:			
Castor oil	Lb	1¢/lb	3¢/lb
Coconut oil	Lb	1¢/lb	2¢/lb
Linseed or flaxseed oil	Lb	4.5¢/lb	4.5¢/lb
Olive oil:			
Rendered unfit for use as food	Lb	Free	Free
Palm-kernel oil:			
Rendered unfit for use as food	Lb	Free	Free
Other	Lb	0.5¢/lb	1¢/lb
Palm oil	Lb	Free	Free
Peanut oil	Lb	4¢/lb	4¢/lb
Rapeseed oil:			
Imported to be used in the manufacture of rubber substitutes or lubricating oil	Lb	Free	Free
Other	Lb	2¢/lb	5¢/lb
Sesame oil	Lb	0.7¢/lb	3¢/lb
Soybean oil	Lb	22.5%	45%
Sunflower oil	Lb	5%	4.5¢/lb + 20%
Tung oil	Lb	Free	Free

1/ U. S. Tariff

2/ Converted to Brussels Tariff Nomenclature

Table 3 — Continued

Item	Unit	1/	2/
Corn oil, cottonseed oil, hempseed oil, kapok oil and perilla oil			
Corn oil	Lb	6.5%	20%
Cottonseed oil	Lb		
Hempseed, kapok, and perilla oils	Lb		
Babassu, croton, poppy, sweet almond, vegetable tallow, Japan wax, myrtle wax, and nut oils, not elsewhere specified	Lb	Free	Free
Vegetable oils, not elsewhere specified	Lb	5%	20%
Artificial mixtures of two or more of the products provided for in heading 1507:			
In chief value of linseed oil	Lb	4.5¢/lb	4.5¢/lb
Animal or vegetable oils and fats, wholly or partially hydrogenated, or solidified or hardened by any other process, whether or not refined, but not further prepared:			
Steearins of the oils or fats of headings 1504, 1506, and 1507	Lb	The same rate applicable for the oil or fat	The same rate applicable for the oil or fat
Other	Lb	5¢/lb	5¢/lb
Margarine, imitation lard, and other prepared edible fats:			
Margarine	Lb	7¢/lb	14¢/lb
Other	Lb	5¢/lb	5¢/lb

Source: Tariff Schedules of the United States Annotated, 1974. Section III of Chapter 15.
(Washington: United States Government Printing Office), 1974.

Importance of the Study

Against this background, it is essential that the Philippines follow closely changing supply-demand conditions for fats and oils. Present programs to expand substantially coconut production in the future must be evaluated carefully. This study will appraise the impacts of trade impediment among developed countries, evaluate the trade prospects of Philippine coconut oil, and assess the importance of export expansion and pricing policies. The results should be useful for evaluating the marketing strategy of the Philippine coconut industry to enable it to compete effectively against the new challenges.

Policy makers and planners in Philippine agriculture are currently looking for analyses that will guide them in estimating future levels of production and prices. Knowledge of the relationships between projected supply and projected demand is essential in order to devise corrective measures affecting domestic production and distribution as well as exports of coconut oil and other coconut products. A careful evaluation of trends in supply and demand should prove valuable in guiding the industry in general and the policy makers in particular.

Objectives of the Study

The specific objectives of the study are:

- a) to estimate projected international demand and supply for Philippine coconut oil;
- b) to provide a qualitative analysis of trade flows and trade barriers affecting the industry;
- c) to evaluate government policies affecting the coconut industry; and
- d) to examine the factors which influence the Philippine coconut oil trade and the impact of changing demand within importing countries.

Limitations of the Study

Data limitations pose a major constraint in the analysis of the industry. Nevertheless, it is believed that the results from the study could provide a better picture of the prospects and future of Philippine coconut oil. It is the aim of the author to pursue the study after her return to the Philippines, in order to obtain more precise and realistic results as refinements and improvements in data collection and analysis are obtained.

CHAPTER II

REVIEW OF LITERATURE

Concepts of International Trade

Most economists believe that foreign trade can make an impressive contribution to a country's development. Trade should not be considered simply as a device for achieving productive efficiency; rather it should also be taken as an "engine of growth"⁵. On the other hand, it is argued that international trade has actually operated as a mechanism of international inequality-widening the gap in the levels of living between the rich and the poor countries.⁶

John Stuart Mill stated that trade according to the principle of comparative advantage results in a "more efficient employment of the productive forces of the world"⁷ and this may be considered the "direct economical advantage of foreign trade". One of the most "indirect" dynamic benefits is the "tendency that for

⁵D. H. Robertson, "The Future of International Trade", reprinted in American Economic Association, Readings in the Theory of International Trade (Blakiston Co., 1949), p. 50.

⁶Gerald M. Meur, The International Economics of Development Theory and Policy (New York: Harper and Row, 1968), pp. 215.

⁷John Stuart Mill, Principles of Political Economy (London, 1848, Book I, Chapter X, Sec. 1, Book III, Chapter XVII, Sec. 5, Book IV, Chap. II, Sec. 1.

every expansion of market an improvement in production processes results.⁸

Hla Myint⁹ interprets trade as a dynamic force which widens the extent of the market and the scope of the division of labor, permits greater use of machinery, stimulates innovations, overcomes technical indivisibilities, raises the productivity of labor and generally enables the country to enjoy increasing returns and economic development.

Ricardo advanced the theory of international trade and the associated idea of comparative advantage.¹⁰ He related the theory to a two-country case involving two final products and only one limitational factors, labor, which was the source of the value of the two products. He neglected the other variables such as transport cost (ocean freight cost), which heavily affect international trade. Under the assumption of constant returns to scale, he demonstrated that when the ratios of the number of labor units

⁸Ibid.

⁹Hla Myint, "The 'Classical Theory' of International Trade and the Underdeveloped Countries", Economic Journal (June 1958), pp. 317-337.

¹⁰Charles Kindleberger, International Economics (Illinois: Richard D. Irwin, Inc. 1968), pp. 19-37.

required to produce a given product say, B, are different between the two countries, specialization in production would be desirable for both countries. This assumption emphasized the supply side of the development process - - demand is not included.

If trade increase the capacity for development, then it follows that the larger the volume of trade the greater is the potential for development. However, what is actually happening at present is that production in most of the less developed countries (LDC's) is weighted in the direction of production for exports. Factor supplies have been export-biased. Productivity has increased because the direct foreign investment in the export sector had operated under efficient management and with advanced production techniques.¹¹

The question to ponder is, why is it that the export sector has not propelled the general growth of the developing country? A probable answer to this is that the terms of international trade are working against the development of the less developed countries (LDC's).

¹¹The basis for trade so far as supply is concerned is found in differences in comparative cost. Differences in comparative costs arise because of the fact that different countries have different factor endowments and because different commodities are but produced with a predominance of one another factor. Trade arises out of differences in relative factor prices and due to disparities in foreign exchange rates and not equilibrium rate.

The factor-equalization theorem¹² states that under certain conditions, free international trade is a perfect substitute for complete international mobility of factors in the trading countries and is sufficient to equalize the prices of products as well as factor prices. Against the proposition, it is argued that the international distribution of income has become more unequal. The contention of the classical theory is simply that the real income of each country will be higher with trade than without trade.

Another major criticism to international trade is the secular deterioration in the commodity terms of trade of poor countries. It has been contended by some economists that the commodity terms of trade between industrial and primary producing countries have shifted in favor of industrial countries, allegedly because of monopolistic elements in the products of the industrial countries.¹³

Focusing on this possibility, the less developed countries have become extremely concerned about their opportunities for

¹²P. A. Samuelson, "International Factor-Price Equalization Theorem Once Again", Economic Journal (June, 1949), p. 182.

¹³Gerald M. Meier, The International Economics of Development: Theory and Practice, p. 218.

expanding exports. Thus, it is contended that the commercial policies of developed countries need to be liberalized.

Trade Barriers

Several arguments have been used to support policies aimed at restricting trade.¹⁴ Most of these arguments center around national defense, protection of the infant industry, efforts to conserve on the use of foreign exchange earnings, and income transfer schemes favoring the domestic producers via a high price policy.

However, as tariffs are increased, two opposing forces are at work: a) the terms of trade tend to favor the country levying the tariff; and b) the volume of imports tend to be curtailed by higher tariffs.

Balassa's calculations given in Vandendriesche's paper concerning the recent and past Kennedy rounds of effective tariff rates show that not only are rates bias against the less developed countries (LDC's) but also tariff reductions are proportionally lower on

¹⁴John Black, "Arguments for Tariffs", Oxford Economic Papers (June, 1959),

products of the LDC's compared to the more advanced manufactures of developed countries.¹⁵

By using the optimum tariff argument, it is possible to show that a retaliatory tariff by most of the less developed countries (LDC's) will tend to improve their position in world's trade.¹⁶ However, it will definitely leave the trading region worse off than it would be under free trade. Therefore, given an economic system within which more than one trade barrier exists, the attainment of free trade via the abolition of trade barriers will leave the trading region better off and may improve the position of all parties concerned.

¹⁵B. Vandendriesche, Factors Affecting LDC's Trade (New York: Vantage Press, 1963).

¹⁶J. De V. Graaf, "On Optimum Tariff Structures", Review of Economic Studies, Vol. 22, (1949).

CHAPTER III

COCONUT AND COCONUT PRODUCTS MARKETING

Domestic Marketing in the Philippines

Coconut is grown throughout fifty-five (55) provinces, but production is concentrated along the coastal areas in six regions, namely: Northern Mindanao, Eastern Visayas, Southern Tagalog, Southern Mindanao, Bicol and Western Mindanao.

Coconut accounts for a big portion of our agricultural land. In 1976, coconut hectarage was estimated at 2.5 million hectares, or roughly three-fourths ($3/4$) of commercial cropland and more than one-fifth ($1/5$) of the country's cultivated area. The coconut area increased at the rate of 4% annually in the past decade.

Coconut continues to be a smallholder's crop. In the Philippines, about 85% of the coconut land area are small and medium landholdings with an average extent of four (4) hectares to twenty (20) hectares. Eighty per cent (80%) of these are landholdings with an average size of 2 hectares.

The selling and distribution system for coconut and coconut products involves complex processes.

"There exists considerable evidence of serious imperfections within the marketing structure with possible opportunities for monopsony and monopoly gains at various points of the marketing channel. Obviously,

such imperfections tend to lower producers' income and to impair price flexibilities at the farm level, and thus badly obstruct an efficient resource allocation.¹⁷

Market structure determines the behavior of firms in the industry, and that behavior in turn determines the quality of the industry's performance. Highly concentrated industries are likely to perform poorly and they allocate resources inefficiently -- employing too few factors of production and channeling too many into low concentrated industries.¹⁸

In the coconut industry, no product differentiation nor barriers to entry exists.

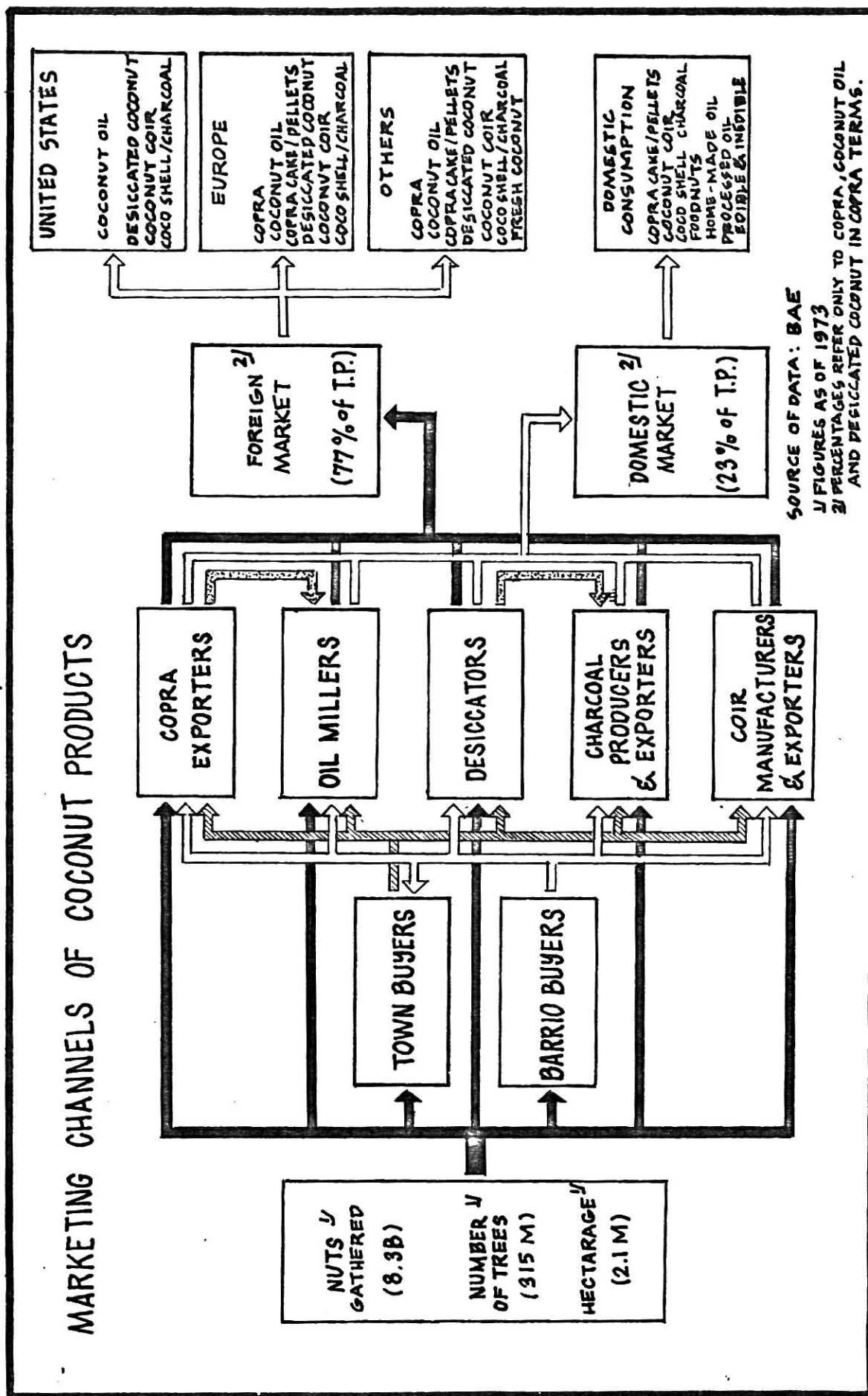
In nearly all instances, the market structure is one of multiple series of middlemen, most of whom enjoy some degree of monopoly power. This ultimately results in lower returns for coconut farmers.

The bulk of Philippine copra is sold directly to barrio buyers while a minor portion is sold to town buyers. Most of the barrio/town buyers are purchasing agents for big oil processors, middlemen and/or exporters (see Figure 1).

¹⁷Cernohous, Zdenek, "The Marketing of Agricultural Products in the Philippines", The Philippine Economic Journal, No. 9, First Semester, (1966), Vol. V, No. 1.

¹⁸Richard Caves, American Industry: Structure, Conduct, and Performance (New Jersey: Prentice-Hall, Inc. 1964), pp. 15-35.

FIG. 1 - DOMESTIC MARKETING CHANNEL, COCONUT PRODUCTS, PHILIPPINES



The monopoly power of the buyer at the point of production is also enhanced by the lack of accurate and up-to-date price and market information by farmers. If the farmer lives in a somewhat remote area, and is unable to transport and sell copra, he will usually have one buyer who collects them. The general rule in this case is contract selling. The farmer is deprived of any opportunity to sell more favorable markets for his products for he is under the obligation to sell his copra to the buyer who extended him credit.¹⁹

In the Philippines, farmers dispose of their surplus coconuts either by selling the unharvested nuts on a contract basis, or by selling the husked nuts themselves. Alternatively, farmers sometimes sell the nuts in copra form.²⁰ Ninety per cent of the total coconut production is converted into copra either by farmers themselves or by established copra processors.

Husked nuts are sold by farmers on a contract basis or through straight outright sale of the assembled nuts. In the former case, the

¹⁹George L. Hicks, The Philippine Coconut Industry: Growth and Change, 1900-1965 (Center for Development Planning, National Planning Association, Field Work Report No. 17, June, 1967) pp. 98-107.

²⁰Fabian Tiongson, Improved Merchandizing of Selected Farm Products (Quezon City: Community Development Research Council, University of the Philippines, Study Series No. 6, 1964).

buyer purchases the coconuts from the plantations at stipulated prices and bears the expenses of preparing the product for the market, including transportation and labor costs. In the latter case, the buyer pays for the dehusked nuts already assembled at a place readily accessible for transport. The farmer bears the expenses of preparing the nuts for the market. ²¹

As a rule, the practice of marketing copra (dehusked coconuts) is determined by: a) nearness of a processing plant; b) volume of production; c) warehousing facilities; d) transportation, and e) relative prices.

Patterns of Philippine Foreign Trade

Philippine foreign trade has increased steadily from \$535 million in 1960 to \$1,168 million in 1972 (see Appendix 1). On the other hand, imports increased at a faster rate than exports. It was only in 1963 and 1966 that the Philippines enjoyed an export surplus in the amount of \$125 million and \$3 million, respectively.

²¹United Coconut Association of the Philippines (UCAP), Coconut Marketing in the Philippines: A Paper Presented in a Seminar-Workshop for PNB/FAO on Warehousing, Marketing and Operational Studies on Coconut, (October, 1975) 3p.

Efforts to accelerate economic growth resulted in the faster increase in imports, particularly of capital goods, including machinery and industrial raw materials.

External trade transactions of the Philippines on the period under study was characterized by sharp changes in economic conditions and policies in the major trading industrialized countries which pulled down export prices and simultaneously effected an upswings in import prices; a deterioration in the commodity terms of trade and the purchasing power of exports; the continued concentration of imports in producers' goods; and the increasing proportion of processed goods in the export mix.

The same could be expected in the coconut sector. World export supplies of copra and coconut oil combined are expected to stagnate slightly below the previous season's level. The sizeable decline in supplies from Indonesia and Sri Lanka could possibly be aggravated by a slightly lower production in the Philippines. Philippine production in 1977 was down 10 to 15% from the previous year.

World net exports of copra and coconut oil in 1976 was estimated at 1.7 million metric tons, oil basis. This was 202 thousand metric tons or 13.5 per cent more than the 1975 shipments of 1.5 million tons. The shares of the different net exporting countries in their order of rank are: (1) Philippines - 81.5 per cent; (2) Papua New Guinea

(3) Sri Lanka - 3.6 per cent; (4) Malaysia - 1 per cent; (5) New Hebrides - 1 per cent; (6) Indonesia - .9 per cent; (7) British Solomon Islands - .8 per cent; (8) Western Samoa - .4 per cent; and Tonga - .4 per cent.

From Fig. 1, it will be seen that, based on 1973 figures, 77 per cent of the total coconut products produced was exported to the U.S.A., Western Europe, and other countries leaving only 23 per cent for domestic consumption.

The orientation of the Philippine copra and coconut oil exports toward the United States is due partly to historical and political factors, and partly due to the special trading privileges that it enjoys with regard to other countries.

Preferential tariffs and other trade, privileges have been accorded to the Philippine coconut oil products in the United States for a long period of time. Until recently, the Philippines has virtually been the sole supplier of coconut oil and copra by reason of the preferential treatment.

World Market Structure for Lauric Oils

The international market structure for coconut oil is presented in Fig. 2. The basic components of the market are described in terms of flows of production, exports, stocks, prices, imports and consump-

tion.²²

Supply originates mostly in developing countries like the Philippines, Ceylon, Indonesia and Malaysia and consumption takes mostly in the developed countries like the United States, Western Europe, Canada, Japan, etc.

Lauric oils can be obtained from copra, coconut oil, palm oil and palm kernel oil. The market flow pattern indicates that lauric oil passes through a number of dealers or export firms in the Philippines, and other major coconut oil importing countries. The market strength of the importing countries, is in part determined by the relatively few large crushers and importing firms in the U.S.A. and the E.E.C. This is true even in the market for coconut oil products which is relatively competitive at the final demand level.

The trend in the expansion of coconut product exports from developing countries over the years has not been as rapid as warranted by the growth in demand.

... technological change reduced the need for raw materials, synthetic products had in many instances displaced natural ones. The reason being that the higher growth rates connected with the choice of these

²²Walter C. Labys, Dynamic Commodity Models: Specification, Estimation and Simulation (Massachusetts: Lexington Books Co., D.C. Heath and Company, 1973), pp. 149-150.

countries had to be made between either export diversification or import substitution.²³

Price Trends

The growth and development of the world's fats and oils market appears to have been limited by the relative instability of prices during the period from 1960-1975 (Table 4). The price level widely fluctuated at relatively short intervals over the study period and went up abruptly in 1974 (Fig. 3). The increase in prices was due to lower fats and oils production with the exception of soybean oil and palm oil in 1973 (see Table 2 page 4). The drop in supplies was affected by the fuel crisis. There were serious dislocations in the shipments and products were withheld from the market as safeguards against contingencies.

The international market for fats and oils moves freely in response to supply and demand. Short-term fluctuations in prices are due to changes in supply of the commodity and the prices of substitutable fats and oils. Advances in technology have made it possible for a wider variety of fats and oils to be used as substitutes.

Projected prices of the world's fats and oils disclosed that prices are expected to go up in the short-run and the long-run periods. This could be attributed to higher milling costs, marketing costs and

²³George L. Hicks, The Philippine Coconut Industry: Growth and Change, 1900-1965.

marketing margins brought about by the impending energy crisis.

TABLE 4. FATS AND OILS: DEFLATED EUROPEAN PRICES FOR MAJOR OILS, 1960-1975.
(1972=100)

(IN U.S. DOLLARS PER METRIC TON)

LOGARITHM PROJECTION

PERIOD	SOYBEAN OIL	RAPESEED OIL	PEANUT OIL	COCONUT OIL	PALM KERNEL OIL	FLAXSEED OIL	PALM OIL	OIL \$ DOLLARS \$M RINGET
1 1960	276	274	410	368	365	317	281	860
2 1961	351	352	414	283	297	343	287	879
3 1962	280	277	344	280	278	310	263	807
4 1963	270	270	337	326	337	259	274	840
5 1964	286	315	354	346	359	250	292	895
6 1965	333	324	400	295	293	252	332	1018
7 1966	311	291	353	294	323	218	281	861
8 1967	257	245	335	335	298	233	264	809
9 1968	206	187	313	421	422	264	195	597
10 1969	220	223	370	327	342	257	211	647
11 1970	308	282	408	370	355	234	278	852
12 1971	324	308	466	314	351	154	265	813
13 1972	241	232	426	215	245	156	211	595
14 1973	384	348	479	429	446	482	344	841
15 1974	619	554	802	1006	804	818	514	1237
16 1975	386	378	588	254	280	457	288	693
17 1976	569	522	845	630	647	522	469	1208
18 1977	602	548	903	662	683	618	490	1243
19 1978	636	576	965	695	722	657	512	1280
20 1979	673	606	1031	735	763	659	535	1317
21 1980	711	636	1101	775	805	744	559	1356
22 1981	752	668	1177	815	852	750	584	1396
23 1982	796	704	1258	855	899	840	611	1438
24 1983	842	739	1344	906	950	854	637	1480
25 1984	891	776	1438	953	1003	951	666	1524
26 1985	942	817	1534	1005	1060	1011	696	1570
27 1986	956	858	1640	1057	1120	1075	727	1616
28 1987	1054	902	1753	1114	1183	1143	760	1664
29 1988	1114	948	1872	1174	1249	1216	794	1713
30 1989	1178	996	2001	1237	1321	1292	829	1763
31 1990	1246	1047	2138	1302	1395	1374	867	1815

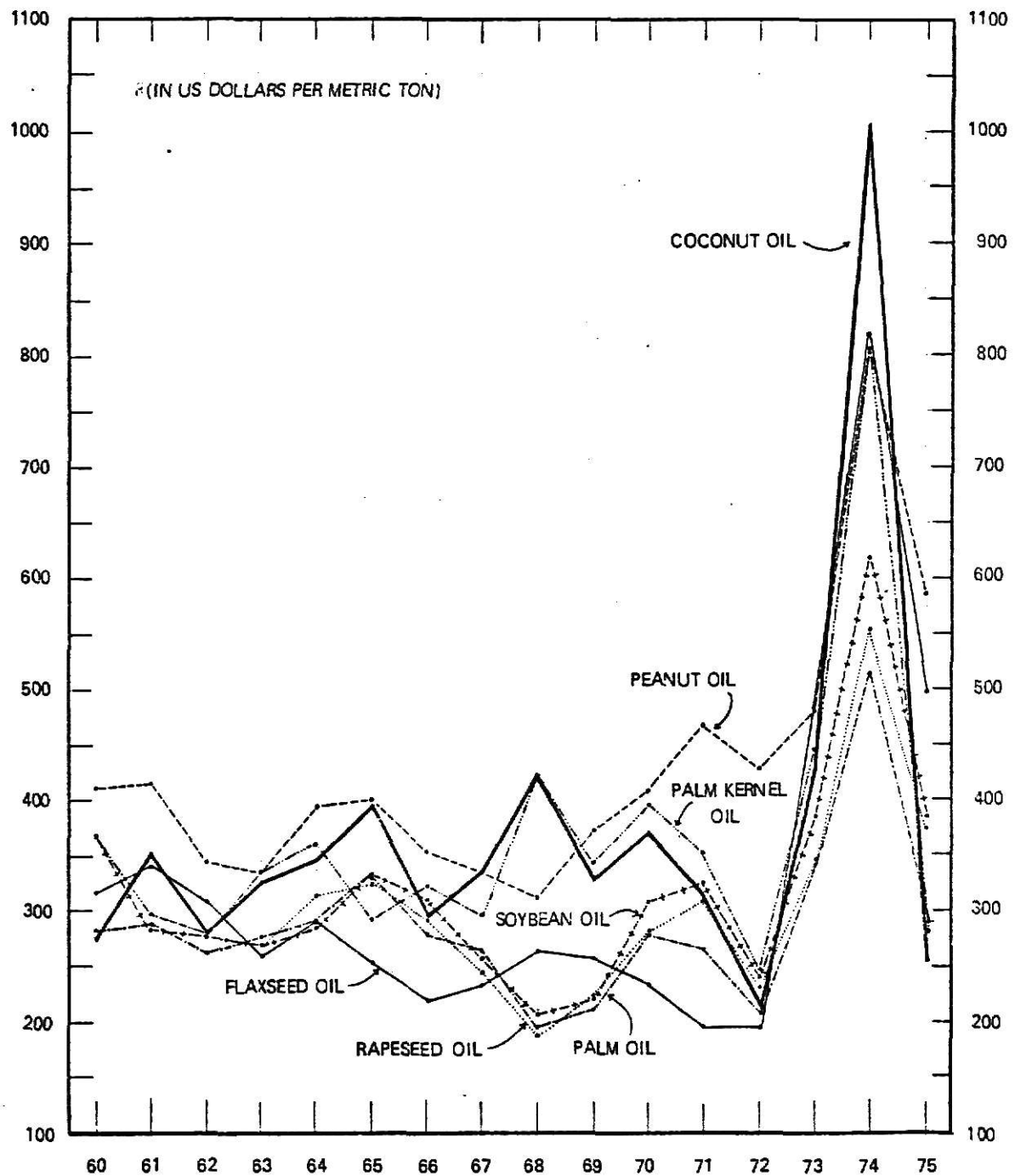
Table 4. Con't.

32 1991	1317	1101	2285	1372	1474	1460	906	1868
33 1992	1394	1158	2442	1445	1557	1523	946	1923
34 1993	1474	1217	2609	1522	1645	1621	988	1990
35 1994	1559	1278	2788	1603	1738	1756	1032	2039
36 1995	1649	1344	2979	1685	1836	1867	1079	2099
37 1996	1744	1413	3183	1779	1938	1984	1126	2161
38 1997	1844	1484	3401	1874	2048	2112	1177	2225
39 1998	1951	1561	3634	1974	2163	2245	1229	2291
40 1999	2063	1640	3884	2076	2286	2328	1285	2359
41 2000	2182	1724	4150	2191	2414	2528	1342	2428

SOURCE:

SOURCE: UNITED STATES DEPARTMENT OF AGRICULTURE--FOREIGN AGRICULTURAL SERVICE, WORLD STATISTICAL REPORT.
INCLUDES RECORDED PRICES FOR YEARS 1960-1975. PRICE INDEXES USED--PURCHASING POWER OF THE DOLLAR

FIG. 3. FATS AND OILS: DEFLATED EUROPEAN PRICES FOR MAJOR OILS, 1960-1975



Substitution Effects

Fats and oils are exported by both developed and developing countries, and substantially contribute to the export earnings of both groups. Most of the fats and oils are substitutable for each other due to similarity in uses.

The degree to which prices of different oils have moved together is expressed in the correlation matrix (Table 5). The correlation matrix provides an indication of the market substitutability between coconut oil and other fats and oils.

Table 5. Correlation Matrix of Prices of Coconut
Oil vs. other Competing Fats and Oils,
1960-1975

Item	Coconut Oil	Soybean Oil	Rapeseed Oil	Peanut Oil	Palm Kernel Oil	Flaxseed Oil	Palm Oil
Coconut Oil	1.000	0.790	0.733	0.738	0.970	0.805	0.846
Soybean Oil		1.000	0.985	0.921	0.762	0.892	0.949
Rapeseed Oil			1.000	0.905	0.697	0.877	0.940
Peanut Oil				1.000	0.733	0.886	0.815
Palm Kernel Oil					1.000	0.796	0.789
Flaxseed Oil						1.000	0.844
Palm Oil							1.000

Source of Basic Data: USDA Foreign Agricultural Service
World Statistical Report 1977, Price Indexes Used
Purchasing Power of the Dollar.

The results indicate that the price of coconut oil is highly correlated with those other oils. In other words, the price of coconut oil is dependent upon the prices of competing oils in the world markets. In statistical terms, values are highly correlated when the correlation coefficients are close to 1.0. Coconut oil prices are most highly correlated with those of palm kernel oil, palm oil and flaxseed oil, ranking first, second, and third, respectively.

Competition from Synthetic Products

The threat of displacement by synthetic substitutes continues to be a serious problem to the coconut industry. Petro-chemical plants have been established in the United States and in Europe to process petro-chemical based products for replacing coconut oil for use by the chemical industries. Unless coconut oil can compete in price with the petro-chemical products and other competing fats and oils in the world market, the Philippine coconut oil stands to lose substantial portions of the world market.

Elasticity

The notion of elasticity is used to interpret the effect of a percentage change of an independent variable relative to a dependent variable. The elasticity of Y with respect to X may be defined in X. In general, the elasticity of Y with respect to X is not constant; rather

it changes with different values of X and Y because the elasticity is measured at different points along the regression line. However, major difficulties in deriving elasticities were noted by Orcutt:²⁴

- a) Errors in Observations - values of demand, price and income used for estimation may contain errors of sampling and measurement; these errors can lead to different forms of bias on the demand elasticities, depending on the proportional distribution of errors among the variables;
- b) Data Aggregation - commodities with relatively low price elasticity may also have substantial price variations; this condition will tend to influence the elasticities where the relative prices are aggregated in the form of index numbers.
- c) Short run vs. Long run elasticities - measurement will normally result in the short-run values being less than the long-run values.

The elasticities presented are calculated at the point of the means of each of the independent variable.²⁵ For the jth coefficient, the elasticity is calculated as follows:

$$E_j = B_j \frac{\bar{X}_j}{\bar{Y}_j}$$

where:

E_j = elasticity of the jth coefficient

²⁴G.H. Orcutt, "Measurement of Price Elasticities in International Trade", Review of Economics and Statistics, Vol. 32 (May, 1950), pp. 117-132.

²⁵Robert S. Pindyck, Econometric Models and Economic Forecasts (New York: Mc Graw Hill, 1976), p. 72.

$\bar{X}_j$ = mean value of the jth coefficient of the independent variable.

$\bar{Y}_j$ = mean value of the jth coefficient of the dependent variable.

In general, high elasticity coefficients imply that the dependent variable is very responsive to changes in the independent variable.

The income elasticity of demand, hence was obtained using the above-mentioned formula, where

$$B_j = B_j \frac{\bar{X}_j}{\bar{Y}_j}$$

$$= 0.0926 \frac{1196.66}{287.48} = .385$$

The income elasticity coefficient of .385 obtained at the mean value implies that the consumption of coconut oil is less than proportionately responsive to changes in real national income of the major importing countries (U.S.A. and Western Europe). Thus, income elasticity of demand is low in high-income countries.

The computed direct price elasticity of demand is -.21. Thus, a one per cent increase in price of coconut oil relative to the prices of major competing oils - cottonseed oil, U.S.A., soybean oil, U.S.A. and palm oil, Malaysia will lead to a .21 per cent decrease in coconut oil demanded. The negative sign of the coefficient indicate the normal negative slope of the demand function.

The price elasticity of supply is inelastic at .4580. This means that a one per cent increase in export prices of coconut oil will lead to a .46 per cent increase in supply of coconut oil mainly for exports. It must be noted at this point, however, that although farmers may want to harvest their nuts as quickly as possible, they can not do so because coconut-bearing trees takes at least 3 to 4 years to bear nuts. Thus, policies geared to increase production through improved technology, production credit, etc. should be worked out to further increase the country's foreign exchange earnings.

CHAPTER IV

GOVERNMENT POLICIES AFFECTING PHILIPPINE COCONUT OIL TRADE

Domestic Policies

In as much as coconut oil's share in the world market of the major fats and oils is only 6% of which 79% is accounted for by Philippine production, it is obvious that the Philippines should increase her volume of production to be able to compete effectively with the bigger oil suppliers in the world market.

Government efforts to promote the coconut industry include policy measures such as development of high-yielding varieties of coconut, improvement in the quality of copra, control of pests, and diseases (particularly cadang-cadang), better farming methods and use of fertilizer. The government is presently undertaking a hybridization program aimed at replacing senile trees with early-bearing, high-yielding and disease-resistant varieties (hybrids) which will assure the farmer a yield five times as much as the current yields of the coconut farms. The 40-year hybridization program will be implemented by the Philippine Coconut Authority (PCA) by 1980 through 2020 financed by funds collected by the coconut farmers through the

Coconut Consumers Stabilization Fund levy.²⁶

However, again though the program of hybrid replanting envisions the upliftment of the farmer, the question of motivating him to subscribe to the program arises. Why should he permit his land to be replanted and wait for another 4 years before the first harvest from the hybrids, when his existing stands are capable of earning him a living although admittedly not at optimum levels.

Policies to Promote the Development of the Coconut Industry

The government aims to promote to the fullest extent possible the rapid development of the coconut industry by providing for an adequate financing of coconut cooperatives and coconut producers.

Agro-industrial cooperatives were set up to help processors and planters and give them greater control in the marketing of their products.²⁷

Furthermore, investments incentives were given to coconut farmers to encourage them to produce more.

²⁶Department of Agriculture, Twenty-five year Perspective Plan for the Coconut Industry, 1975.

²⁷Fifth Congress of the Republic of the Philippines, Republic Act No. 4403, House No. 5130. Fourth Session (June 19, 1965).

Coconut Investments Act

On June 1971, President Marcos approved R. A. 6260, otherwise known as the Coconut Investment Act, to allow the coconut farmers to raise ₱100 million in 10 years from the sales of coconut products. ²⁸

The ₱100 million COCOFUND is intended to finance the short-term and the long-term needs of the farmers. Of the ₱100 million ₱60 million will be allocated in 600 towns through rural banks or other lending institutions throughout the coconut-producing regions to meet the farmers' short-term needs such as production loans. The remaining ₱40 million will be invested to meet the long-term needs of the industry which include improvement of roads and other infrastructure, storage facilities, etc.

Then, too, credit facilities are to be provided readily to coconut farmers at preferential rates.

Quality Control

Rules and regulations on the standardization and inspection of copra was promulgated to effect quality control under the direct

²⁸Seventh Congress of the Republic of the Philippines, Republic Act 6260, "An Act Instituting a Coconut Investment Fund and Creating a coconut Investment Company for the Administration Thereof." (June 17, 1971).

supervision of the Philippine Coconut Authority (PCA). ²⁹

Also, Republic Act No. 1365 was enacted requiring all copra buyers to use moisture meters in all their domestic purchases of copra in the place where such purchase is made. ³⁰

Export Policies

To date, the primary strategy in the Philippines' export policy is the restructuring of the export sector by inducing the processing of traditional export products and giving encouragement to exports of manufactured and semi-processed goods. ³¹

The Export Tariff Act levies a duty on the gross freight on board (F.O.B.) proceeds of export goods on the prevailing exchange rate as follows:

Copra	6%
Coconut Oil	4%
Copra meal and cake	4%
Dessicated coconut	4%

²⁹Department of Commerce, Commerce Administrative Order No. 2, "Rules and Regulations on the Standardization and Inspection of Copra", (January 16, 1948).

³⁰Third Congress of the Philippines, Republic Act No. 1365. "An Act Requiring All Copra Buyers to use Moisture Meters in all their Domestic Purchase of Copra in the Place where Such Purchases is made", (June 8, 1955).

³¹Presidential Decree No. 230, "Amending the Tariff and Customs Code; creating Title III in Book I - Export Tariff", (July 1, 1973).

Thus, by levying a higher export tax on copra, the government hopes to encourage the semi-processing of copra into crude oil so as to generate more employment and increase the country's foreign exchange earnings.

International Policies

Developing countries like the Philippines meet with various obstacles in the exporting coconut products in the markets of the developed and industrialized countries. These obstacles come in the form of customs duties, tariffs, quantitative restrictions, internal taxes, etc.

The gravity of the problem differs according to the commodity exported and the level of processing involved. Copra, which is generally considered an unprocessed raw material, is relatively free of custom tariffs and quantitative restrictions, while coconut oil has 1¢/lb tariff. The more processed the product when it enters the developed countries, the higher the tariff becomes amounting to as high as 7¢/lb. (See Table 2).

Most Favored Nation (MFN) Tariffs

The most favored nations (MFN) tariff duties, calculated as arithmetic averages of five major countries for all products (combined dutiable and free) fall within the relatively narrow range of 6.2 and 9.6

per cent ad valorem (See Fig. 4).³² If only the fixed duties are considered, the European Community has the lowest arithmetic average tariff on all products, and the United States, the highest.

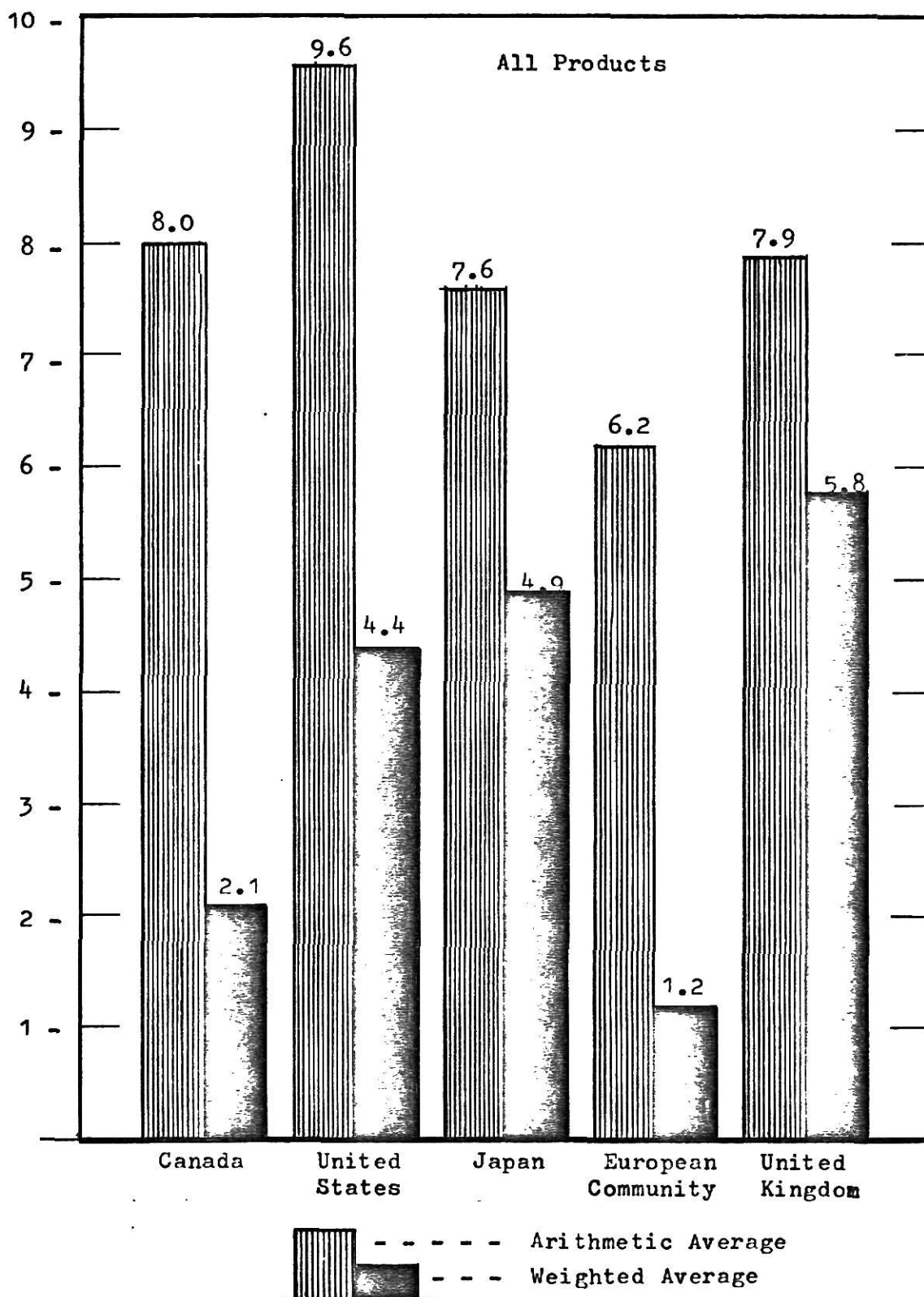
On the other hand, the European Community has the lowest weighted average tariff on all products (excluding products subject to variable levies) while the United Kingdom has the highest, 5.8 per cent ad valorem. On dutiable products alone, Canada has the highest average tariffs, with an arithmetic average of 12.4 per cent (See Fig. 5). The European Community has the lowest arithmetic average (excluding products covered by variable levies) and Japan, the lowest weighted average.³³

Imports on oilseeds, fats and oils, and their products under preferential rates are quite significant for the United Kingdom and the United States. In 1970, 61 per cent of imports by the United Kingdom and 54 per cent of U.S. imports entered under preferential duties instead of MFN duties.

³²United States Tariff Commission, Probable Effects of Tariff Preferences for Developing Countries, Vol. 1, No. 2 (United States Tariff Commission: Washington D.C., 1972), 181 p.

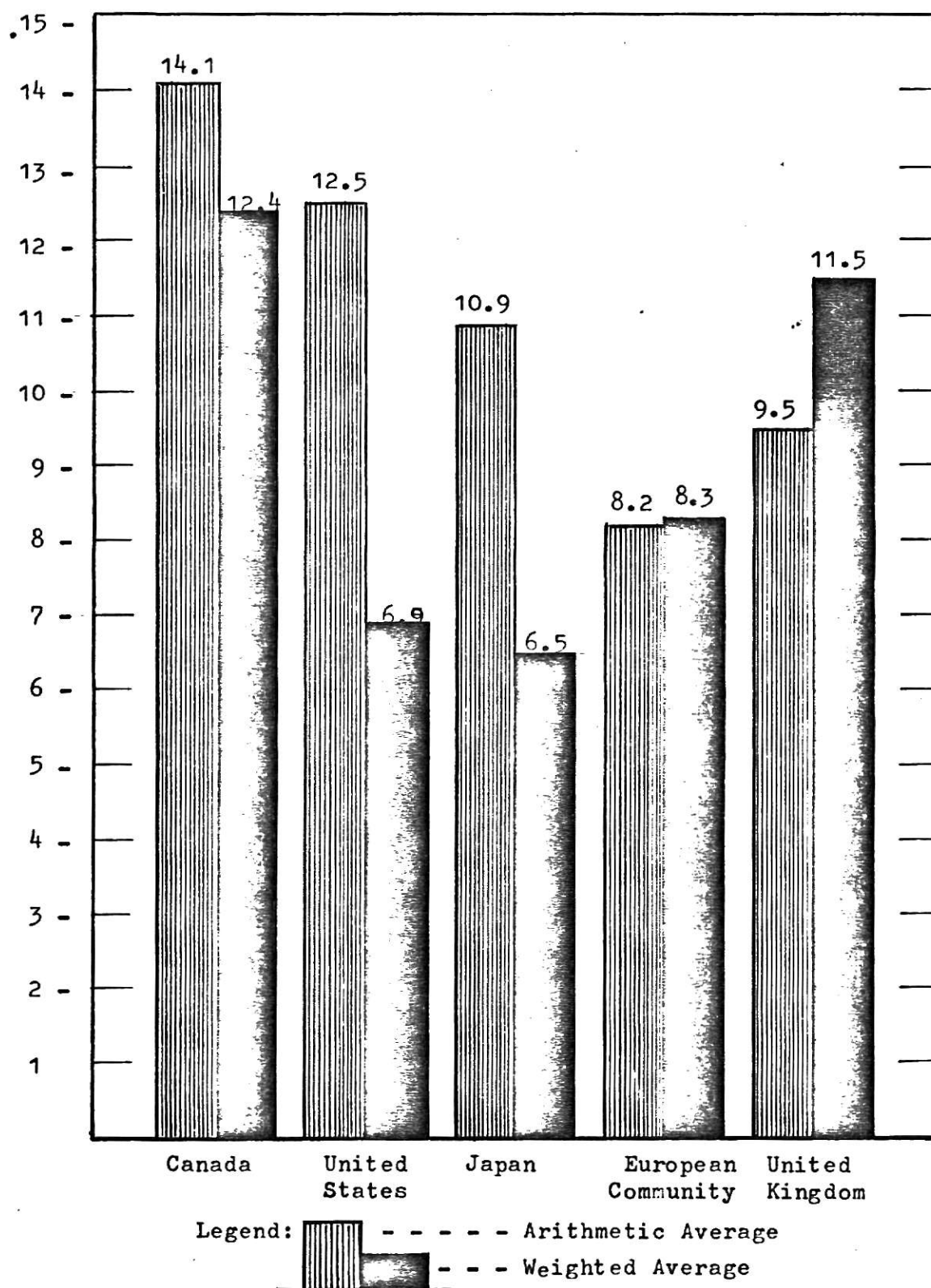
³³However, several limitations exists on the use of weighted average. Data aggregated may not show the specific rates and that some countries may have prohibitive tariffs on certain commodity.

Fig. 4 - Average MFN Tariffs on Oilseeds, Fats and Oils



Source: United States Tariff Commission, 1972.

Fig.5 -Average MFN Tariffs on Oilseeds, Oils and Fats,
Dutiable Products, 1972 .



Source: United States Tariff Commission, 1972.

The duty free tariff provisions for fats and oils in 1970 ranged from 17.1 per cent for the United Kingdom to 43.1 per cent for Canada. For the United States and the European Community about 28 per cent of import duties ranged between 0.1 and 5 per cent ad valorem.

Table 6. Distribution, by duty level of MFN tariff provisions for oilseeds, fats and oils, and their products

(In per cent)					
Duty Level	: Canada	: United States	: Japan	: European Community	: United Kingdom
Free	43.1	23.5	30.3	24.5	17.1
0.1 - 5.0 percent	-	28.0	18.2	28.6	21.9
5.1 - 10.0 "	20.2	20.5	28.8	30.6	46.4
10.1 - 15.0 "	10.1	9.1	7.5	8.1	12.2
15.1 - 20.0 "	26.6	6.8	6.1	6.2	2.4
20.1 - 25.0 "	-	5.3	4.6	2.0	-
25.1 - 30.0 "	-	-	3.0	-	-
30.1 - 40.0 "	-	3.0	1.5	-	-
40.1 - 50.0 "	-	-	-	-	-
Over 50.0 "	-	3.8	-	-	-
Total	100.0	100.0	100.0	100.0	100.0

Source: United States International Tariff Commission, 1974.

Forty-six per cent of the United Kingdom duties, 30 percent of the European Community duties, and 29 per cent of Japanese duties are in the 5.1 - 10 per cent rate bracket. Canada and the United Kingdom have no MFN tariff provisions higher than 20 per cent ad

valorem.

United States' Policies

The Laurel-Langley Agreement between the United States and the Republic of the Philippines, which governed trade and investment during the transitional period following institute of Philippine independence expired in 1974. In that year, discussions were held on a proposed new treaty. These discussions were suspended in 1975. However, no commitment with respect to formal economic relations between the two countries was made before year end.³⁴

Coconut oil from the Philippines (virtually the sole source of U.S. imports) and from the Pacific Trust Territory currently enters the United States duty-free with a specified quota. Any excess thereof requires a duty of one-cent per pound.

European Common Market Policies (ECM)

In recent years, conflicts between domestic and international objectives has characterized the industrial policies of the European communities. The factors which helped to create such a conflict can be identified as:

- a) The adoption by the governments of Western Europe of domestic policies and achieve full employment, economic

³⁴United States Tariff Commission, Probable Effects of Tariff Preferences for Developing Countries.

growth and regional development has induced these governments to look inward rather than outward and imposed obstacles to the full liberalization of trade.

- b) The failure of the European governments to cope with the persistent disequilibrium in international payments.

The European Economic Community (EEC) levies a 5 per cent ad valorem tax and 10 per cent on coconut oil imports for industrial use. This action is aimed to protect the dairy industries of the member-countries, which face stiff competition against the margarine producers. However, copra and copra meal and cake are exempted from payment of any tariff. Dessicated coconut is subject to a 6 per cent tax except in the United Kingdom where it is imported duty-free. A further threat to the expansion of the coconut oil industry is the European Common Market's proposal to apply a 5 per cent ad valorem tax on crude coconut oil and between 10 to 15 per cent tax on refined oil. These rates are higher than the present ones in Germany, the Netherlands, and Belgium and lower than those in France, and Italy. This proposal is intended to protect and subsidize the dairy industry of the member countries, which have a surplus production of butter fats.

Trade Organizations

Trade organization have been established for the purpose of minimizing or eliminating trade impediments. The Organization for European Economic Cooperation (O.E.E.C.) which has been

renamed the Organization for European Economic Cooperation and Development (O.E.C.D.) comprising of the United States, Canada, and the sixteen countries of Western Europe has agreed to reduce trade barriers common to the member countries and with developing countries.

The European Economic Community (E.E.C.) composed of France, West Germany, Italy, the Neitherlands, Belgium, Luxemburg, United Kingdom, Ireland and Denmark - is a customs union in which all barriers to trade between member countries have been eliminated.

The European Free Trade Association (EFTA) composed of Sweden, United Kingdom, Denmark, Norway, Portugal, Switzerland and Austria has agreed that trade barriers on industrial goods are to be lowered in international trade among member countries.

The General Agreement on Tariffs and Trade (GATT) provides confrontation for international trade grievances and calls for the most-favored nation (MFN) treatment among the 105 member-countries must provide equal or favorable trade treatments to each other. Therefore, the GATT provides for non-discrimination. After the Kennedy Round discussion among member countries, it was agreed that tariffs on many manufactured and agricultural commodities should be lowered on an MFN basis.

In recent years, as the trading world rapidly become more global and interdependent, as patterns of trade and distribution of economic power had changed, and as tariff levels already had been significantly lowered, non-tariff measures became relatively more visible.³⁵ Paradoxically, the more interdependent the trading world became, the more reluctant it seemed to eliminate discrimination.³⁶

Thus, the reduction of trade barrier between member countries of these organizations may actually create comparative disadvantage to nations such as the Philippines which are outside the organizations.

³⁵According to the GATT Secretariat, non-tariff measures fall into about 30 basic types - the following eleven were earmarked for initial action: quantitative restrictions, including import prohibitions and export restraints; import licensing procedures; subsidies; countervailing duties; standards; packaging and labeling requirements; marks of origin; customs valuation; customs nomenclature; customs procedure; and import documentation.

³⁶United States International Trade Commission, *ibid.*

CHAPTER V

METHODOLOGY

Multiple regression analyses on Bio-Medical (BMD) Program Stepwise Regression were used in the study.

General Description of the Program

This program computes a sequence of multiple linear regression equations in a stepwise manner. At each step one variable is added to the regression equation. The variable added is the one that makes the greatest reduction in the error sum of squares. Equivalently, it is the variable which has the highest partial correlation with the dependent variable partialled on the variables added; and equivalently it is the variable which, if it were added, would have the highest F-value. In addition, variables can be forced into the regression equation by the user. Non-forced variables are automatically removed when their F-values become too low. Regression equations with or without the regression intercept may be selected.

Computation Procedure for Stepwise Regression

- I. Construct the correlation matrix from the raw data.
 - A. Calculate the corrected sum of squares and cross-product matrix. After the correction for the mean, we obtain $X_c'X_c$

- B. Using $X_c'X_c$, calculate the correlation coefficients making up the correlation matrix.
- C. Assemble the correlation coefficients into a matrix. There are k independent variables.
- D. Assign the correlation matrix, R .

Stepwise Procedure

The basic idea of the method is to perform a regression with several variables as a series of straight line regression equations (and to readjust the Tableau stage by stage through the process). At each stage, the appropriate entries in the Tableau provide regression coefficients and the entries for the analysis of variance table in coded units. Properly combined, the entries also provide F -values for two series of tests, one for the entry of a variable into a regression equation and one for the deletion of a variable from the regression equation. Although the appropriate F -distribution percentage points can be employed at each stage for the tests, it is simpler to choose fixed critical values that do not depend on the changing degrees of freedom. The critical F -value for entry chosen is numerically one which is greatest.

The selection of the variables included in the model used are based on: a) economic logic; b) highest multiple R^2 ; and c) highest F -value.

Linear programming transportation model will be used to determine the shipping rate and transportation costs involved in

coconut oil trade.

The study covers a 16-year time series of data. One difficulty in time series analysis is that data sets to be included must be uniform and complete. In the present study, some information for current years is not available so that figures for the most recent years could not be included.

Model for International Demand for Philippine Coconut Oil

The volume of demand for Philippine coconut oil exports is postulated to be a function of 1) lagged demand for coconut oil; 2) real income of importing countries, U.S.A. and Western Europe; 3) the price ratio of coconut oil, Philippines to soybean oil, U.S.A., cottonseed oil, U.S.A. and palm oil, Malaysia. The price ratio was obtained by dividing the deflated wholesale price of oil by the average price of these competing oils -- cottonseed oil, soybean oil and palm oil. 4) the inclusion of a dummy variable was used to reflect differences in the exchange rate between the Philippine peso and the U.S. dollar.

The price ratio was used to provide an alternative for specifying commodity interdependence. This was computed by dividing the price of coconut oil by its major competing oils - soybean oil, U.S.A. cottonseed oil, U.S.A. and palm oil, Malaysia.

Furthermore, quantity of coconut oil exported was lagged to account for changes in the demand from previous year. The logic behind a lagged variable was to account for oil stocks.

The real national income of U.S.A. and Western European countries were included since these are the major importing countries of Philippine coconut oil.

The demand equation is expressed as:

$$Qdco^{ph} = B_0 + LAGD_{cot-1} + INCOM_t + USA + W. Europe + RATIO_t + DUMMY + E_t$$

where:

- $Qdco^{ph}$ = total quantity of Philippine coconut oil exported to the U.S.A. and W. Europe (1000 metric tons)
- $LAGD_{cot-1}$ = lagged quantity of Philippine coconut oil exported to U.S.A. and W. Europe (1000 metric tons)
- $INCOM_t$ = real national income of U.S.A. and W. Europe (reported national income deflated by the purchasing power of the dollar in billion)
- $RATIO_t$ = ratio between the deflated wholesale price of coconut oil Philippines and the average deflated wholesale price cottonseed (U.S.A.), soybean, U.S.A. and palm oil, Malaysia.
- $DUMMY$ = dummy variable to account for foreign exchange rate with values of 1 for 1960 and 0 for all other years.
- t = time period

Definition of Variables

- a. $Qdco^{ph}$ = Total quantities of coconut oil exported to U.S.A. and W. Europe are assumed to be the total quantity demanded for a given period. The inclusion of U.S.A. and W. Europe is due to the fact that these countries are the major importing countries of Philippine coconut oil. Western Europe includes United Kingdom, Sweden, Spain, France, Portugal, Norway, Netherlands, Iceland, Denmark and Belgium.
- b. $LAGD_{cot-1}$ = the quantity of Philippine coconut oil exported to the U.S.A. and W. Europe was lagged to account for oil stocks.
- c. $INCOM_t$ = This variable is expressed in billion dollars and was taken from the U.N. FAO National Income Accounts. Income of the major importing countries, U.S.A. and W. Europe was deflated using the purchasing power of the dollar as the deflator.
- d. $RATIO_t$ = To minimize the difficulties and the extent of the work involved, simpler approaches are devised to provide useful alternative for specifying commodity interdependence within a commodity model. The incorporation of several price variables into a single demand relationship is an analytical approach which is followed most frequently. Normally, one or two prices may be entered to reflect interdependence with one or two commodities. If the intention is to measure the relative change in demand between commodities, the variable to be introduced would be a price ratio, containing the price of the commodity under consideration and the price of an alternative commodity.³⁷

³⁷Walter C. Labys, Dynamic Commodity Models: Specification, Estimation and Simulation.

Prices of major competing oils such as soybean oil, U.S.A., cottonseed U.S.A., and palm oil, Malaysia were compared to analyse the effect on the price of Philippine coconut oil. Since the United States is a major importer of Philippine coconut oil, inclusion of U.S. domestic oils like soybeans and cottonseed oil is in order. Malaysian palm oil is included since it is admitted duty-free into the United States and the price is generally lower than that of coconut oil.

Deflated prices were used in the analysis to reflect basic changes on coconut oil under the time period under study from 1960 to 1975. Thus, dollar values were expressed in terms of an "index or constant" prices. This was derived by dividing the wholesale price of the above-mentioned prices included in the model by the purchasing power of the dollar. For comparability, all monetary values were expressed in dollars.

- e. DUMMY = the dummy variable technique was used to separate information on certain variables into discrete categories by assuming "dummy" values of 0 or 1. A 1 was placed in year 1960 as foreign exchange rate started to have great influence during this year. It must be noted that the early 1960's was the period when the exchange rate of the peso vis-a-vis the U.S. dollar was altered. A 0 was then placed in all other years of the study period covered from 1961 to 1975.

Model for Supply of Philippine Coconut Oil Mainly for Export

The volume of supply of Philippine coconut oil exports is postulated to be a function of the copra produced at 65 per cent recovery rate (copra crushings), lagged copra export prices, lagged rainfall and time trend.

The supply equation is expressed as:

$$QS_{co}^{ph} = B_o + COPRA_{cr} + LAGEXP_{t-1} + LAGRAIN_{t-1} + TREND + E_t$$

where:

- QS_{co}^{ph} = quantity of coconut oil produced mainly for exports (1000 metric tons)
- $COPRA_{cr}$ = amount of copra produced assumed at 65 per cent recovery rate (1000 metric tons)
- $LAGEXP$ = copra export price (\$/long ton)
Indexes used = Purchasing power of the peso.
- $LAGRAIN$ = rainfall lagged by one-period (1000 mm)
- $TREND$ = trend index of copra crushed (1 to 1960, 2 for 1961, 3 for 1963 n).

Definition of Variables

- a. QS_{co}^{ph} = The supply model for exported coconut oil must make a distinction between country supply and country exports. These variables are usually linked through the identity that exports during the period equals production during that period minus consumption. However, in this study due to unavailability of data volume of supply means the total supply of coconut oil produced which refers to the summation of export shipments and domestic usage.

Since coconut oil is a derived commodity, its supply is reflected by the condition surrounding coconut production -- a perennial supply. Coconuts generally require 3 to 4 years before they begin to yield.³⁸

³⁸United Nations FAO. Coconut Industry in Asia.

The effective yield is reached after approximately 12 years, but the increase is not sufficiently dramatic to warrant a more complex yield pattern.³⁹

The volume of supply is determined by the following factors:

- a) Economics. This relates to the process of acquisition of inputs and selling products in the market. Nerlove provided a thorough explanation of investment factors and showed how variation in these factors over time can provide a distinction between short-run and long-run response in coconut production.⁴⁰
- b) Ecological. This includes climatic conditions such as rainfall, humidity or temperature. Some regions in the Philippines are subject more to typhoons than others.
- c) Institutional. This encompasses the restrictions on international trade and the nature of the commodity (raw or processed).
- d) Uncertainty. Expectations become even more important for tree crops which require several years to come into production than for annual crops.

³⁹George L. Hicks. The Philippine Coconut Industry: Growth and Change, 1900-1965. Centre for Development Planning, No. 17 (June 1967).

⁴⁰M. Nerlove. "Distributed Lags and Demand Analysis. Agricultural Handbook No. 141 (Economic Research Service, U.S. Department of Agriculture, Washington, D.C., 1958.

- b. $COPRA_{cr}$ = The quantity of coconut oil produced is dependent upon the total quantity of copra crushed (desiccated coconut) which is assumed to be at 65 per cent recovery rate.
- The amount of coconut produced and the kind of technology used is an important factor in determining the amount of copra produced. However, technological innovation can not be quantified. Copra is milled into coconut oil by two kinds of processes: 1) expeller type, and 2) solvent extraction.
- The expeller type leaves 5 per cent oil that can be recovered from the copra cake while less than 1 per cent from solvent extraction.⁴¹
- c. $LAGEXP_{t-1}$ = Deflated export price of copra lagged 1 period is an important variable since price expectations of the processors come into the picture. If lagged export price of copra is less than the equivalent export price of coconut oil, then processors will want to produce more oil.
- d. $LAGRAIN_{t-1}$ = Climatic factors that influence coconut production include rainfall and humidity. Abeywardena notes that the harvest of coconuts for a year is influenced by the rainfall for the previous year.⁴²
- e. TREND = The trend index reflects technological advances and other development which have taken place through time, including the biological growth of coconut trees.

⁴¹United Nations, Coconut Industry in Asia.

⁴²V. Abeywardena, "Forecasting Coconut Crops Using Rainfall Data." A Preliminary Study, Ceylon Coconuts Quarterly (Vol. 19, 1968), pp. 161-176.

Linear Programming Transportation Model

Another important factor to be considered in international trade is ocean transport cost for the commodities.

Freight rates are high for coconut products carried on the ships of established shipping lines from the Association of Southeast Asian Countries (ASEAN) to the industrialized countries, thus unduly raising the cost to purchasers. This may be due to factors such as demand for cargoes loaded in the ship, distance covered and short-run adjustments influencing the supply and demand for shipping.

In further study by the author, a linear programming transportation model will be used. This model involves the distribution of a homogenous product (coconut oil) from the major exporting countries (Philippines, Malaysia, and Indonesia) in known amounts to its destinations (major importing countries, U.S.A. and Western European countries), where $d = j=1, 2, \dots, n$ in a manner which minimizes total transportation costs. The appropriate transfer costs reflect the total costs of moving a unit of coconut oil from the exporting country's port to the importing country's port. In addition to ocean freight rates, other transportation charges such as insurance and handling cost must also be included.

Algebraically, the model is:

Minimize cost:

$$C = \sum_{i=1}^m \sum_{j=1}^n C_{ij} X_{ij}$$

Subject to:

$$1) \sum_{j=1}^n X_{ij} = a_i \quad (i=1, 2, \dots, m)$$

$$2) \sum_{i=1}^m X_{ij} = b_j \quad (j=1, 2, \dots, n)$$

$$3) \sum_{i=1}^m a_i = \sum_{j=1}^n b_j$$

where X_{ij} is the amount shipped from origin i to destination j , C_{ij} is the unit cost of shipping the commodity between i and j , and z is the total cost. In the model, the only unknown is matrix x whose elements X_{ij} represent quantities of the commodity shipped from i to j . (If the ocean freight rates for all European countries cannot be obtained, the transportation model will be solved by manual calculations).

The further study will attempt to evaluate the major areas in which minimum total cost could be derived throughout the region (SouthEast Asia) where a pooling system is best attainable. Such quantitative analyses would be useful in appraising the present agricultural policies for both the Philippines and the importing countries.

The ocean freight rates will be based on data to be gathered from the foreign embassies in Manila, the shipping companies, the Maritime, Inc. and other agencies.

CHAPTER VI

RESULTS AND DISCUSSION

Demand Function for Coconut Oil Exports

The preliminary estimates of the demand function are presented in Table 7, page 65 . The results of the preliminary statistical estimation for the volume of demand for Philippine coconut oil is:

$$Qd_{co}^{ph} = B_0 + LAGD_{t-1} + INCOM_t^{U.S.A. + W. Europe} + RATIO_t + DUMMY + E_t$$

(For variable notations, see page).

The resulting equation of all variables are chosen is:

$$Y_t = 128.988 + 0.4167 \underset{(0.2505)}{LAGD_{t-1}} + 0.1001 \underset{(0.0414)}{INCOM_t} - 50.6032 \underset{(37.5623)}{RATIO} - 71.7658 \underset{(71.3662)}{DUMMY}$$

$$R^2 = .9349$$

$$S^2 = 61.7378$$

The estimates of the structural parameters show the correct signs -- the signs are consistent with postulated expectations and economic theory. Lagged exports show a relatively high positive sign. Income index variable responded positively to demand by importing countries. The coefficient for the cross price ratio is negative as one would expect. The RATIO (price of coconut oil vs. price of cottonseed and soybean oil, U.S.A. and palm oil, Malaysia)

coefficients implied a demand elasticity with respect to the price ratio computed at their means. The dummy variable showed a negative sign.

The demand for Philippine coconut oil exports was inelastic with respect to income of importing countries. The elasticity coefficients is .385. This implies that coconut oil consumption is less than proportionately responsive to changes in real national income of importing countries.

The resulting equation implies that holding all other variables constant (real national income of importing countries, price ratio of coconut oil vs. cottonseed oil, soybean oil and palm oil, and the dummy variable), an increase in previous year's volume of demand (lagged demand) for coconut oil by one thousand metric tons will increase the volume of demand for coconut oil in the current year by 416.7 metric tons.

Then, too, holding all other variables constant, lagged demand, price ratio, and dummy variable, an increase in income by importing countries (U.S.A. and Western Europe) by one billion dollars will increase coconut oil demanded by 100 metric tons.

Furthermore, holding all other variables constant, the price ratio (deflated wholesale price of major competing oils-soybean oil, U.S.A., cottonseed oil, U.S.A. and palm oil, Malaysia) resulted in

a negative sign. This implies that an increase in the price of coconut oil relative to the price of competing oils (an increase in the price ratio) will result in a decrease in the volume of coconut oil demanded by importing countries.

As stated previously, the inclusion of dummy variable was used to determine the effect of foreign exchange rate. The devaluation thus, resulted in a decline in the demand for Philippine coconut oil by importing countries.

A detailed analysis, however, showed that lagged quantity demanded is the most important variable in the model since it is highly correlated to coconut oil consumption.⁴³ The correlation matrix (Table 7 page 65) showed that LAGDEM (lagged demand) is highly correlated to the dependent variable with a coefficient of 0.885.

Then, too, INCOMI (income index) of importing countries is also positively correlated to the demand for Philippine coconut oil with a coefficient of 0.881. Also, income index is also highly correlated with LAGDEM (lagged demand) with a coefficient of 0.851.

⁴³Based on the results of the Stepwise regression model, Step No. 2 was selected as the best subset model. This is so because as Step 3 and 4 are regressed, the inclusion of variables RATIO and DUMMY does not give a significant increase in R^2 . It should be pointed out at the outset that the other variables are as significant. However, variables lagged demand and income index in Step 2 provide statistically the "best fit equation."

The variable RATIO is negatively correlated to DEMAND, LAGDEM and INCOMI with coefficients - 0.372, - 0.262 and - 0.230, respectively. Also the dummy variable showed negative signs but showed positive correlation with price ratio.

The PALMO (palm oil Malaysia prices) was positively correlated and this means that palm oil, Malaysia is highly substitutable to coconut oil, Philippines. However, the coefficients did not show high correlation coefficients.

Thus, the stepwise regression model includes variables which are highly correlated to the dependent variable. The final model chosen is:

$$D_{co}^{ph} = 37.4392 + 0.55358 \text{ LAGDEM}_{t-1} + 0.0923 \text{ INCOMI}$$

(0.23574) (0.04173)

Supply Function for Coconut Oil Export

The preliminary estimates of the supply function are presented in Table 8, page 66. It is postulated that supply of coconut oil mainly for exports is dependent upon total domestic copra crushings (assumed at 65 per cent recovery rate), deflated copra export price lagged 1 period, lagged rainfall, and trend in domestic copra crushings.

The resulting equation thus is:

$$Q_{sco}^{ph} = -362.0752 + 0.314 \text{ COPRA} + 1.4038 \text{ LAGEXP}_{t-1}$$

(0.1707) (0.4845)

$$+ 1.1099 \text{ LAGRAIN} + 0.5060 \text{ TREND}$$

(0.4248) (7.1464)

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PROBLEM CODE          DEMAND
NUMBER OF CASES       16
NUMBER OF ORIGINAL VARIABLES  6
NUMBER OF VARIABLES ADDED  0
TOTAL NUMBER OF VARIABLES  6
NUMBER OF SUB-PROBLEMS  1
THE VARIABLE FORMAT IS (F4.1,F4.1,F5.1,F4.3,F3.0,F1.0,F2.0)

```

```

VARIABLE      MEAN      STANDARD DEVIATION
DEMAND 1      287.47485    148.95561
LACCEM 2      252.17488    132.24329
INCCM 3      1196.68018    747.07583
RATIC 4        1.22212      0.43996
PALMC 5      286.25300     72.45546
GUPMY 6         0.06250      0.25000

```

COVARIANCE MATRIX

```

VARIABLE      1      2      3      4      5      6
NUMBER
1  22187.773  17433.207  58006.750  -24.353  2324.224  -15.185
2      17488.285  84026.625  -15.251  3046.116  -13.472
3      558128.125  -75.584  26306.820  -46.319
4          0.194      5.901      0.009
5      5249.753  -0.350
6          0.062

```

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4	5	6
1	1.000	0.885	0.881	-0.372	0.215	-0.408
2		1.000	0.851	-0.262	0.318	-0.407
3			1.000	-0.230	0.486	-0.248
4				1.000	0.185	0.081
5					1.000	-0.019
6						1.000

SLS-PROBLEM 1

DEPENDENT VARIABLE

1

MAXIMUM NUMBER OF STEPS

12

F-LEVEL FOR INCLUSION

0.010000

F-LEVEL FOR DELETION

0.005000

TOLERANCE LEVEL

0.001000

STEP NUMBER 1

VARIABLE ENTERED 2

MULTIPLE R

0.8850

STD. ERROR OF EST.

71.7844

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESS ON	1	260674.500	260674.500	50.567
RESIDUAL	14	72142.063	5153.004	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE		VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
(CONSTANT	36.09425)							
LAGDEM 2	0.95685	0.14016	50.5869 (2)		INCCM 3	0.52273	0.2766	4.8879 (2)
					RATIO 4	-0.31076	0.9313	1.3896 (2)
					PALPG 5	-0.14951	0.8989	0.2972 (1)
					OLMPY 6	-0.11089	0.8340	0.1619 (2)

STEP NUMBER 2

VARIABLE ENTERED 3

MULTIPLE R

0.9179

STD. ERROR OF EST.

63.5061

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	2	280387.313	140193.625	34.761
RESIDUAL	13	52429.250	4033.019	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE		VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
(CONSTANT	37.47392)							
LAGDEM 2	0.55358	0.23574	5.5142 (2)		RATIO 4	-0.35638	0.9311	1.7425 (2)
INCCM 3	0.09226	0.04173	4.8879 (2)		PALPG 5	-0.48852	0.7309	3.7615 (1)
					OLMPY 6	-0.26147	0.7988	0.8806 (2)

STEP NUMBER 3
VARIABLE ENTERED 4

MULTIPLE R 0.9287
STD. ERROR OF EST. 61.7667

ANALYSIS OF VARIANCE				
	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	3	287035.000	95678.313	25.079
RESIDUAL	12	45781.516	3815.126	

VARIABLES IN EQUATION				VARIABLES NOT IN EQUATION			
VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE	VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
(CONSTANT)	102.57118						
LAGDEM 2	0.51389	0.23125	4.5384 (2)	PALPC 5	-0.42009	0.6503	2.3572 (1)
INCCMI 3	0.09152	0.04059	5.0834 (2)	DUMPY 6	-0.29016	0.7983	1.0112 (2)
RATIC 4	-49.58842	37.56630	1.7425 (2)				

STEP NUMBER 4
VARIABLE ENTERED 6

MULTIPLE R 0.9349
STD. ERROR OF EST. 61.7378

ANALYSIS OF VARIANCE				
	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	4	290889.375	72722.313	19.079
RESIDUAL	11	41927.145	3811.559	

VARIABLES IN EQUATION				VARIABLES NOT IN EQUATION			
VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE	VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
(CONSTANT)	128.59853						
LAGDEM 2	0.41668	0.25054	2.7661 (2)	PALPO 5	-0.42271	0.6483	2.1756 (1)
INCCMI 3	0.10006	0.04145	5.8269 (2)				
RATIC 4	-50.60316	37.56227	1.6149 (2)				
DUMPY 6	-71.76582	71.36615	1.0112 (2)				

F-LEVEL OR TOLERANCE INSUFFICIENT FOR FURTHER COMPUTATION

SUMMARY TABLE

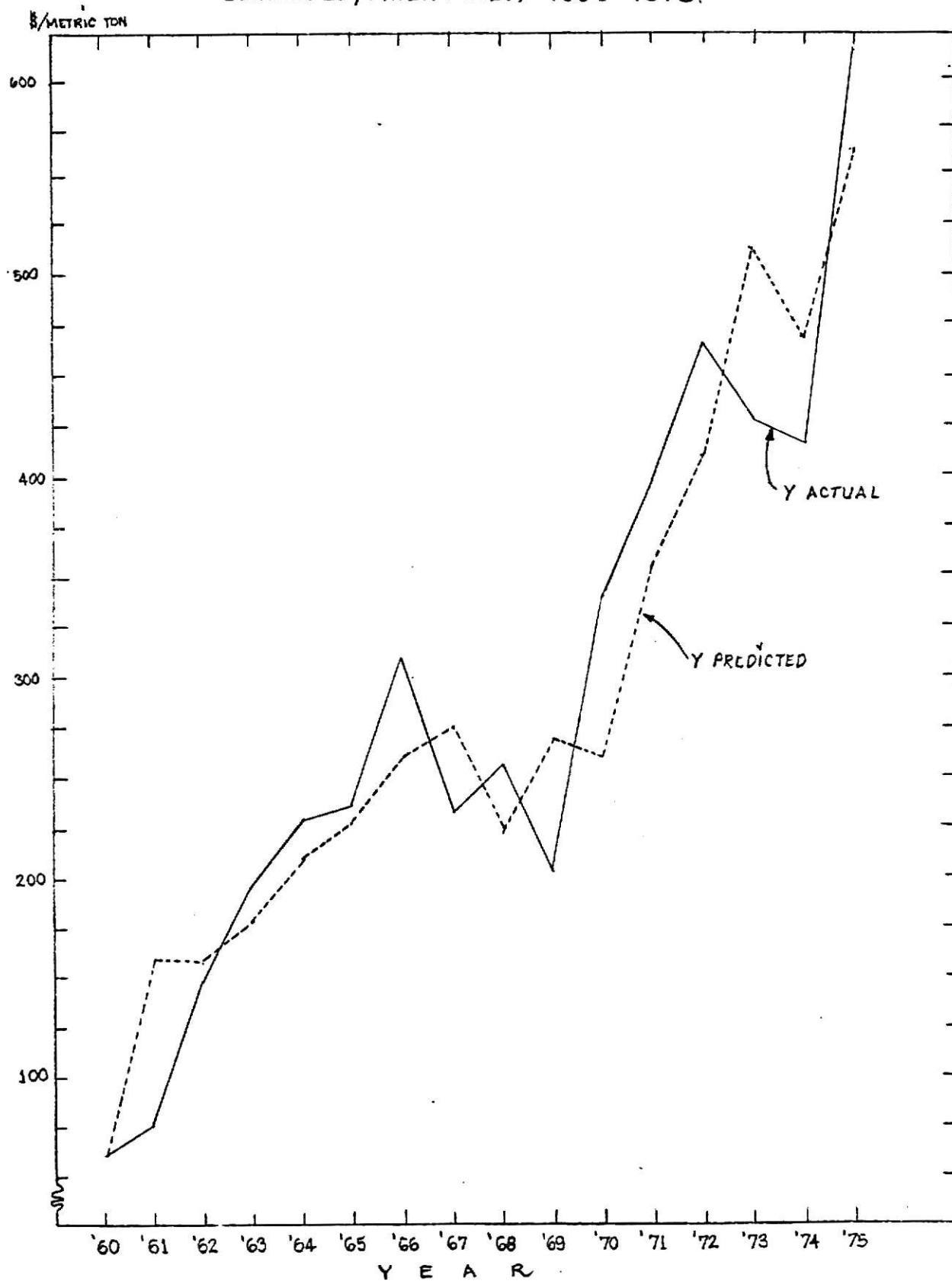
STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	MULTIPLE RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	LAGDEM 2		0.8850	0.7832	0.7832	50.5869	1
2	INCCMI 3		0.9175	0.8425	0.0592	4.8879	2
3	RATIC 4		0.9287	0.8624	0.0200	1.7425	3
4	DUMPY 6		0.9349	0.8740	0.0116	1.0112	4

LIST OF RESIDUALS

CASE NUMBER	Y X(1)	Y COMPUTED	RESIDUAL	X(2)	X(3)	X(4)	X(4)
1	59.7000	59.6558	0.0002	50.1000	501.8999	1.3560	1.0000
2	74.4000	160.9413	-86.5413	59.7000	553.2000	0.9540	0.0
3	147.6000	158.9157	-11.3157	74.4000	565.2998	1.1390	0.0
4	155.3000	179.9872	15.3128	147.6000	607.0999	1.4080	0.0
5	279.4000	210.5852	18.8148	195.3000	717.7958	1.4150	0.0
6	235.8000	228.2268	7.5732	225.4000	751.5999	1.4140	0.0
7	309.5999	260.3604	49.2395	235.8000	834.8999	0.5960	0.0
8	230.3000	275.5530	-45.2530	309.5999	876.5000	1.3820	0.0
9	255.6000	223.2560	32.3440	230.3000	956.0999	1.9240	0.0
10	202.4000	268.2561	-65.8561	255.6000	1073.2998	1.4740	0.0
11	338.7998	261.8430	76.9568	202.4000	1146.3999	1.3080	0.0
12	397.3999	356.6804	40.7195	338.7998	1358.7958	0.9770	0.0
13	465.7998	410.1709	55.6289	397.3999	1574.3000	0.8280	0.0
14	427.3999	514.0461	-86.6462	465.7998	2062.2558	0.3040	0.0
15	415.7000	465.1755	-53.4756	427.3999	2649.2000	2.0350	0.0
16	614.3999	561.8272	52.5727	415.7000	2918.5000	0.6400	0.0

FINISH CARD ENCOUNTERED
PROGRAM TERMINATED

FIG. 6. ACTUAL AND PREDICTED VALUES OF COCONUT OIL
DEMANDED, PHILIPPINES, 1960-1975.



$$R^2 = .96$$

$$S^2 = 40.32$$

All variables included in the equation are significant. All the signs of the coefficients as noted coincide with a priori reasoning.

If all other variables in the model (lagged copra export price, lagged one-period rainfall and time trend) are held constant, a thousand metric ton increase in domestic crushings increases supply of coconut oil by 314 metric tons.

Again, holding all the other variables constant, an increase in lagged one-period real export price by one thousand pesos increases supply of coconut oil by 1,404 metric tons. Thus, the farmers and/or processors expectations about prices play a big role in determining how much copra will be crushed into oil. This indicates that past prices have a great bearing on expected prices and that high post prices will induce greater copra crushings. Generally, coconut oil commands a higher price than copra.

Furthermore, if all other variables are held constant, an increase by 1,000 mm. of rainfall in the primary coconut-producing provinces in the Philippines will increase coconut oil supplied for exports by 1.1099 thousand metric tons.

Finally, an increase in the trend of copra crushings by thousand metric tons will increase coconut oil supply by .5060 thousand metric tons.

BYOC2R - STEPWISE REGRESSION - REVISED JULY 17, 1970
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE SUPPLY
NUMBER OF CASES 16
NUMBER OF ORIGINAL VARIABLES 5
NUMBER OF VARIABLES ADDED 0
TOTAL NUMBER OF VARIABLES 5
NUMBER OF SUB-PROBLEMS 1
THE VARIABLE FORMAT IS (F3.0,F4.0,F5.2,F3.0,F2.0)

VARIABLE	MEAN	STANDARD DEVIATION
SUPPLY 1	387.00000	122.77835
COFRA 2	581.25000	129.69263
DEFEXP 3	126.27428	49.86205
LAGRAI 4	233.31250	26.87527
TREND 5	8.50000	4.76095

COVARIANCE MATRIX

VARIABLE NUMBER	1	2	3	4	5
1	15074.523	13574.047	5406.168	1583.532	527.933
2		16820.176	4774.949	1178.448	541.533
3			2486.223	276.920	211.787
4				722.455	44.033
5					22.667

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4	5
1	1.000	0.852	0.883	0.480	0.903
2		1.000	0.738	0.338	0.877
3			1.000	0.207	0.852
4				1.000	0.344
5					1.000

SUB-PROBLEM 1
 DEPENDENT VARIABLE 1
 MAXIMUM NUMBER OF STEPS 10
 F-LEVEL FOR INCLUSION 0.010000
 F-LEVEL FOR DELETION 0.005000
 TOLERANCE LEVEL 0.001000

STEP NUMBER 1
 VARIABLE ENTERED 5

MULTIPLE R 0.9032
 STD. ERROR OF EST. 54.5559

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	1	184442.750	184442.750	61.560
RESIDUAL	14	41674.941	2976.781	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	189.02495		
TREND 5	23.29118	2.95893	61.5605 (2)

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
GCPFA 2	0.29254	0.2308	1.2175 (2)
DEFEXP 3	0.39872	0.2041	2.4574 (2)
LAGRAI 4	0.41942	0.8816	2.7750 (2)

STEP NUMBER 2
 VARIABLE ENTERED 4

MULTIPLE R 0.9269
 STD. ERROR OF EST. 51.3588

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	2	191773.813	95886.875	36.295
RESIDUAL	13	34343.926	2641.840	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	-0.88228		
LAGRAI 4	0.87596	0.52584	2.7750 (2)
TREND 5	21.58951	2.96877	52.8849 (2)

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
GCPFA 2	0.28614	0.2293	1.0701 (2)
DEFEXP 3	0.56456	0.1927	5.6142 (2)

STEP NUMBER 3

VARIABLE ENTERED 3

MULTIPLE R 0.9469
STD. ERROR OF EST. 44.1564

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	3	202720.313	67573.438	34.657
RESIDUAL	12	23397.418	1949.785	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	-115.22746		
DEFEXP 3	1.23434	0.52095	5.6142 (2)
LAGRA1 4	1.13662	0.46495	5.5761 (2)
TREND 5	9.54997	5.68536	2.8216 (2)

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
COPRA 2	0.48544	0.2210	3.3914 (2)

STEP NUMBER 4

VARIABLE ENTERED 2

MULTIPLE R 0.9556
STD. ERROR OF EST. 40.3212

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	4	208233.938	52058.484	32.020
RESIDUAL	11	17883.758	1625.796	

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	-362.07520		
COPRA 2	0.31443	0.17074	3.3914 (2)
DEFEXP 3	1.40384	0.48452	8.2948 (2)
LAGRA1 4	1.10999	0.42481	6.8273 (2)
TREND 5	0.50600	7.14636	0.0050 (2)

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
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F-LEVEL OR TOLERANCE INSUFFICIENT FOR FURTHER COMPUTATION

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	REMOVED	MULTIPLE R	RSD	INCREASE IN RSD	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	TREND	5	0.9032	0.8157	0.8157	61.9605	1
2	LAGRAI	4	0.9205	0.8481	0.0324	2.7750	2
3	DEFEXP	3	0.9465	0.8965	0.0484	5.6142	3
4	COPRA	2	0.9596	0.9209	0.0244	3.3914	4

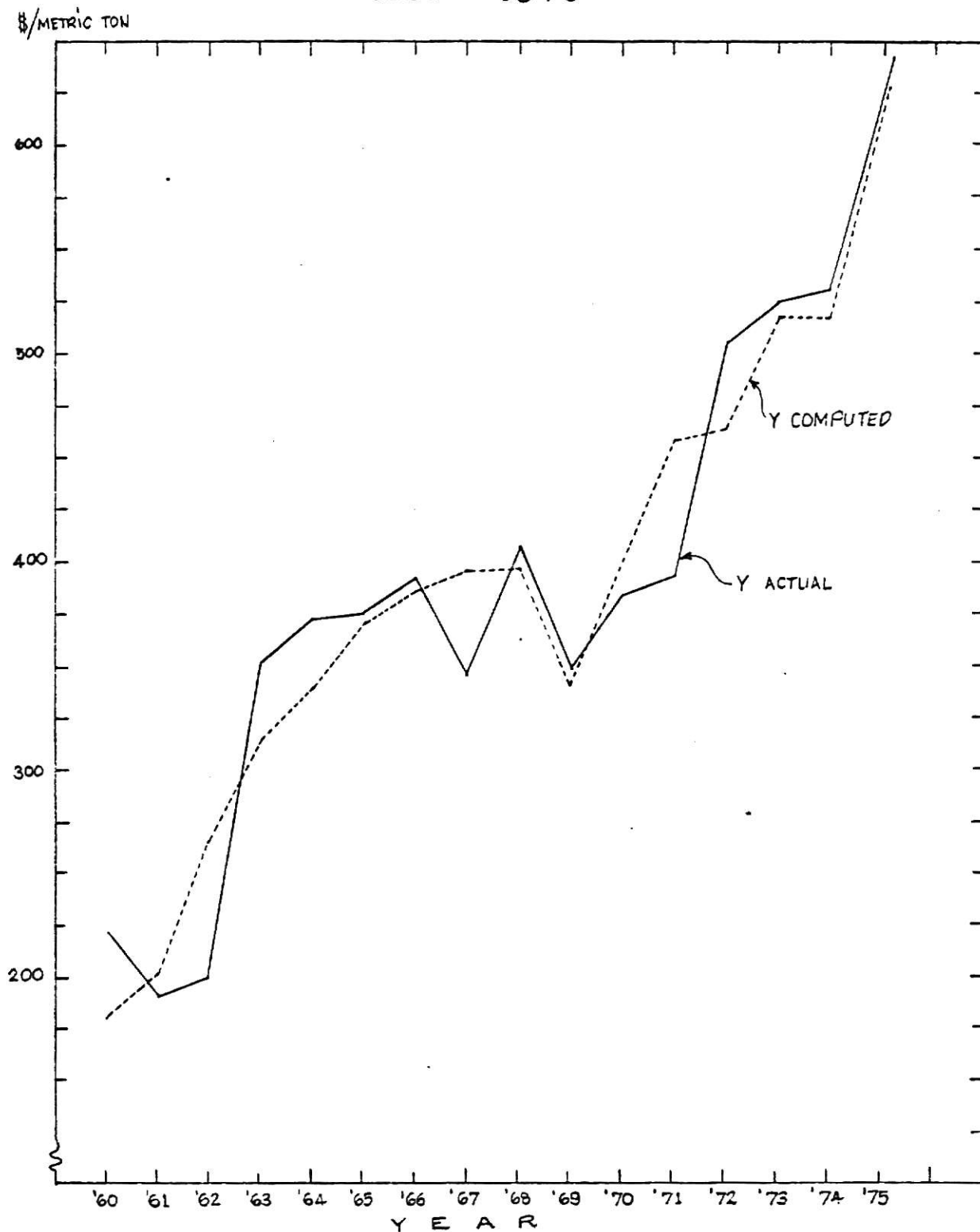
LIST OF RESIDUALS

CASE NUMBER	Y X(1)	Y COMPUTED	RESIDUAL	X(5)	X(4)	X(3)	X(2)
1	221.0000	185.2017	35.7983	1.0000	210.0000	66.8800	699.0000
2	190.0000	201.0193	-11.0193	2.0000	223.0000	68.1800	696.0000
3	200.0000	268.8328	-68.8328	3.0000	223.0000	74.6900	881.0000
4	157.0000	314.3525	-157.3525	4.0000	221.0000	88.8100	968.0000
5	374.0000	339.6991	34.3009	5.0000	229.0000	100.2400	966.0000
6	376.0000	370.3056	6.6944	6.0000	240.0000	115.4100	957.0000
7	394.0000	386.3538	7.6462	7.0000	264.0000	105.7300	965.0000
8	345.0000	395.3228	-50.3228	8.0000	239.0000	112.0400	1052.0000
9	467.0000	397.6252	69.3748	9.0000	226.0000	134.8300	1032.0000
10	344.0000	340.3147	3.6853	10.0000	197.0000	120.3500	985.0000
11	385.0000	396.3525	-11.3525	11.0000	190.0000	145.0600	1076.0000
12	394.0000	458.6018	-64.6018	12.0000	252.0000	151.8900	1023.0000
13	507.0000	465.0417	41.9583	13.0000	271.0000	122.2800	1107.0000
14	526.0000	517.5127	-91.5127	14.0000	283.0000	150.4800	1104.0000
15	531.0000	517.1050	13.8950	15.0000	206.0000	210.0400	1107.0000
16	642.0000	638.9536	3.0464	16.0000	259.0000	253.4500	1112.0000

FINISH CARD ENCOUNTERED
PROGRAM TERMINATED

FIG. 7. ACTUAL AND COMPUTED Y VALUES OF COCONUT OIL
AVAILABLE FOR EXPORTS (SUPPLY), PHILIPPINES
1960 - 1975

75



The equation line has a good fit in that we obtain an R^2 of about .96. The regression explains 96 per cent of the variation in the dependent variable, as shown by the regression line.⁴⁴ However, R^2 value is not always an indication of a good predictability.

The correlation matrix of Table 8 of the Stepwise Regression supply analysis showed that TREND is very highly correlated to supply of Philippine coconut oil mainly for exports with a high coefficient of 0.903. Also, the lagged deflated export price of coconut oil showed a highly positive correlation at 0.883 and total copra produced at 0.852.

It should be noted however that TREND is highly correlated to variables SUPPLY, COPRA and DEF EXP (deflated export price).

The predicted values on Fig. 7 are almost a duplication of the actual line. Although they do not coincide on all points, their trend is the same. A slight variation between the predicted value and the actual line is brought about by the unexplained variation included in the error term.

⁴⁴Following the guidelines of the Stepwise Regression Model, Step No. 3, Table 8, page 3 is considered the best fit statistically. However, the remaining variable COPRA, is statistically significant in the final equation.

Chapter VII

SUMMARY AND CONCLUSIONS

The prospects for Philippine coconut oil appears somewhat bleak and uncertain. It appears that the country will face increasing difficulties in maintaining a reasonable rate of growth in exports of coconut oil mainly because of increased supplies of competing fats and oils and synthetics.

The results of the study show that the demand for coconut oil in major importing countries is income inelastic. This indicates that the volume of demand for coconut oil is relatively insensitive to increases in income of the major coconut-oil importing countries.

At present, the Philippine government discourages the export of copra in favor of coconut oil. In contrast, the current tariff regulations of U.S.A. and Western European countries still favor imports of copra. However, these regulations may be changed, at least in the U.S.A.

According to a recent U.S. Tariff Commission report, the U.S.A. may be better off to import coconut oil instead of copra because the time element involved in shipping reduces the recovery rate of copra into oil. One of the three U.S. producers has recently withdrawn from the manufacture of coconut oil and the

other two may do so before 1980, with or without preferential exemption from duty afforded to imports from the LDC's.

The Philippines must enact measures to make coconut oil more competitive in the world market. Efforts to bring tariff patterns of the importing countries in line with their own best interests and that of the Philippine coconut industry would be most helpful.

Policy Implications

It is suggested that if the Philippines wishes to maintain its current share of the world's fats and oils market, an efficiently produced and stable supply of coconut oil is imperative. This will require improved technology, infrastructure development and production credit programs for farmers. Moreover, standardization and quality control of coconut oil must be considered to meet world market specifications.

The coconut oil millers in the country might consider a co-operative venture for marketing "via a pooling system". The Philippine Oil Millers Association in collaboration with the Philippine Coconut Authority (PCA) might take steps to develop improved markets and to negotiate sales of Philippine coconut oil. A Marketing Board might be created by the government to collaborate with the Export Council in market development activities abroad.

However, it is suggested that a thorough study is needed first to examine the consequences of alternatives and formulate specific recommendations for needed programs.

More rapid vertical integration within the industry must be initiated to maximize returns from production of coconut oil and help bring about long-term stability in the industry. In this regard, it is necessary to intensify efforts into end-use research and continuously improve the quality of oil.

The government will play a major role in formulating the appropriate policies for over-all development of the coconut oil industry. However, the private sector must also coordinate with the objectives of the government to assure success.

The Philippines must look for new international markets such as the People's Republic of China or the USSR. Regional cooperation among Southeast Asian nations (major coconut oil exporting countries) can help strengthen their bargaining power and help to bring about reduced trade impediments in importing countries. Tariff imposition means a higher price paid by importing countries and a lower price received by exporting countries. Furthermore, tariff imposition on coconut oil will bring about a decrease in copra processing in the Philippines. A reduction in tariffs will have beneficial effects on the Philippine coconut oil industry.

Ocean freight constitutes the bulk of charges for transporting coconut oil into importing countries. A feasibility study should be made to measure the potential benefit of regional cooperation in shipping coconut oil by several Southeast Asian coconut exporting countries. Linear programming analyses can be formulated to address this question effectively.

Comments for Further Research

More detailed information on trade barriers is needed. Greater consideration should be given to the impact of domestic and foreign policy instruments upon world demand and supply relationships. More detailed studies to measure demand and supply coefficients is recommended. The treat of petro-chemical products as substitutes for coconut oil should be studied.

Finally, the world demand model for coconut oil needs to be segmentized into demand for food and demand for industrial purposes. The markets for the two users are distinct and the market interdependencies with competing products are quite different. The industrial market currently takes the larger percentage of coconut oil, and is more subject to intrusion by competitive products such as palm oil and synthetic products from the petro-chemical industry.

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Appendix 1. Foreign Trade of the Philippine: 1960-1975
(F.O.B. Value in Million U.S. dollards)

Year	Exports	Imports	Balance of Trade Favorable (+) Unfavorable (-)
1960	535.44	624.52	- 89.08
1961	540.75	622.17	- 81.42
1962	580.28	590.23	- 9.95
1963	770.57	645.36	+125.21
1964	779.38	802.04	- 22.66
1965	795.74	835.25	- 39.51
1966	877.41	873.61	+ 3.80
1967	891.50	1,060.95	-169.45
1968	962.11	1,195.14	-233.03
1969	983.17	1,181.78	-198.61
1970	1,142.19	1,159.30	- 17.11
1971	1,189.25	1,260.83	- 71.58
1972	1,168.43	1,333.60	-165.17
1973	1,837.19	1,596.62	+240.57
1974	2,294.47	3,143.26	-418.27
1975	2,573.68	3,459.18	-1,164.71

Source: National Census and Statistics Office (NCSO), 1975.
Foreign Trade Statistics of the Philippines, p. 1.

Appendix 2. Total Production, Area and Yield of Coconut and
Percent Growth Rates, Philippines, 1954 - 1976

Year	Production ('000 kilos)	% Change	Area ('000 ha.)	% Change	Yield ('000 kilos)	% Change
1954	4,603.0	-	990.0	-	4,649	-
1955	5,321.5	13.50	990.0	-	5,375	13.57
1956	5,504.1	3.32	992.0	0.20	5,548	3.12
1957	5,951.0	7.51	992.0	-	5,999	7.52
1958	5,973.6	.37	995.6	0.36	6,000	.02
1959	6,041.4	1.12	1,006.1	1.05	6,005	.08
1960	6,015.9	-.42	1,059.4	5.30	5,679	-5.74
1961	6,194.7	2.89	1,199.9	13.26	5,163	-9.99
1962	7,395.6	16.24	1,283.7	6.98	5,761	10.38
1963	7,704.4	4.01	1,392.3	8.46	5,534	-4.10
1964	7,222.2	-6.68	1,482.9	6.51	4,870	-13.63
1965	7,051.9	-2.41	1,604.7	8.21	4,394	-10.83
1966	7,089.9	.54	1,610.9	0.39	4,401	.16
1967	7,925.2	10.54	1,820.2	14.23	4,354	-10.79
1968	7,412.5	-6.92	1,800.4	-2.16	4,117	-5.76
1969	7,244.1	-2.32	1,845.5	2.50	3,925	-4.89
1970	7,745.0	6.47	1,883.9	2.09	4,111	4.52
1971	7,814.0	.89	2,048.5	8.74	3,814	-7.79
1972	8,424.4	7.24	2,125.5	3.76	3,963	3.76
1973	8,310.9	-1.36	2,133.3	0.37	3,896	-1.72
1974	8,376.3	.78	2,206.0	3.30	3,797	-2.61
1975	9,368.0	10.59	2,279.5	3.22	4,110	7.62
1976	10,662.4	12.14	2,521.2	9.59	4,229	2.87

Source: Bureau of Agricultural Economics

Appendix 3. Quantity and Value of Coconut Oil Exported to USA and Other Countries, 1955 - 1976
(qty. in '000 metric tons; value in M US\$)

Year	Total Production	Total Amount		Amount Exported to				% to Total	
		Quantity	Value	Quantity	Value	USA	Other Countries	Export Proceeds	Value
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1955	152.0	74.2	16.5	69.9	15.6	4.3	0.9	5.7	4.1
1956	203.0	108.9	24.0	89.5	20.0	19.4	4.0	3.2	5.3
1957	334.0	97.6	21.4	86.2	19.0	11.4	2.4	7.3	5.0
1958	229.0	87.0	24.1	82.2	23.2	4.8	0.9	7.3	4.9
1959	189.0	64.6	22.5	58.6	20.2	6.0	2.2	6.6	4.2
1960	221.0	59.7	15.7	59.6	15.6	0.1	a/	3.7	2.8
1961	190.0	74.4	15.9	74.3	15.8	0.1	0.1	4.4	3.2
1962	200.0	147.6	31.6	142.8	30.6	4.8	1.0	7.9	5.7
1963	352.4	195.3	46.7	168.5	40.3	26.9	6.4	12.7	6.4
1964	373.8	229.4	60.0	183.6	48.0	45.8	12.2	18.7	8.1
1965	376.2	235.8	68.1	188.2	54.3	47.6	13.8	19.6	8.9
1966	394.4	309.6	74.5	241.2	58.1	68.5	16.4	22.7	9.0
1967	345.5	230.3	59.3	200.4	51.9	29.9	7.3	19.4	7.2
1968	406.7	255.6	77.3	223.8	68.4	31.9	8.9	25.5	9.0
1969	347.5	202.5	50.6	178.3	44.7	22.1	5.8	18.3	5.9
1970	474.9	338.9	95.6	290.4	83.7	48.5	12.0	30.5	9.0
1971	536.0	397.4	103.4	292.8	76.8	104.6	26.6	20.7	9.1
1972	598.2	465.8	84.3	226.3	60.8	129.5	23.5	22.2	7.6
1973	526.0	428.6	151.9	271.7	98.4	155.6	52.7	23.3	8.3
1974	531.0	433.3	400.9	298.2	273.6	117.6	107.1	17.2	15.9
1975	608.0	591.6	226.4	473.8	175.6	140.6	54.7	25.8	9.9
1976	642.0	450.4	136.5	556.4	194.3	306.1	104.4	17.5	5.3

a/ Less than 0.1 million dollar

Source: Central Bank Statistical Bulletin

Appendix 4. Coconut Oil: Exports by Principal Exporting Countries, Annual 1967 - 1973
(1000 metric tons)

Continent and Country	1967	1968	1969	1970	1971	1972 ^{1/}	1973 ^{1/}
<u>Asia:</u>							
Philippines - registered	234	270	213	337	409	467	426
unregistered ^{2/}	0	1	0	0	0	0	0
Indonesia - registered	2	17	4	3	4	34	17
unregistered ^{2/}	3	1	0	0	0	0	0
Malaysia ^{3/}	29	38	27	43	37	21	25
Sarawak ^{3/}	3	4	4	4	4	3	3
Subtotal Malaysia	32	42	31	47	41	24	28
Singapore ^{3/ 4/}	12	39	22	24	9	15	5
Sri Lanka	68	64	56	56	71	87	18
Total Asia	351	434	326	467	534	627	494

^{1/} Preliminary; partly estimated

^{2/} Excess of imported from the Philippines and Indonesia over recorded exports after allowances were made afloat and for diversion enroute

^{3/} Net exports

^{4/} Believed to include a substantial volume of unregistered imports from Indonesia

Appendix 4 — Continued

Continent and Country	1967	1968	1969	1970	1971	1972 ^{1/}	1973 ^{1/}
<u>Oceania:</u>							
French Pacific Islands . . .	0	7	11	11	8	11	11
Fiji	14	17	17	19	17	15	18
New Guinea	24	23	21	21	27	27	28
Total Oceania	38	47	49	51	52	53	57
<u>Africa:</u>							
Mozambique	9	8	8	7	7	6	10
Tanzania	3	2	3	7	5	3	1
Total Africa	12	10	11	14	12	9	11
Other	0	0	1	0	2	3	0
Total	401	491	387	532	600	692	562
Oil equivalent of copra exports:	805	796	703	599	699	862	658
Grand total oil equivalent of copra and coconut oil	1,206	1,287	1,090	1,131	1,299	1,554	1,220

^{1/} Preliminary; partly estimated

Source: Foreign Agriculture Service. Prepared or estimated on the basis of official statistics of foreign governments, other foreign source material, reports of U. S. Agriculture Attaches and Foreign Service Officers, results of office research, and related information.

Appendix 5. Coconut Oil: Imports by Principal
Exporting Countries, 1966 - 1970
(1000 metric tons)

Region/Countries	1966	1967	1968	1969	1970
<u>Western Europe</u>					
Belgium-Luxembourg	8.6	7.1	10.9	12.0	18.9
France	10.6	14.9	13.3	21.5	18.7
Germany, Fed. Rep.	35.5	43.6	61.0	45.0	31.6
Italy	18.7	24.0	23.9	28.3	19.8
Netherlands	<u>1.6</u>	<u>6.2</u>	<u>8.8</u>	<u>8.7</u>	<u>8.4</u>
Total EEC	75.0	95.8	117.9	115.5	97.4
Austria	12.4	11.7	7.0	7.2	6.6
Denmark	1.0	0.6	1.5	-	-
Ireland	0.3	0.7	1.2	1.5	1.5*
Spain	4.7	1.8	3.2	3.2	1.9
Sweden	1.6	0.4	1.5	1.3	3.9
Switzerland	3.6	2.5	2.1	2.6	1.2
United Kingdom	35.9	39.0	47.6	43.2	48.1
Yugoslavia	0.1	0.7	0.6	0.2	0.6
Others	<u>0.6</u>	<u>0.6</u>	<u>1.1</u>	<u>0.5</u>	<u>1.1*</u>
Total Western Europe	135.3	153.7	183.8	175.2	162.3
<u>Eastern Europe and U.S.S.R.^{1/}</u>	<u>47.9</u>	<u>23.1</u>	<u>52.2</u>	<u>26.8</u>	<u>34.2</u>
<u>Americas</u>					
Canada	19.3	20.2	20.5	21.5	21.5
United States	226.2	228.8	197.5	193.8	265.4
Argentina	0.2	0.2	0.5	...	...
Peru	1.7	1.0	1.0*	0.1	...
Surinam	1.7	0.5	2.1	...	...
Uruguay	0.3	0.3*	0.3*	0.3	...
Others	<u>3.2</u>	<u>3.0</u>	<u>4.3*</u>	<u>4.0*</u>	<u>5.6*</u>
	252.6	254.0	226.1	222.2	295.4

*Totals computed from unrounded data

^{1/} Estimated from statistics of exports by destination; may be incomplete

Appendix 5 — Continued

Region/Countries	1966	1967	1968	1969	1970
<u>Asia</u>					
Burma	0.5*	2.0*	1.1	2.0*	2.0*
China (Mainland) ^{1/}	6.6	9.5	9.2	16.4	10.5*
Hong-Kong	0.7	0.5	0.4	0.3	0.6
Iraq	0.9	0.8*	0.8*	0.6	...
West Malaysia	1.3	0.9	1.3	2.3	2.9
Pakistan	15.7	16.9	6.0*	10.9	7.0*
Sabah	0.1	0.1	0.1	0.8	1.1
Singapore	12.8	14.4	12.0	11.8	14.1
Others	<u>7.0*</u>	<u>6.7*</u>	<u>6.8*</u>	<u>6.9*</u>	<u>...</u>
	45.6	51.9	37.7	52.0	47.7
<u>Africa</u>					
Kenya	3.1	1.6	1.0	0.9	0.5
Morocco	0.7	0.7	0.9	0.4	...
Rhodesia, Zambia and Malawi	0.9	0.8*	0.1	0.5	...
Sudan	0.9	0.5*	0.5	1.0	0.5*
Somalia	2.5	2.8	2.5*	0.2	...
South Africa	9.3	7.2	8.9	7.6	10.3
U.A.R.	1.7	1.7	2.9	3.1	5.8
Others	<u>1.9</u>	<u>1.4</u>	<u>4.5*</u>	<u>4.2*</u>	<u>2.6</u>
	21.0	16.7	21.3	17.9	20.7
<u>Oceania</u>	<u>1.1</u>	<u>1.0</u>	<u>1.4</u>	<u>1.2</u>	<u>1.3*</u>
WORLD TOTAL	<u>503.5</u>	<u>500.6</u>	<u>522.6</u>	<u>495.3</u>	<u>561.6</u>

*Totals computed from unrounded data

^{1/}Estimated from statistics of reports by destination; may be incomplete.

Source: Foreign Agricultural Service

**SUPPLY AND DEMAND PROSPECTS
FOR PHILIPPINE COCONUT OIL
AND IMPLICATION ON INTERNATIONAL TRADE
(A PRELIMINARY ANALYSIS)**

by

EVELYN M. LACHICA

A. B. Economics, Far Eastern University, 1968

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The Philippines is almost wholly dependent upon agricultural exports for foreign exchange. In recent years, the coconut industry alone has accounted for 58.4 percent of the country's foreign exchange earnings.

Under the direction of the Philippine Coconut Authority (PCA), a major long-term program is under way to upgrade the industry and increase coconut production. Because copra and coconut oil compete with other fats and oils in the world markets, an understanding of these markets is important for the success of the Philippine program.

The objectives of this study are to examine the factors which influence the Philippine coconut oil trade in the world markets, to determine the impact of changing demand within importing countries and to analyze the trade barriers affecting the industry. The preliminary analysis in this study will serve as basis for more in-depth study by the author upon her return to her post in the Philippines.

Demand and supply factors were subjected to multiple regression analysis in order to evaluate the future markets for Philippine coconut oil and the implications for international trade with importing countries. Demand and supply models were formulated to reflect the impacts of competing products such as Malaysian

palm oil. Time series data on volumes, prices and incomes for a 16-year period were used to make the empirical analysis.

Results of the study indicate that Philippine coconut oil faces several problems in international markets. Demand in the major importing countries is income inelastic, so that future quantities demanded will not increase proportionately with increases in purchasing power. Competitive oils and synthetics will be purchased instead of coconut oil when relative prices favor doing so. Recent changes in tariff policies by importing countries and market associations have worked to the relative disadvantage of Philippine coconut oil. International marketing policies and programs by the Philippines have not been in tune with the changes and developments in the world markets.

The present program to increase the efficiency of the Philippine coconut industry and insure more stable supplies of coconut oil in world markets will likely ward off further substitution against coconut oil in the major importing countries. However, the Philippines needs to develop more effective intelligence in the world fats and oils markets and to plan export policies and programs to maintain market shares. These steps are necessary in order to insure future sales of coconut oil for foreign exchange earnings and stable incomes for the small coconut producers in the Philippines.