Projections and Prospects for the Lauric Oils: 1972-1987[1]

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Abstract

A set of economic forecasts based on both quantitative and qualitative analysis of market prospects is presented. The forecasts have been more general than particular, but this has been the result of the difficulties of analyzing market prospects for a large number of specialized end-uses. Several basic uncertainties which limit the fulfillment of these forecasts are reviewed. The demand forecasts presented hopefully will be more meaningful as the surrounding uncertainties are lessened, especially with regard to supply. At present it appears that the Philippine coconut situation is improving with potential export availabilities in the near future closer to the high assumption than the medium assumption. Should no typhoons or droughts set back the anticipated increases for the Philippines, we should be entering a period of greater lauric oil export availabilities. No anticipated increases are foreseen immediately for Ceylon or Indonesia. Given the existence of adequate supplies of lauric oils on a world basis, the demand for these oils is likely to be steady, although increasing only slowly. This conclusion, of course, assumes that a period of adequate supplies will foster a price level which is both reasonably low and reasonably stable. Such an outcome is difficult to envision given the random fluctuations in supply which the industry has habitually experienced. However, should this prophecy be fulfilled, it will be welcome news indeed.

Introduction

In this day of change, predictions as to what we may be doing 20 years from now would amaze most of us. For example, Alvin Toffler in his recent book, *Future Shock*, suggests that a number of us will be living under the sea experiencing hitherto unknown psychic pleasures. But I am afraid that I can't offer anything quite as exotic as that in predicting the future for coconut oil. At best, the supply of coconut oil will be plentiful and the price stable, such that it will receive increased use in a wider range of edible and inedible products. At worst, supply will deteriorate severely with polyunsaturated fats replacing laurics in edible uses and with synthetics dominating present inedible markets. In establishing a mean within this range, difficulties are encountered, partially because we have not expended sufficient resources to utilize the methods of technological forecasting, but more so because we are attempting to forecast for a market where supply is unstable and demand is linked to a quickly changing technology. To overcome these difficulties, at least to a limited extent, I would like to propose an approach which combines *quantitative* or econometric projections of demand with *qualitative* or subjective information regarding the future of particular end-uses.

The quantitative projections which I have prepared are based on an econometric model recently constructed to predict supply, demand, and price movements in the lauric oils market. The nature of the model is such that it can be used in conjunction with a simulation procedure to provide a series of forecasts for the 15 year period, 1972–1987. The approach that is taken in providing these forecasts is that of partial analysis. This method requires that one group of determinants in the model be varied systematically while others are held constant. The impact of varying these determinants in terms of the total market can then be obtained by observing the values that the simulated or determined variables take over time.

A certain amount of qualitative information already is available regarding forecasts which experts have made for a number of typical end-uses. I also have attempted to keep in close touch with market developments in certain areas. This qualitative information can be employed as follows to help strengthen the present forecasts. First, the information can provide a background from which to evaluate and interpret the quantitative forecasts. Second, it can offer greater detail as to expected developments for the many different end-uses where laurics serve as inputs.

Such an approach provides the plan for this paper. I should first like to point out some of the market uncertainties upon which all forecasts are contingent. Results of the simulation and quantitative projections will then be presented. Finally, the qualitative information will be reviewed so as to outline possible developments in individual markets.

Areas of Uncertainty

From the start, it is necessary to point out several important areas of uncertainty influencing any market projections which can be made at this time. I will discuss these uncertainties *first* as they relate to supply, and *second* as they relate to demand.

Possibly the greatest area of uncertainty is that which surrounds the production of coconuts. Since 1966, for example, world exports have fallen consistently despite attempts to bolster production. Table I shows the world output of copra and coconut oil to have fallen from 1.4 million tons (metric in oil equivalent) in 1966 to a level of ca. 1.2 million tons in 1967 and 1968, and 1.1 million tons in 1969 and 1970. Factors which underlie this situation relate both to climatic conditions and to productivity.

The climatic conditions which have influenced coconut production the most since 1966 have been typhoons and earthquakes in the Philippines, as well as persistent droughts in both the Philippines and Ceylon. Whether or not these conditions will be more favorable in the 1970's cannot be predicted. Some hope can be found in the fact that the Philippines has not only reportedly moved a substantial portion of its coconut acreage south to Mindanao, which is less prone to typhoons, but also that the Philippines recently has experienced a more than ample rainfall giving the coconut crop its long needed boost.

The productivity conditions responsible for this decline appear to relate to management of the industry. In the Philippines, for example, the best farms of the Mindanao display yields of ca. 100 nuts per tree while the national average rests at ca. 30 nuts per tree (1). Similar conditions exist when one discusses the age structure of coconut trees. Tree stands in a number of countries consist mostly of older, lower yielding varieties, many of which have passed their prime. However there are signs that these conditions can be reversed. In the Philippines, the number of bearing trees reportedly has shown a steady growth from ca. 195 million in 1969 to 215 million in 1970 and possibly 230 million in 1971. Yields of the bearing trees have also shown an increase over the 1969 levels, although they remain below the 1966 level (2).

Also related to the supply situation is the uncertainty regarding the rising domestic consumption of coconuts and oil in the exporting countries. As will be explained later, the population explosion in these countries appears to be overtaking the growth in the available supply of coconuts to possibly influence the export situation. There is no information presently available which suggests the extent to which exports might be reduced. It is likely that in a major producing country such as the Philippines, the output of coconuts will increase sufficiently to offset rising consumption. Other countries have the possibility of adopting policies which could maximize coconut exports by shifting a portion of domestic consumption to less expensive vegetable oils. But such an attempt would re-

[1] Presented at the AOCS Meeting, Atlantic City, N.J., September 1971.

TABLE I

Coconut Oil and Palm Kernel Oil Net Exports[a]
(000 metric tons)

Coconut oil net exports	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Philippines	738	648	708	817	759	797	899	924	690	595	609
Ceylon	75	129	151	110	157	115	87	78	78	68	67
Indonesia	146	175	103	87	120	112	136	96	146	122	99
Oceania	167	189	174	171	184	174	169	170	174	166	170
Subtotal	1126	1141	1136	1185	1220	1198	1291	1068	1088	961	942
Rest of world	102	125	88	120	100	85	100	108	157	143	147
Total coconut oil	1228	1266	1224	1305	1320	1283	1391	1176	1245	1104	1089
Palm kernel oil net exports	409	394	361	369	373	371	378	296	307	315	322
Total net exports	1637	1660	1585	1674	1693	1654	1769	1472	1552	1415	1411

[a] Source: *World Oils and Fats Statistics*, prepared by Economics and Statistics Department, Unilever Ltd., for the Congress of the International Association of Seed Crushers; also assorted National Publications. Figures have been adjusted to account for overshipments.

quire substantial changes in major agricultural and trade policies.

One last uncertainty concerning supply relates to the influence that the likely increase in palm oil might have on the lauric market. As a result of recent government action in West Malaysia, palm oil exports have increased from 90,300 metric tons in 1960 to 139,200 tons in 1965, and 357,000 tons in 1970. Total area under high yield palm trees responsible for those increases has risen from 135,000 acres in 1960 to 400,000 acres in 1968 with 1,000,000 acres anticipated for in 1974 (3). This would imply that palm oil output may reach 1.5–2.0 million tons by 1978. The impact of this dramatic increase on the future demand for coconut oil remains uncertain. The trees planted have a sufficiently low yield of palm kernel oil such that the total supply of lauric oils will not be increased substantially. In fact palm kernel oil exports from West Malaysia have declined from 25,200 tons in 1960 to 18,700 tons in 1965, and 8,200 tons in 1970. The most likely outcome is that substantial exports of palm oil together with a possible greater supply of all fats and oils will pressure coconut oil prices downwards.

With respect to uncertainties underlying the demand side of the market, one faces a series of complex questions regarding the increased use of synthetic fatty alcohols, fatty acids, and other lauric-type derivatives. Synthetic alcohols have already replaced lauric alcohols in a substantial number of end-uses, and this proportion could increase significantly given relatively higher lauric price levels. Synthetic fatty acids have been produced only on a small scale in several of the Eastern bloc countries, and a large-scale production facility is not presently envisioned for the U.S. Over the next 15 years, however, improvements in the technology of producing these acids inexpensively may occur, greatly changing the present market situation. Although 2 or 3 years ago it was clear that food uses of coconut oil would be likely to increase, uncertainty as to future food uses has arisen from the attention recently brought to the health hazards of consuming oils and fats with high levels of saturation (4). This may inhibit the growth of coconut oil consumption in a country such as the U.S., but the extent to which this attention may influence consumption in other major importing countries is not presently known.

Prospects for Demand

Given these uncertainties, one finds the framework within which to make long term forecasts a precarious one. The stated intention, nevertheless, is to combine quantitative and qualitative information so as to reach some practical conclusions about the future of the market. In this section the quantitative projections are presented based on an econometric model of the lauric oils market which attempts to integrate the different variables influencing market demand, supply and prices. Consideration is first given to the *model* itself and the assumptions which must be formulated regarding the future export situation; later I will present and discuss the actual *projections*.

The Model

The model which has been used to obtain the long term projections is based on the structure of the world lauric oils market depicted in Figure 1 (5). It has been considered appropriate to describe the market in terms of lauric oils, since palm kernel oil is sufficiently similar to coconut oil that market behavior is best described in terms of combined volumes. In Figure 1 market flows are shown to originate at the production stage, pass through the export to import stage, and culminate at the final demand stage. The interaction between the export and import flows as reflected in stocks is considered to be the most important force explaining price behavior. The equations which have been selected to represent the geographic distribution of these flows are as follows: (a) coconut oil export equations for the Philippines, Ceylon, Indonesia, Oceania and rest of the world; palm kernel oil exports for the world; (b) lauric oil import and consumption equations for the U.S., United Kingdom, the E.E.C. countries, Japan, and rest of the world; and (c) lauric oil stock equations for the U.S., U.K., E.E.C. countries, Philippines and Ceylon.

A simplified illustration as to how forecasts are prepared from the model is given in Figure 2. Data describing the variables over the period 1953–67 are utilized to estimate the parameters for the various equations as well as to test the performance of the model. It is then assumed that anticipated changes in the structure of lauric oils market will be sufficiently minor to justify use of the parameters for simulating the behavior of the variables over the period 1968–87. There has been some concern that the elasticity of demand for lauric oils in the various countries may change, given that the export levels of lauric oils may rise above 1,500,000 tons per year for the medium and high projections. Although the impact that these changes may have on the market will soon be evaluated, the present simulation does correct somewhat for such changes. The simultaneous character of the model assumes that exports and imports are in equilibrium for each forecast year.

The parameters employed at the simulation stage of Figure 2 can, therefore, be accepted with some degree of confidence. The exact manner in which forecasts are produced at this stage follows a framework of partial analysis. Extrapolated values are provided for the basic market determinants, while others are held constant. In this case, values are provided for the determinants underlying demand and low, medium and high values are provided regarding possible export availabilities. Successive solution of the equations of the model provides the simulated forecasts for demand and prices, the latter designated as the New York crude coconut oil price. Since actual or close to actual values have been introduced into the simulation for the period 1968–71, the forecast figures to be examined are these extending from 1972–87.

Before beginning that discussion, let us first analyze the extrapolations which have been introduced regarding both demand and exports. Demand for lauric oils is known to depend on prices, on the outputs of industries utilizing these oils, and occasionally on substitution effects from the nearest competitive oil. Since prices are determined interdependently with demand and since substitution effects can only be held constant over the long term, changes in demand will relate primarily to changes in an index representing the outputs to 1987 of the major products utilizing lauric oils such as cooking oils, bar soaps, bakers goods, or margarine. One possible approach which can be taken to extrapolating these outputs and that which has been followed here is to assume on the basis of past trends that output will increase or decrease by a certain percentage over the next 15 years. Percentage changes selected for the various country output indexes are as follows: U.S. =

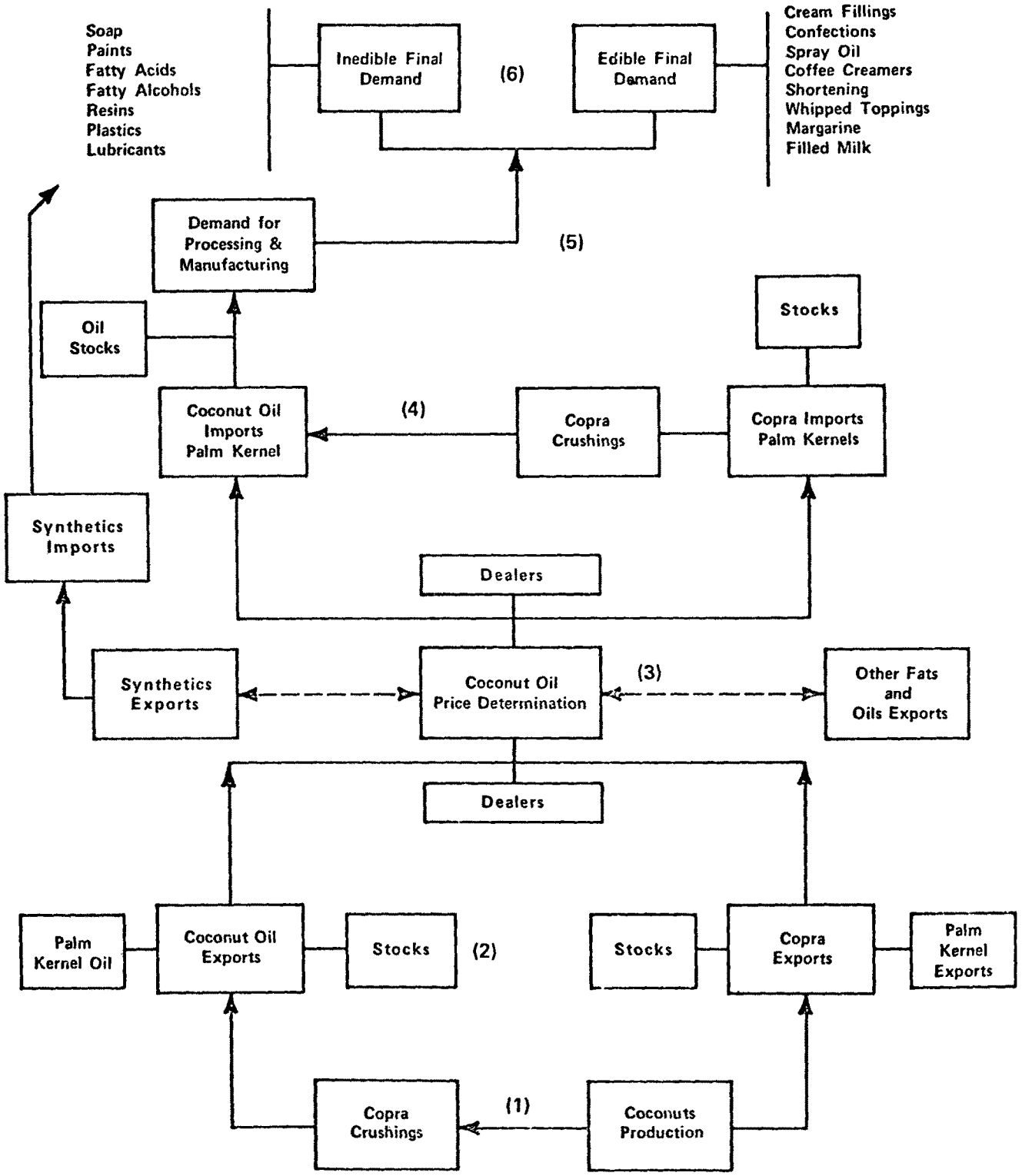

FIG. 1. Hypothetical structure of the world lauric oils market.

30% increase; U.K. = 55% decrease; E.E.C. = 20% decrease; and Japan = 110% increase.

Extrapolations for exports are presented at three levels, based on low, medium and high assumptions regarding future lauric oil availabilities. Export figures for the three major exporting countries together with the world lauric oil total are reported in Table II. The circumstances underlying these assumptions relate to expectations regarding productivity and plantings as well as domestic consumption.

Philippines: The low, medium and high export levels predicted for 1987 are 880,000, 1,000,000 and 1,450,000 tons respectively. The low projection is based on the production situation deteriorating to the extent that the 1966 level of 899,000 tons will not again be attained before the end of that period. This figure is based not only on the problems associated with reforming management practices in the industry, but also on the belief that the planting of trees throughout the 1960's has been too small to offset declining yields from old or abandoned trees. The medium forecast is slightly more optimistic. It follows the assumption that increased tree plantings have occurred only recently and that corresponding increases in production will not take place until the 1980's. The projection of only moderate export availabilities is similar to that expressed in the Philippines Study on Regional Plan Harmonization, although the circumstances underlying that forecast are more related to the possibilities of rising domestic consumption (6). The high projection differs principally in the assumption that coconut tree plantings throughout the 1960's have been more than adequate to offset the rising number of older trees and that most of

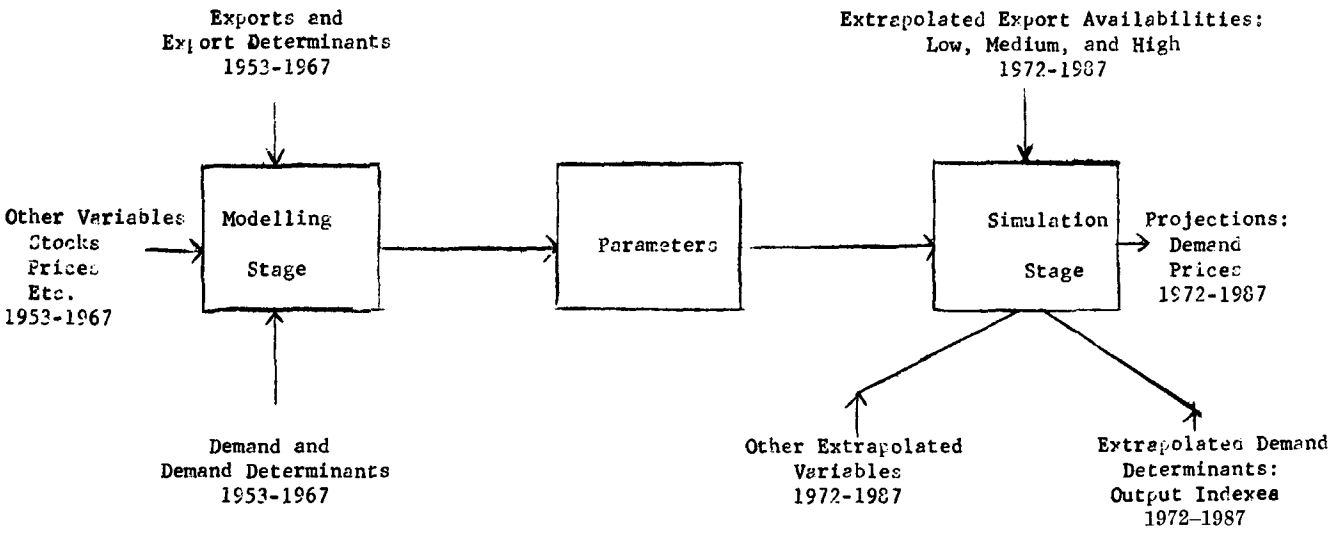

FIG. 2. Simulation procedure for obtaining demand projections: 1972–87.

this increased production will be available for export. This follows the rationale presented in a recent issue of *Oil World* (2). Table II suggests that export availabilities for the high projection would increase by as much as 6.5% per year over the period 1972–77, and possibly 3.6% over the longer period 1972–87.

Ceylon: Low, medium and high export levels forecast for 1987 are 36,000, 110,000 and 170,000 tons. The low prediction reflects a situation that could occur if domestic consumption of coconuts continues to expand and plantings do not increase above present annual levels. The medium forecast reflects export levels that have been attained in the past. This level is not changed substantially for the high forecast, principally because the total area of planted trees has remained relatively constant and no major increases in productivity are foreseen.

Indonesia: Low, medium and high export levels anticipated for 1987 are 121,000 tons, 176,000 tons and 206,000 tons oil equivalent, respectively. The low prediction which is constant reflects a degree of uncertainty as to whether copra exports will change at all from present levels. Most recently, infestations of up to 1 million trees by grasshoppers suggests that exports may decline below this level at least for the next several years. The medium forecast implies that recent increases in plantings will be accompanied by improvements in productivity as well as in insular transportation. The most optimistic increase in exports that could result from these improvements is reflected in the high forecast. This would assume that the recently formed Copra Marketing Board covering the Sulawesi would increase substantially exports from that region.

World: For the total lauric oils export figures reported in Table II, it has been assumed that the world exports of palm kernel oil will not change substantially over the next 15 years. World lauric oils levels anticipated for 1987 are 1,514,000, 1,865,000 and 2,500,000 tons for the low, medium and high assumptions, respectively.

The Projections

The demand projections relating to the low, medium and high export assumptions together with figures reflecting rates of change in demand are reported in Table III for the world, the U.S. and the E.E.C. countries. Demand figures for each of these areas will be discussed beginning with the projections for total world demand. At a medium level of world export availabilities, world demand is forecast to grow at a rate of ca. 0.8% per year over the period 1972–77. Since the assumptions underlying the medium export projection suggest that increases in tree numbers have occurred only most recently, noticeable increases in the rate of growth occur only later in the period. A rate of growth of 1.2% per year is forecast for 1977–82, while a rate growth of 1.5% per year is forecast for 1982–87. The assumptions underlying the high export assumptions would suggest that tree numbers have increased significantly throughout the 1960's. Consequently, total world demand corresponding to this assumption should increase at a rate of ca. 3.2% per year for 1972–77. The forecast rate of growth will then decline to 2.3% for the years 1977–82 and to 1.6% for 1982–87.

The lauric oil market in the U.S. has witnessed recently a period of rapid increase in demand followed by a slight decline, but it is anticipated that greater availability will lead again to rising demand. Total lauric oil consumption in the U.S. increased from 392,000 tons in 1964–65 to 432,000 tons in 1967–68, a growth rate of 3.3%. Rates of growth are measured between annual points taken as 2 year averages to provide more representative growth figures. Total consumption then declined to 392,000 tons in 1969–70, and the corresponding rate of growth describing these years is negative at −4.8%. With greater quantities of copra and coconut oil potentially available beginning 1972, the model indicates that the use of coconut oil will continue to grow, but at rates lower than that of the 1950's or the 1960's. The rate of growth of demand forecast according to the medium export assumption would be 2.7% for the period 1972–77. This rate would then decline to 2.2% for the years 1977–82 and to 2.0% for 1982–87.

TABLE II

Low, Medium, and High Export Availabilities: Coconut Oil and Total Lauric Oil

	Quantity											
	Coconut oil									Lauric oil		
	Philippines			Ceylon			Indonesia			World total[a]		
Years	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
1968	690	690	690	78	78	78	146	146	146	1552	1552	1552
1969	595	595	595	68	68	68	122	122	122	1415	1415	1415
1970	609	609	609	67	67	67	99	99	99	1411	1411	1411
1971	600	650	801	68	78	80	121	129	140	1391	1463	1690
1972	580	700	846	66	80	87	121	132	144	1432	1610	1747
1977	680	800	1165	56	90	120	121	146	166	1373	1639	2065
1982	780	900	1355	46	100	145	121	161	186	1506	1701	2310
1987	880	1000	1450	36	110	170	121	176	206	1514	1865	2500
Annual per cent change in growth												
1972–77	3.2	2.7	6.5	−3.7	2.4	7.0	0	2.0	2.9	−0.9	0.3	2.9
1977–82	2.7	2.4	3.1	−3.5	2.2	3.9	0	2.0	2.4	1.8	0.3	2.8
1982–87	2.4	2.2	1.4	−5.0	2.1	3.3	0	1.9	2.2	0	0.7	1.7
1972–87	2.8	2.4	3.6	−4.2	2.1	4.5	0	1.9	2.4	0.6	1.0	2.4

[a] World Totals deviate from trend values because of random fluctuations added to simulate possible export variations due to climatic conditions.

TABLE III

Projections for Lauric Oil Demand Including Rates of Change[a] 1972–87

Year	U.S.			E.E.C. Countries			World[b]		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
1972	486	492	492	510	527	545	1464	1606	1689
1977	547	561	575	495	526	568	1409	1665	1984
1982	607	624	648	507	536	595	1561	1773	2232
1987	659	684	717	502	552	620	1538	1908	2470
Annual per cent change in growth									
1972–77	2.4	2.7	3.2	−0.6	0.0	0.7	−0.8	0.8	3.2
1977–82	2.2	2.2	2.5	0.6	0.4	0.9	2.0	1.2	2.3
1982–87	1.8	2.0	2.2	0.0	0.9	0.9	−0.5	1.5	1.6
1972–87	2.1	2.2	2.6	0.0	0.3	0.9	0.3	0.8	2.6

[a] Demand figures represent 2 year average taken over indicated and succeeding year except for 1987.
[b] Imports for consumption.

Given that coconut oil prices may be more elastic during the later parts of this period, however, the higher rate of growth would be sustained throughout. A more substantial rate of growth in demand would follow, should exports also be at higher levels. The high export assumption would suggest a rate of growth of 3.2% for 1972–77, but this would decline to 2.5% and 2.2% in the later periods, respectively. As can be realized, neither set of demand forecasts implies a substantial change in consumption patterns.

Historical rates of growth in demand found for the E.E.C. have been much lower, even negative. The sharpest declines are seen covering the major importers, the Federal Republic of Germany and the Netherlands. Past data show that consumption has declined for Germany at an annual rate of −4.4% from 1964–65 to 1967–68 and −11.9% from 1967–68 to 1969–70. In the Netherlands the decline was −5.2% from 1964–65 to 1967–68, and −4.2% from 1967–68 to 1969–70.

The rate experienced by the E.E.C. as a whole has not been as low with an overall rate of −1.5% found for the years 1962–63 to 1967–68, and −1.0% for the years 1967–68 to 1969–70. Because the declines among the major importers have been so sharp, this factor together with positive rates of growth for the other countries suggest that this decline may not continue. Either the low, medium or high assumptions with one exception suggest a rate of growth of demand between 0–1%. With high export availability, the overall rate could possibly rise to 0.7% per year for 1972–77 and 0.9% per year for 1977–87.

Individual Markets

Given some confirmation that the demand for coconut oil will continue to expand over the next 20 years, although at possibly lower rates in the more developed countries, recommendations can be offered for particular end-use markets where possible. In addition to the uncertainties outlined above, a number of other factors enter which make 15 year projections for individual end-uses extremely difficult. First of all, almost no useful data exist regarding utilization of coconut oil for individual products. Objective extrapolation of trends becomes impossible under such conditions. Second, coconut oil is utilized in such a large variety of products that end-uses are difficult to measure, even for product groups. Figure 3 suggests a number of these uses, although it is by no means exhaustive. The factors which will be examined as being most related to expanding demand are changes in per capita consumption and population changes, the extent to which coconut oil is already employed in minimal proportions, and new uses which can be developed to offset any decline in total use. Predictions are offered for both food and nonfood uses with figures offered both for world and for U.S. consumption.

Food Uses

There is no question but that food uses will increase among the developing countries that are presently exporters and importers. Per capita food consumption of fats and oil has averaged 22.0 kg in the U.S. and 23.3 kg in the E.E.C. countries, as compared to 4.0 kg in both Africa and the Far East. A recent forecast has suggested that by 1985 per capita consumption will rise slightly to 25.7 kg in the E.E.C. countries, but more markedly to 5.7 kg in Africa and 6.3 kg in the Far East (7). That even greater amounts of coconuts and coconut oil could be absorbed in the latter countries is evidenced by the importance of coconut products in their diet.

Food uses in the U.S. are not anticipated to expand beyond that suggested by the total lauric oil growth rate given in Table III. That the growth rate will be positive or at least not negative can be confirmed from several different points of view. First of all, per capita food consumption of fats and oils rose from 20.7 kg in 1960 to 24.3 kg in 1970, in spite of a belief that saturation had already been attained. The outlook now is that per capita consumption could rise to 26.0 kg by 1980 (8). Second, per capita coconut oil consumption rose from 0.45 kg in 1960 to 0.82 kg in 1966, and has not fallen below that level since then. Finally, the recent attempt to check the consumption of food products containing coconut oil by labeling their content and by drawing attention to their polyunsaturated nature was reversed by the FDA.

In terms of specific food products, the only area in which lauric oil usage is likely to decline over the long term period is that of dairy products, especially filled milk. Lauric oils usage will probably expand at the given rate of products which depend on its organoleptic qualities as well as its slow deterioration. Among these are baking uses such as cream fillings, coatings, and spray oils which represent ca. 50% of present food consumption. The only new food product development foreseen is the addition of coconut proteins to existing foods, but this is presently likely to have greatest usage in the developing countries.

Nonfood Uses

Slightly more uncertainty surrounds the long term usage of coconut oil in nonfood or industrial uses. To all of us it is obvious that the development of lauric type synthetic alcohols and, to a more limited extent, synthetic acids has affected the market for lauric derivatives.

On a global scale the demand for coconut alcohols might expand, although no one is willing to suggest a growth rate. A recent short term forecast of alcohols based on differences in per capita alcohol consumption between countries suggested that such an expansion rate might occur (9). Fatty alcohol consumption in the U.S. and Canada has averaged 0.72 kg per capita while in Western Europe, Japan and the rest of the world, it has averaged 0.19, 0.16 and 0.02 kg, respectively. Foreseen advances in the standard of living of this latter group of countries over the next 15 years should increase the total consumption of fatty alcohols. Although a major portion of this consumption will be met by synthetics, there still should exist a need for greater amount of the coconut-based alcohols.

The market for coconut alcohols in the U.S. has deteriorated considerably. One source has estimated a decline in use of these alcohols in detergents from 118,000 tons in 1965 to ca. 65,000 tons in 1970 (10). The great advantage of synthetic alcohols relates to a lower and more stable price. Unless coconut oil prices decline to a reasonably low and stable level, it is likely that the market share of the synthetics will become even larger. Also of importance is the role that the price advantage plays in the mind of the technological planner. Most of the total market share lost to synthetic alcohols has resulted from the design of new products which depend on the use of synthetics rather than natural alcohols.

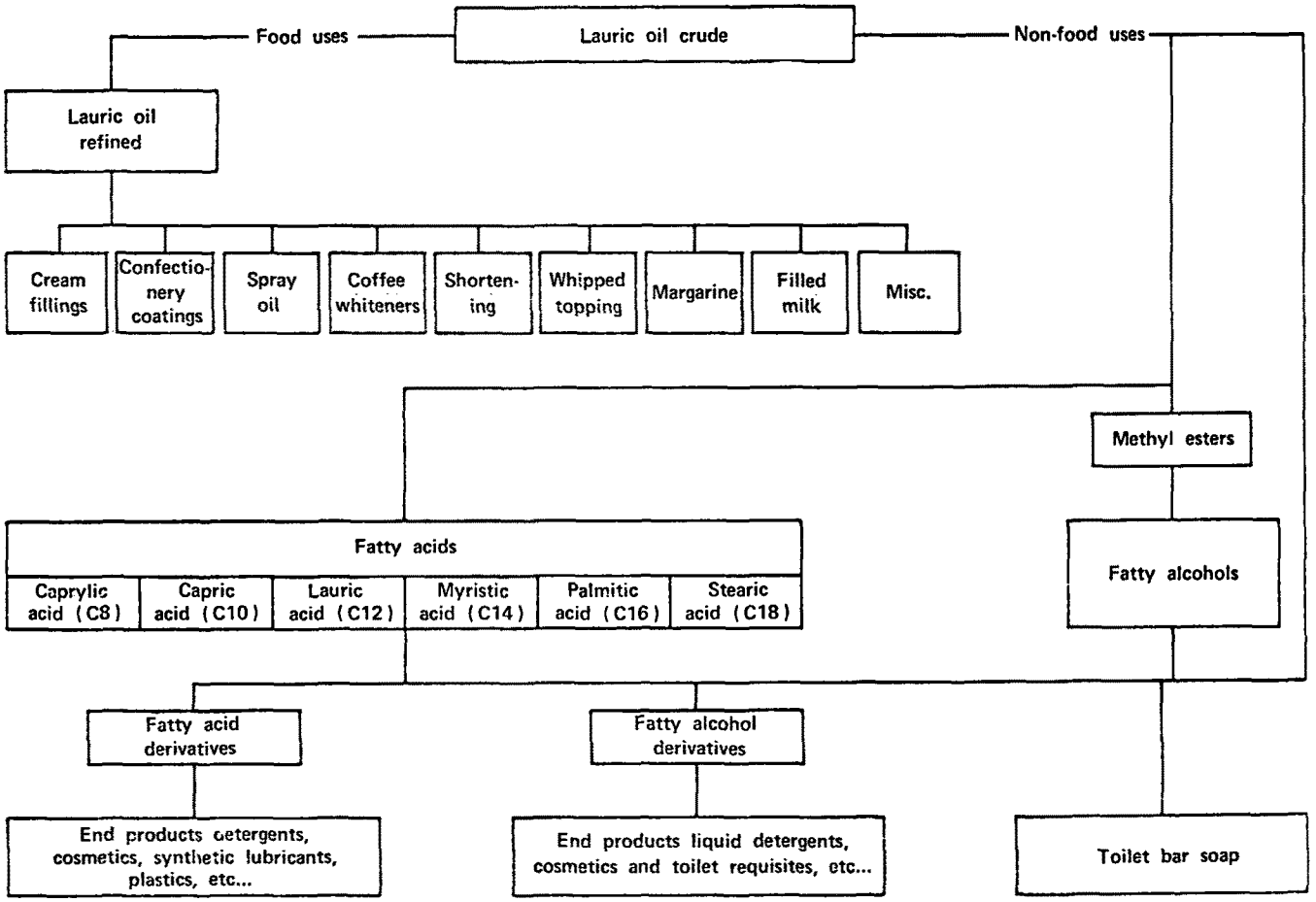

FIG. 3. Uses of lauric oil.

The market for coconut-based fatty acids in the U.S. has proved somewhat more stable. Production of these acids increased from 21,900 tons in 1953 to a high of 44,600 tons in 1959. Since 1962, utilization has remained constant at ca. 27,000 tons per year. All of these figures are probably understated. The percentage of coconut oil used relative to other fats and oils in total acid production, in contrast, has declined from 11.7% in 1952 to 3.1% in 1966 (11). Although this suggests a reasonable decline in market share, two reasons can be offered as to why production of coconut-based acids will remain at present levels or rise to slightly higher levels. First, synthetic acid competition from presently operating facilities will be minimal; synthetic acid plants presently operating in the U.S.S.R. and mainland China or existing at the pilot stage in the U.S. produce acids in a range lower than that associated with the laurics. Second, synthetic fatty acid competition is not likely to expand in this country in the near future; the output which would be required in operating even the smallest synthetic acid facility would be substantially in excess of the demand which is presently foreseen. Fifteen years, nonetheless, is a long time, and in view of the present rates of technological change, it is not unlikely that synthetic acids in the lauric range will eventually be produced domestically.

If the demand for lauric-based alcohols or acids begins to deteriorate seriously, is it possible that many new uses might be developed to sustain the growth anticipated in total demand? The development of new product uses would ensure the confidence of coconut producers, but such developments are not likely unless export availabilities should increase substantially. One recent suggestion is that research into the development of a number of lauric derivatives might take place if oil prices fell to certain levels (12). Development of oxazalines and imidazolines might take place at 16¢/lb.; the development of laural dimethylamine oxide at 14¢/lb.; and the development of vinyl laurates and laural methaorylate polymers at 13¢/lb.

That such developments could possibly take place is not inconceivable based on anticipated price levels which would accompany the given export levels. Especially with exports at least reaching the medium assumption, the prices forecast from the simulation as given in Table IV would seem favorable. Although the model has no floor price presently built into it, the possibility of the real market price falling below 7.0¢/lb. is unlikely.

TABLE IV
Price Projections Based on Export Alternatives

Export projection level	New York crude coconut oil price, ¢/lb.		
	1972	1977	1987
Low	14.4	15.2	14.8
Medium	13.8	13.0	10.5
High	11.2	9.2	6.0

REFERENCES

1. "The Philippine Coconut Industry," prepared for the Third Session of the Asian Coconut Community, Manila, October 1970, ACC (III)/CRS-7.
2. "Oil World," ISTA Mielke & Co., Hamburg, Germany, September 1, 1971.
3. "World Outlook for Palm Oil," prepared by the Economic Research Service, USDA.
4. "White House Conference on Food, Nutrition and Health," Final Report, December 1969.
5. Model originally developed by the author for Commodities Division, UN Conference on Trade and Development, Geneva. See UNCTAD/CD/Misc. 43/Rev. 1, July 1971.
6. Ramiro, M.P., "Philippines: Study on Regional Plan Harmonization of the Coconut Industry," National Economic Council, Manila.
7. "Long Term Situation and Outlook," Study Group on Oilseeds, Oils, and Fats, Second Session, CCP:OF 67/3, July 1967.
8. Kromer, G.W., "Trends in U.S. Consumption of Edible Oils," presented at the Oilseed Processing Clinic, New Orleans, February 1971.
9. Hill, H.A.W., "The World Status of Synthetic Detergent Range Primary Alcohols," presented at the Soap and Detergent Association Meeting, New York, January 1970.
10. Food and Agricultural Organization of the UN, "Survey of U.S. and Canadian Nonfood Uses of Coconut Oil," Rome, 1966.
11. Kromer, G.W., "Fatty Acids: An Expanding Market for Fats and Oils," Fats and Oils Situation, FOS-237, USDA, April 1967.
12. Sonntag, N.O.V., H. Fineberg, H. Molteni, H. Zabel and E.S. Pattison, JAOCS 46: 632A (1969).

Figures 1 and 3 from UN documents UNCTAD/CD/Misc. 43/Rev. 1 and UNCTAD/CD/Misc. 42, respectively.

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