

A STATISTICAL STUDY OF THE COCONUT OIL INDUSTRY IN U. S. FROM 1929 TO 1951

by

EDUARDO C. GOPEZ*

Because of the economic bond between the Philippines and America, the prosperity of the local coconut industry hinges on what happens in the coconut oil industry in the United States. This study, therefore, was made to discover economic tendencies that may influence our policies in solving the problems of our local copra industry in particular and some of our economic problems in general.

Although this study is exploratory in nature, it is inane to claim that its results are entirely new and different from what we have long suspected, nay, perhaps from what we have long assumed. But if it confirmed our suspicions, then the study has achieved its purpose, for now we have facts to support our assumptions.

Production

Since the raw material for coconut oil is imported, the abnormal situation precipitated by the Japanese occupation of copra producing countries, especially the Philippines, is very pronounced in the production data plotted on Chart I. Hence, trends should be appraised both against the pre-war level and the basic economic changes which emerged during and after the World War II.

Two equations estimating the trend were computed and plotted on Chart I. The first-degree equation (represented by the straight line on the chart) is $Y_c = 336.6 + 9.7 X$ with origin at 1940. From the chart, it could be seen that it does not seem to fit the data well. First, if the period from 1929

* Department of Economic Research, Central Bank of the Philippines. Formerly Lecturer in Business Administration, Accounting, and Economic Statistics, Ateneo de Zainboanga.

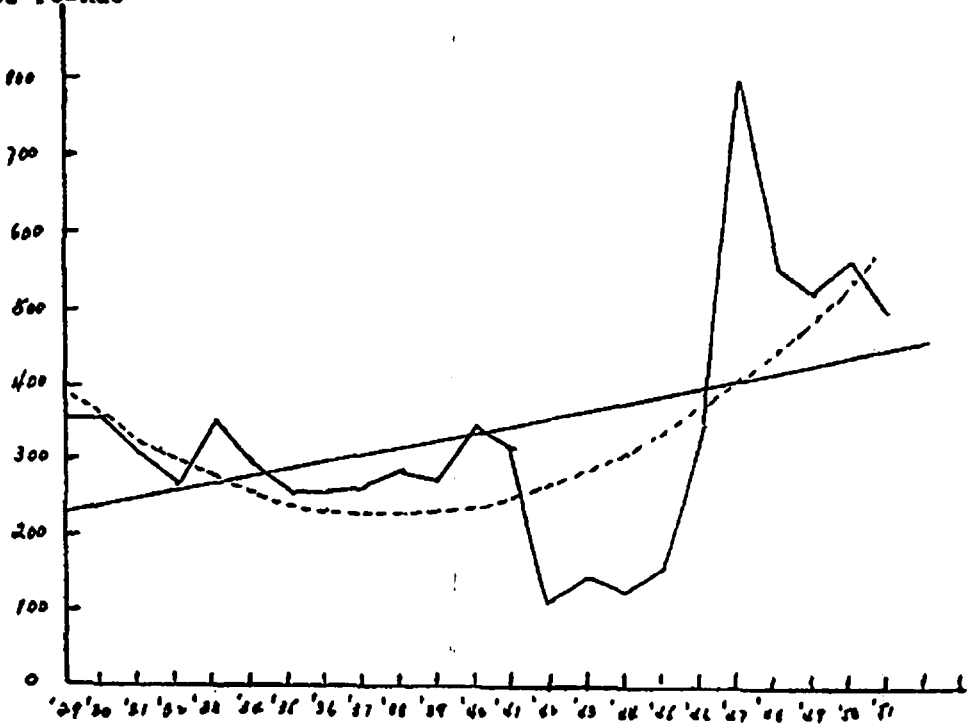
THE COCONUT OIL INDUSTRY IN U.S. FROM 1929 TO 1951

CHART I

Trend Lines Fitted to Annual Production
of Coconut Oil in U. S. A.

1929-1951

Millions
of Pounds



Source: Table I

to 1941 were isolated, the resulting trend would have been downward and not upward in slope. It is believed that the irregular situation during the war years constitute a break in the economic order and should therefore be excluded in computing the trend. Second, the slope of the trend have been pulled up by the extra-ordinary high production in 1947. It is felt that the sky high production in this year was due to the back-log in demand that has to be satisfied. Replenishment of dwindling stocks does not seem to be indicative of a trend but only an adjustment of the disrupted economic order. Furthermore, the high production in the years subsequent to 1947 may still be partly due to the back-log in demand which it is believed could not have been fully satiated by a single year of high production. For these reasons, it became necessary to try another equation.

The second equation, a second degree parabola, (represented by the dotted line on the chart) is $Y_c = 246.1 + 9.7 X + 2.06 X^2$ with origin in 1940. Although mathematically this line seems to be the "best fit," it can not be logically defended. For, it is obvious that if extended the line will assume the characteristics of a compound interest curve, a situation which is seldom encountered in established and old industries.

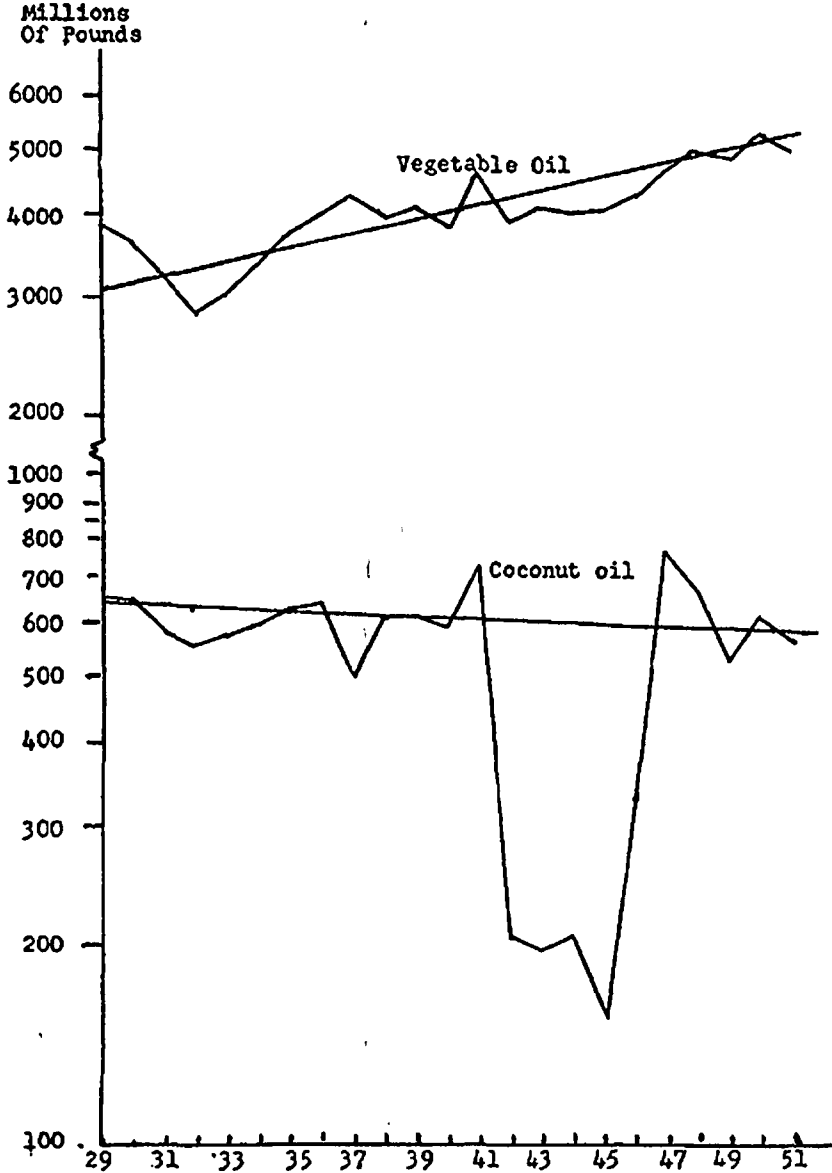
Which trend should be used is a difficult question to answer.¹ But perhaps if we study other aspects of the industry we might have a basis for a decision.

Notice that there is no pronounced cycle in the chart. It is true that from a peak in 1929 production started dropping down until 1932. But in 1933 production went up inspite of the fact that this year is supposed to be the deepest trough in American business history. It is interesting to note that in this year the average annual price of coconut oil dropped to its lowest price in the entire period covered by this study.² Whether it is over-production that depressed the price, it can not be held certain, for examination of consumption figures shows that there is a slight increase in 1933. (see Chart II)

From 1934 to 1939 the production kept on tapering down. This is explained by the passage of a law in the U. S. Congress levying an excise tax of 3 cents per pound of processed

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CHART II
Annual Disappearance of Vegetable Oils
Compared with Coconut Oil in U. S. A.
1929-1951



Source: Table II

coconut oil. This law was a move to create parity prices for farmers. As a result of the World War II in Europe, business picked up during 1940. In the coconut oil industry this is even more important, because of the strategic nature of the product. During 1950, the industry again responded to world situation. The Korean War prompted the industry to a higher production level.

Consumption

To get a clearer picture of the industry, consumption figures were analyzed. Perhaps, consumption will be more reflective of the movements in the industry than production. A cursory study of consumption from 1933 to 1951 shows a declining trend. To confirm this superficial inspection, the total disappearance of coconut oil was compared with the total apparent disappearance of vegetable oils. Both series were plotted on a ratio chart to see if they move relatively in the same way. (See Chart II). Except for the year 1937 and the war years, the relative movements were pretty much the same. That is, if the total disappearance of vegetable oils goes up the disappearance of coconut oil also goes up.

However there is the difference in trends. Whereas the trend for total vegetable oil disappearance is ascending, the trend for coconut oil disappearance is declining. In an effort to find the explanation for this, a band chart showing consumption by classes of products was made. From Chart III three tendencies are discernible. First, edible uses in the post-war period are comparatively smaller than uses for the same purpose in the prewar period. Second, the amount used for soap manufacture in the post-war period has relatively declined. And third, the amount devoted to other industrial uses has greatly increased.

To analyse further these tendencies, certain investigations were made. Chart IV was made to find out which of the edible products was responsible for the decrease.

Before the war, coconut oil was a principal ingredient in the manufacture of margarine. Its use in this field gradually dropped from the 1933 level when it made up almost 75% of

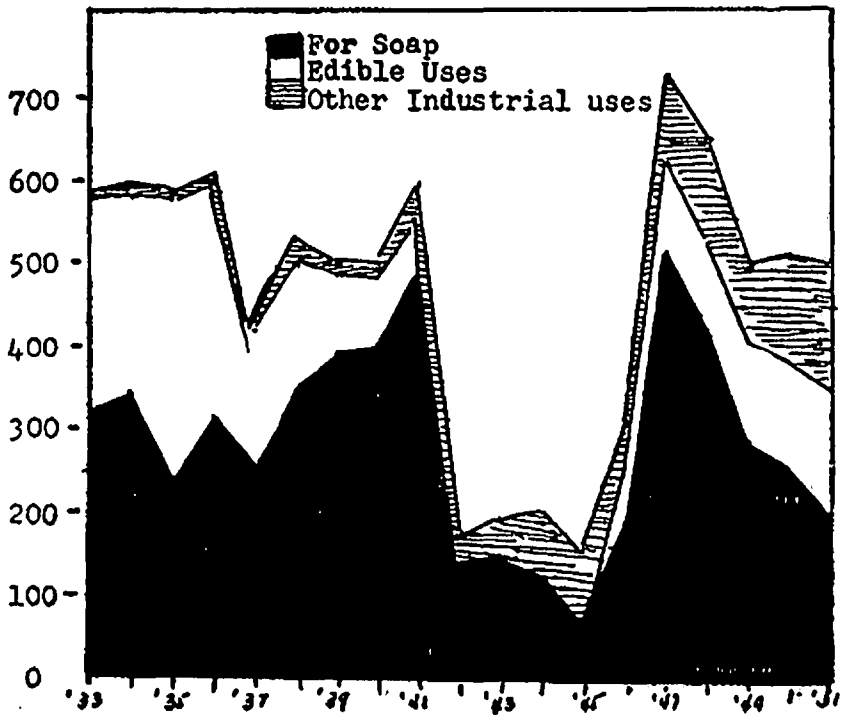
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CHART III

Factory Consumption of Coconut Oil
In U. S. A., By classes of Products

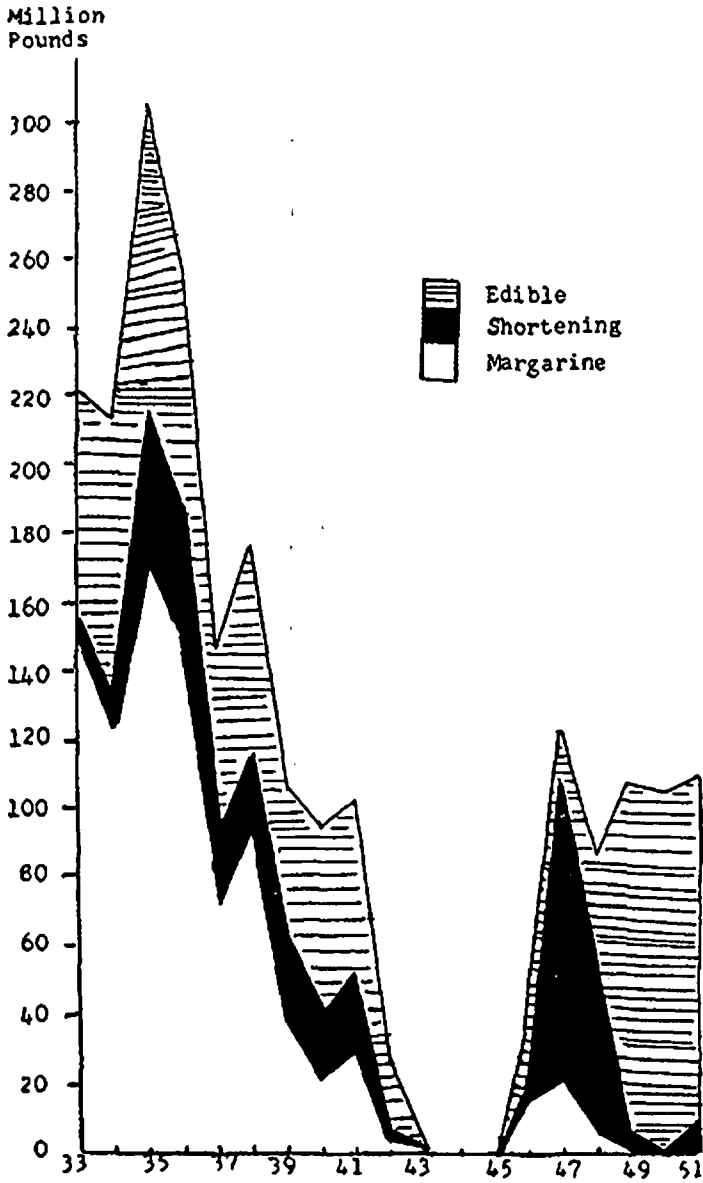
1933-1951

(Millions of Pounds)



Source: Table III

CHART IV
Factory Consumption of Coconut Oil
in U. S. A., By classes of Products
1933-1951



Source: Table III

THE COCONUT OIL INDUSTRY IN U.S. FROM 1929 TO 1951

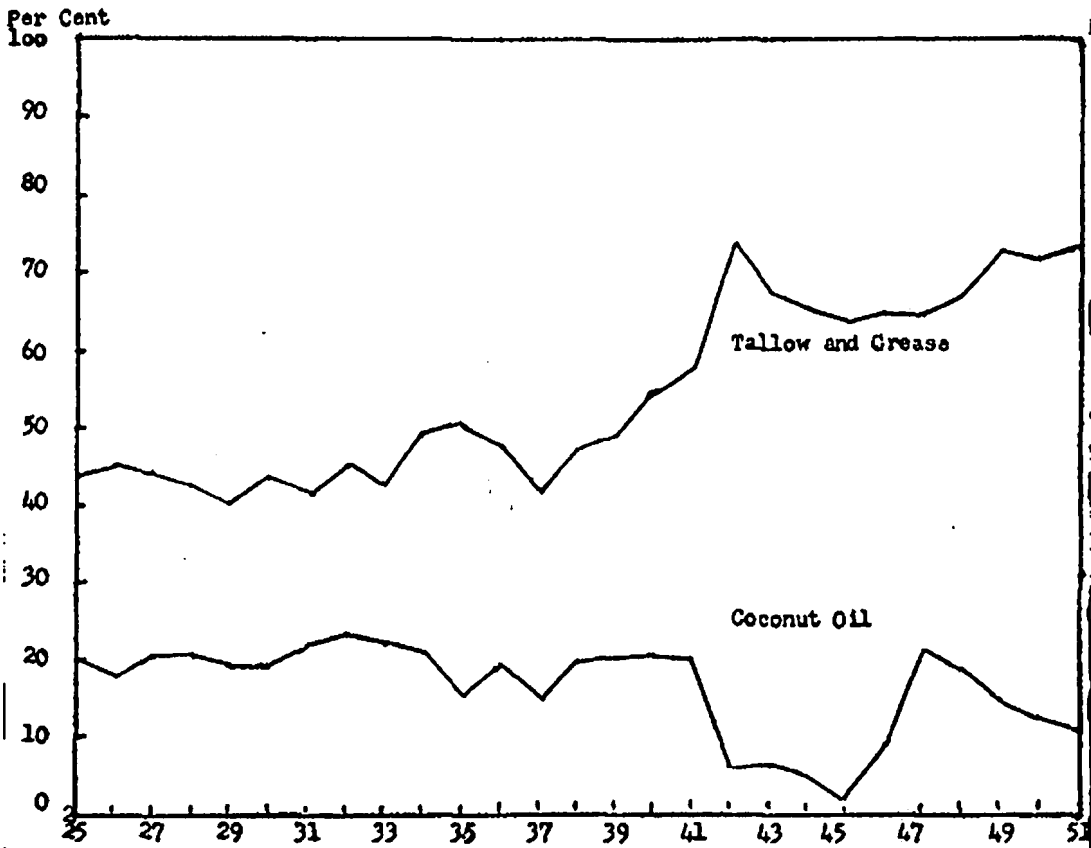
the total fats and oils used for this purpose³, down to almost nil in 1943. There are three outstanding reasons for this virtual elimination of coconut oil in the margarine field. As mentioned the processing tax passed in 1934 made it comparatively higher priced than some of its competitors, notably cottonseed and peanut oils. The strict enforcement of the Margarine Law is another factor that led to the abandonment of this commodity as an ingredient in the manufacture of margarine. In the post-war period, most of the coconut oil for the manufacture of margarine was used on margarine to be exported by the U. S. government under its foreign aid programs.

It is not possible to enumerate the other edible uses of this commodity because no break-down of these figures are available. All that can be said is that for some time, these unidentified uses have regained their pre-war levels.

The uses for industrial purposes other than soap manufacture have considerably increased. There is a strong suspicion that a great bulk of these uses are in the detergent field. The Fats and Oil Industry Report classifies detergents into three broad categories, namely; coconut oil-based group, coal by-products, and petroleum-based detergents.⁴

In an effort to find the reasons accounting for the decline of consumption of this commodity for use in manufacture of soap, total fats and oils used for this purpose were taken. Both coconut oil and tallow and grease were reduced to percentages of total fats and oils used for soap. These two commodities are the principal ingredient in soap manufacture. Chart V shows that in comparison to tallow and grease, coconut oil is declining. It seems that tallow and grease has been displacing coconut oil. Technologically speaking, coconut oil can not be eliminated from the manufacture of soap by tallow and grease. There is no domestically produced fat (in U. S.) that has the high lauric acid content of coconut oil which accounts for the quick lathering qualities of toilet soap.⁵ However, babasu oil imported from Brazil has this quality. The trade agreement between Brazil and the United States facilitates the importation of babasu oil and threatens the monopolistic position of coconut oil in the manufacture of toilet soap.

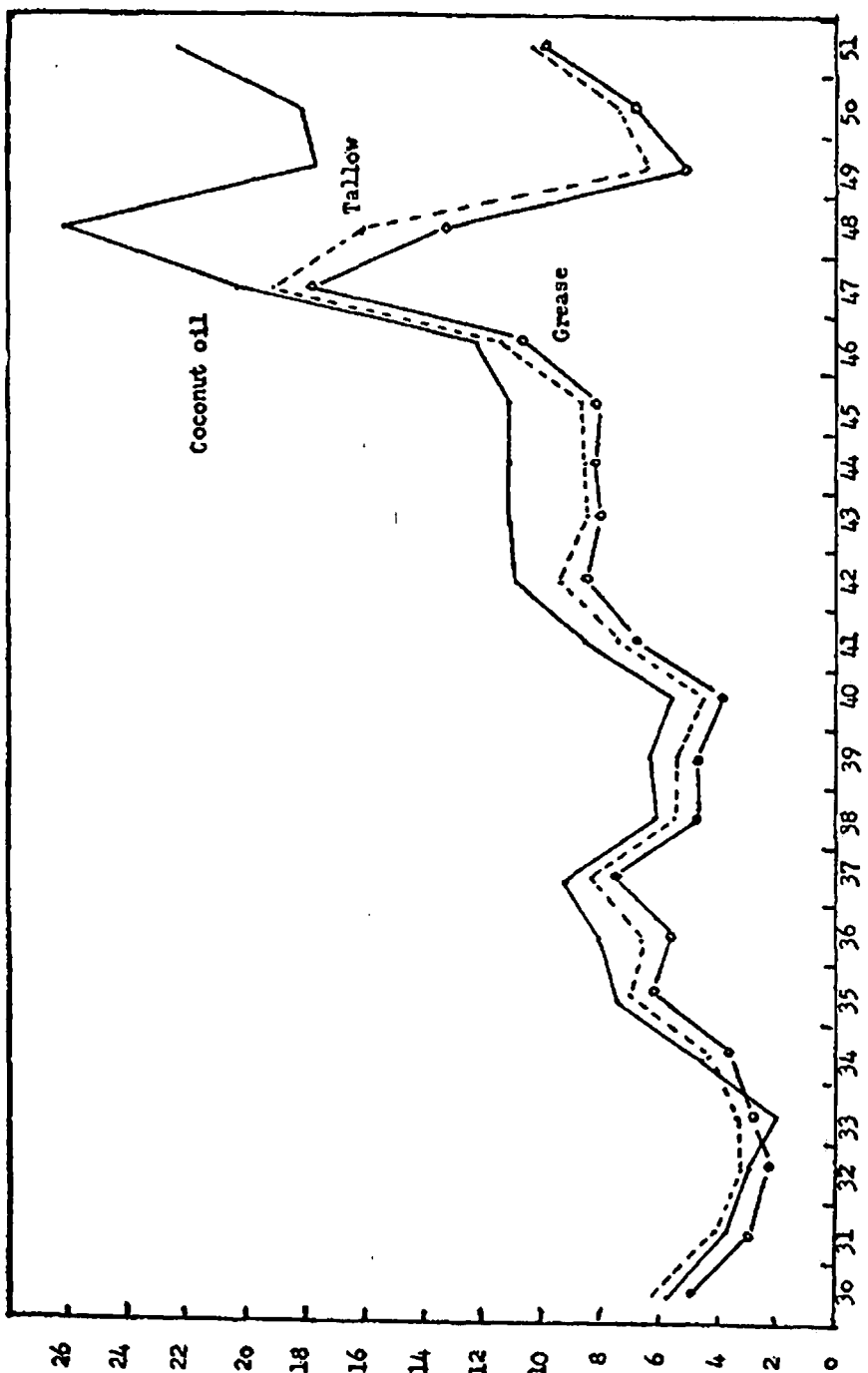
CHART V
PER CENTS OF COCONUT OIL, TALLOW AND GREASE OF TOTAL FATS
AND OILS USED IN THE MANUFACTURE OF SOAP
1925-1951



Source: Table IV

THE COCONUT OIL INDUSTRY IN U.S. FROM 1929 TO 1951

CHART VI
ANNUAL AVERAGES OF WHOLESALE PRICES OF SOAP FATS IN U. S.
1930-1951
(Cents per Pound)



Source: Table V

The downward trend in consumption of coconut oil is then partly due to the partial displacement by tallow and grease; partly due to the competition from babasu oil; mostly due to the decrease in volume of soap production precipitated by the emergence of other detergents; and finally, due to the high price of coconut oil.

Prices

This brings us to the study of prices. The prices of primary fats used in soap manufacture are plotted on Chart VI. By ocular inspection, there seems to be a strong correlation among these three series. Yet something very important must have happened in 1948. For it will be noticed correlation has shifted to another level. Even though they move in the same way, coconut oil is higher priced than tallow since that time.

A scatter diagram was constructed with tallow price as the independent variable and coconut oil price as the dependent variable as shown in Chart VII. Grease was eliminated because its price moves in exactly the same way as tallow. A straight line of regression was drawn freehand. The prices during the 1948-1951 period were out of line. The 1950 price can be explained by the out-break of the Korean War. Governments fearing the beginnings of another global holocaust rushed to stock-pile coconut oil.

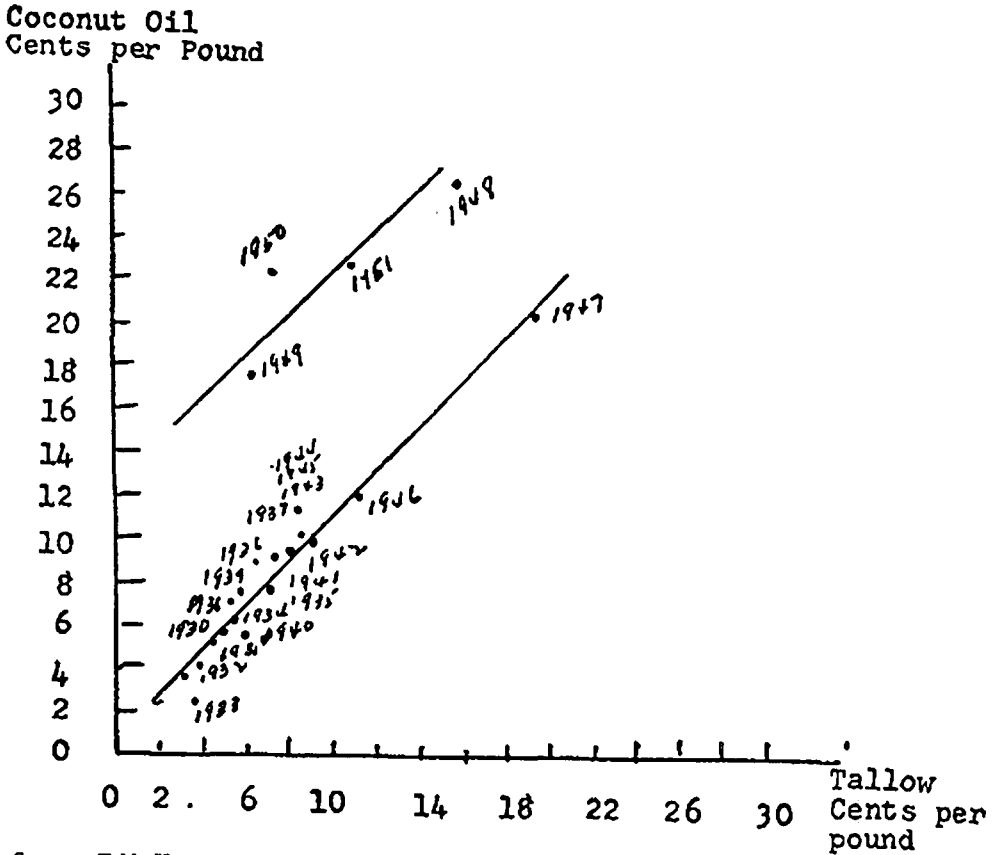
To obtain a better insight to the relationship between the prices of tallow and the prices of coconut oil, the average monthly prices of these commodities were plotted on Chart VIII. Notice that the series started to separate during the early part of 1948. There are two contributory factors to the situation. First, the fact that coconut oil is highly valued as a food fat in Europe kept the prices high. Second and the more important fact is the situation of the beef industry. Tallow, a by-product of beef, was fast declining as the meat packing industry kept on high levels of productivity until in 1951 it returned to its pre-war levels.

Mathematically the two levels of correlation may be described by regression lines. If simple correlation were used, the difference in the equations would be only the values of at the

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CHART VII

ANNUAL AVERAGE WHOLESALE PRICES OF COCONUT OIL
AND TALLOW RELATED IN A SCATTER DIAGRAM
(1930-1951)



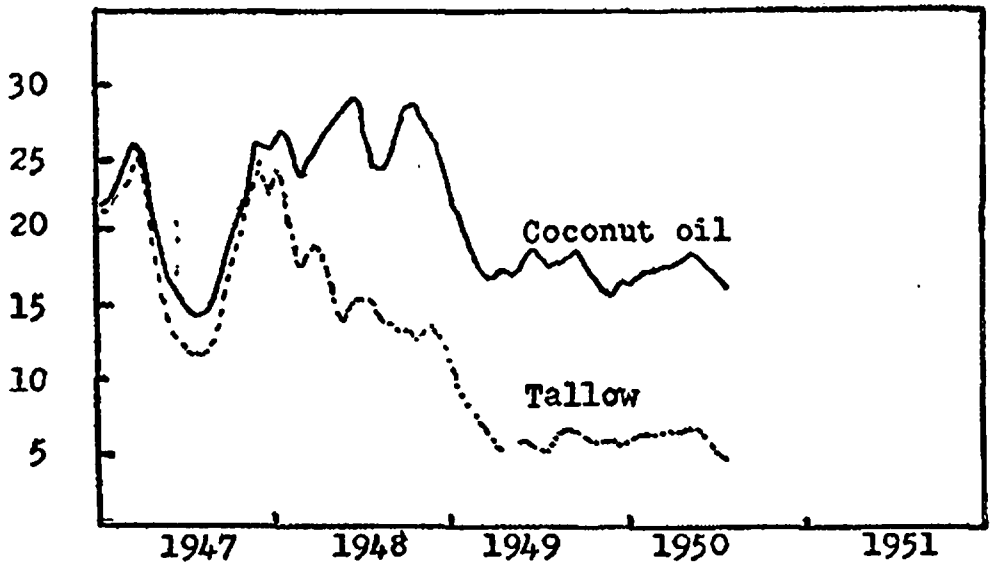
Source: Table V

CHART VIII

Average Monthly Prices of Coconut Oil
And Tallow in U. S.

1947-1951

(Cents per Pound)



Source: Table VI

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points of origin when one factor is zero. As seen from VII the two regression lines are parallel. This means that if the first line describing the linear relationship between the two variables from 1930 to 1947 were represented as $Y_c = a + bX$, a represents the value of Y_c when X is equal to zero, and b represents the typical amount of change in Y for a given change in X . The second line may be represented in the same way and the two equations have the same bX values but differing in a values.⁶ Therefore it could be concluded that even though there is a change in the base relationship between the two lines, there is no change in the relative relationship. A given change in X will give the typical change in Y no matter which equation will be used.

What can we deduce from this study of correlation of prices? First, the relative situations of the two industries have changed. The position of coconut oil industry in relation to the whole economy is much higher than the position of the tallow industry. The term higher should not be confused with the term better. It might be that the position is higher but more precarious. Nor does it refer to absolute values of the industries. It merely means there are many more factors at work in coconut oil industry now than there had been before 1947 or there are factors that depressed the prices of tallow which did not depress the values of coconut oil. Second, in spite of the first observation, the prices of both commodities are sensitive to a third factor enough to be affected in the same way or they influence each other strongly such that they move in the same way.

From the point of view of economic fundamentalism, the behavior of these prices may be explained in this manner. In economic theory we learned that the prices of competing goods move in the same way and that the prices of complementary goods move in opposite direction. But coconut oil and tallow are both competing and complementary goods. That is to a certain extent they can replace each other. The proportion of tallow and coconut oil in soap manufacture can be varied with certain limits. According to the testimony of a chemical engineer, a good soap may contain about eight to seventy per cent coconut oil in fat content.⁷ With more than seventy per cent

the soap will fail to solidify. With less than eight per cent the soap will not lather quickly. Thus even if these commodities are complementary in the manufacture of soap, they are essentially competitive because of the wide range of possible displacement between the two.

Another important tendency is the lag between the two series. Detail inspection of chart VIII will show that coconut oil precedes the movement of tallow. The regression line equations may be used therefore to predict the movement of prices in the tallow industry.

Conclusions

Summing the results of the study we have the following observations:

Production in 1951 seems to be a prelude to levelling off to prewar levels and possibly a decline in the industry.

Declining trend in factory consumption is due to many factors the more important among which are:

- a) The elimination of this commodity from the shortening and margarine fields as a results of political action by farmers.
- b) The partial displacement of this commodity by tallow and grease in the manufacture of soap because of its high price.
- c) The decline in soap production because of the development of detergents.
- d) The importation of babasu oil is a direct threat to the preferential position of coconut oil.

Prices of coconut oil are closely related to prices of tallow and grease. Therefore, developments in the meat-packing industry reverberates in the coconut oil industries. International political development and international price movements influence the price of coconut oil such that the pre-war relationship with tallow prices is no longer present. Yet due to the chief use of this commodity in the U. S. for soap purposes, the

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changes in the price of coconut oil move in the same direction as the changes in the price of tallow.

For the Philippines, the value of the study may be summarized as follows:

It is dangerous to let the copra industry, for that matter any Philippine industry, to be *mainly* dependent on American markets. Lobbying by organized interest may be able to kill any Philippine industry despite any trade agreements between the Philippines and the United States. The case of the margarine industry is an indirect way. There are many other such indirect ways to circumvent trade agreements. The trade agreements of the United States especially with neighbors in their hemisphere make the Philippine position shaky.

It is about time to look for other markets where technological changes do not yet affect coconut oil, preferably in countries that use it as a food product. In such a case the demand may be more stable. On a long run basis, research for new products should be intensified if we want the copra industry to have continued prosperity.

REFERENCES

¹ Another trend has been estimated by the author, but for ethical reasons can not be divulged at the present time.

² See Chart VI.

³ Department of Commerce, "Fats and Oils", *Industry Report* (January 1948) p. 14. U. S. Government Printing Office.

⁴ November 1949, p. 29.

⁵ From the testimonies of various soap manufacturers before the Tariff Committee Hearings of United States Congress in 1934.

⁶ For actual values of the equations write the author.

⁷ According to Prof. Artemio C. Gopez, UST.

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TABLE I
ANNUAL FACTORY PRODUCTION OF
COCONUT OIL IN U. S.
1929-1951

(Millions of Pounds)

<u>Year</u>	<u>Factory * Production</u>	<u>Trend Values **</u>	
		<u>A</u>	<u>B</u>
1929	353	229.8	388.2
1930	353	239.5	354.7
1931	303	249.2	325.3
1932	264	258.9	290.0
1933	351	268.6	278.9
1934	297	278.3	261.9
1935	253	288.0	249.0
1936	258	297.7	240.2
1937	266	307.4	235.5
1938	287	317.1	234.9
1939	273	326.8	238.5
1940	347	336.6	246.1
1941	318	346.3	257.9
1942	111	356.0	273.8
1943	143	365.7	293.8
1944	128	375.4	317.9
1945	151	385.1	346.1
1946	349	394.8	378.4
1947	801	404.5	414.9
1948	557	414.2	455.4
1949	520	423.9	500.1
1950	562	433.6	548.9
1951	497	443.4	591.8

* Source: Commodity Research Bureau, *Commodity Yearbook*.
1939, 1948 and 1952 issues. New York.

** Two mathematical trend lines were computed:

A—Least-squares line with the equation:

$$Y_c = 336.6 + 9.7X, \text{ Origin, 1940; } X \text{ unit of 1 year.}$$

B—Second-degree curve with the equation:

$$Y_c = 246.1 + 9.7X - 2.06 x^2; \text{ Origin 1940 } X \text{ units of 1 year.}$$

Values rounded.

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TABLE II
ANNUAL DISAPPEARANCE OF VEGETABLE OIL
AND COCONUT OIL IN U.S.
1929-1951

(Millions of Pounds)

<u>Year</u>	<u>Total</u> <u>Vegetable</u> <u>Oil *</u>	<u>Coconut</u> <u>Oil **</u>	<u>Coco-Oil</u> <u>Stocks</u> <u>December ***</u>
1929	3859	657	194
1930	3606	655	182
1931	3227	587	204
1932	2839	554	136
1933	3036	574	199
1934	3306	597	189
1935	3781	630	153
1936	3941	637	76
1937	4225	492	178
1938	3962	603	217
1939	4013	600	191
1940	3830	598	258
1941	4619	726	196
1942	3916	202	142
1943	4046	196	129
1944	4001	203	101
1945	4055	159	128
1946	4249	326	103
1947	4658	766	82
1948	4901	666	62
1949	4827	528	150
1950	5380	605	95
1951	4946	563	101

Sources:

* Department of Agriculture, *Agricultural statistics 1952*. Wash. D.C.: Government Printing Office.

** Commodity Research Bureau, *Commodity Yearbooks*. 1939, 1949, and 1952 Issues. New York.

*** *Ibid.*

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TABLE III

FACTORY CONSUMPTION BY CLASSES OF PRODUCTS

1933-1951

(Millions of Pounds)

<u>Year</u>	<u>Total*</u>	<u>Shortening</u>	<u>Margarine</u>	<u>Edible¹</u>	<u>Soap</u>	<u>Other²</u>
1933	584	7	150	69	322	3
1934	590	9	124	78	341	2
1935	582	44	174	87	230	3
1936	602	38	150	60	307	4
1937	426	13	74	50	252	7
1938	524	26	90	61	343	4
1939	497	21	39	44	389	4
1940	497	18	22	55	397	5
1941	600	22	30	54	484	9
1942	171	5	3	15	140	8
1943	191				142	49
1944	200				132	68
1945	147				59	88
1946	295	18	15	4	185	64
1947	730	87	21	15	511	96
1948	643	48	5	34	417	139
1949**	500	5		100	285	110
1950**	506			118	253	135
1951***	462	7		102	197	156

* Not total disappearance. Total of 5 columns only.

¹ Other Edible products.

² Other Industrial products.

Source: *Commodity Yearbook*. Various issues.

** Department of Agriculture, *Agricultural Statistics 1951*.

*** , *Agricultural Statistics 1952*.

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TABLE IV
FATS AND OILS USED IN THE MANUFACTURE
OF SOAP IN U. S., 1925-1951

(Million Pounds)

Year	Coconut Oil		Tallow and Grease		Total Fats
	Pounds **	Percent	Pounds *	Percent	Used
1925	286	20.2	633	44.7	1415
1926	270	18.2	673	45.3	1485
1927	335	20.6	727	44.7	1628
1928	335	20.5	702	42.9	1635
1929	334	19.8	680	40.2	1689
1930	303	19.4	687	44.0	1560
1931	340	22.0	653	42.3	1543
1932	354	23.2	693	45.3	1527
1933	322	22.1	634	43.5	1456
1934	341	21.1	804	49.7	1615
1935	230	15.3	761	50.5	1504
1936	307	19.4	759	48.0	1578
1937	252	15.2	708	42.5	1659
1938	343	20.5	799	47.8	1669
1939	389	21.1	906	49.1	1844
1940	398	21.0	1043	55.1	1892
1941	484	20.7	1368	58.6	2334
1942	140	6.8	1528	74.1	2060
1943	142	7.1	1360	68.7	1995
1944	131	5.7	1530	66.4	2304
1945	59	2.8	1364	64.3	2121
1946	184	9.9	1210	65.1	1857
1947	511	21.7	1526	65.0	2347
1948	417	19.7	1451	68.3	2122
1949	282	15.4	1346	73.4	1832
1950	256	13.6	1363	72.7	1873
1951	197	12.3	1177	73.7	1595

Source: Department of Agriculture, *Agricultural Statistics*,
* 1952 Issue.

** For 1925-1935, 1940 Issue.
For 1936-1940, 1944 Issue.
For 1941-1951, 1952 *Commodity Yearbook*.

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TABLE V
WHOLESALE PRICES OF SOAP FATS
ANNUAL AVERAGES

1930-1951

(Cents Per Pound)

<u>Year</u>	<u>Tallow</u>	<u>Grease</u>	<u>Coconut oil</u>
1930	6.2	5.0	5.9
1931	3.9	2.9	3.9
1932	3.2	2.2	3.2
1933	3.4	2.7	2.0
1934	4.2	3.5	4.6
1935	7.0	6.1	7.4
1936	6.6	5.7	8.0
1937	8.2	7.3	9.0
1938	5.6	4.8	6.1
1939	5.4	4.8	6.1
1940	4.5	4.0	5.6
1941	7.6	7.0	8.4
1942	9.2	8.8	10.9
1943	8.6	8.4	11.0
1944	8.6	8.5	11.0
1945	8.6	8.4	11.0
1946	11.2	10.9	12.0
1947	19.2	18.0	20.7
1948	16.0	13.6	26.3
1949	6.3	5.3	17.4
1950	7.6	7.2	22.3
1951	10.6	10.4	23.3

Source: Department of Commerce, "Fats and Oils," *Industry Report* (July 1950) Table V, p. 16. For 1930 to 1949.

Department of Agriculture, *Agricultural Statistics 1951* for 1950.

Department of Agriculture, *Agricultural Statistics 1952* for 1951.

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TABLE VI
WHOLESALE PRICES OF SOAP FATS
Monthly Averages
(Cents Per Pound)

<u>TALLOW</u>				
<u>Month</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
January	21.8	25.2	9.2	6.3
February	22.7	17.0	7.9	6.1
March	26.2	19.0	6.3	6.3
April	23.2	17.4	5.2	6.2
May	14.3	13.8	5.6	5.9
June	12.4	15.8	5.5	5.0
July	11.8	15.8	5.4	
August	11.9	13.4	6.9	
September	16.8	13.3	6.4	
October	21.6	12.9	5.9	
November	25.4	13.9	5.9	
December	22.3	12.4	5.8	
<u>Coconut Oil</u>				
January	21.8	27.0	18.2	17.2
February	23.3	23.5	16.8	17.1
March	26.1	25.4	17.6	17.9
April	23.9	27.0	17.2	18.3
May	17.6	28.2	18.8	17.4
June	15.6	28.8	17.4	16.1
July	14.3	24.5	17.8	
August	14.5	24.4	18.9	
September	18.5	28.1	16.4	
October	21.8	28.6	16.0	
November	26.0	26.5	16.7	
December	25.5	23.5	16.6	

Source: Department of Commerce, "Fats and Oils" *Industry Report* (July 1950) Table V p. 16.