

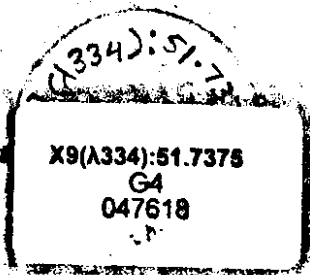
Competitive Position of Lard in the Market of Animal and Vegetable Fats and Oils

BY RAINER SCHICKELE AND THEODORE W. SCHULTZ

AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

R. E. BUCHANAN, DIRECTOR

AGRICULTURAL ECONOMICS SECTION



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Competitive Position of Lard in the Market of Animal and Vegetable Fats and Oils¹

BY RAINER SCHICKELE AND THEODORE W. SCHULTZ²

Lard ranks second among the domestically consumed fats and oils, exceeded only by butter. Lard constitutes about one-sixth of the total value of hog products. It is one of our most important export commodities; between 85 and 90 percent of the lard entering international commerce is of American origin. Yet in spite of its economic importance, especially to the hog producers of the Corn Belt, practically no work has been done to investigate the production and market characteristics of lard and its competitive position relative to other fats and oils. The literature dealing with the market situation of butter, margarine, tallow, coconut oil and other vegetable oils is fairly extensive but, peculiar as it seems, lard has never been dealt with in a systematic and comprehensive manner.

The purpose of this study is to analyze the production characteristics and price structure of lard and to determine the position it holds in competition with other animal and vegetable fats and oils. Three fundamental questions present themselves: (1) What are the determinants that control the production, consumption and exports of domestic lard? (2) to what extent does the market situation of lard affect the hog industry and the income of hog producing farmers? and (3) what kind of competition does lard face in both the domestic and foreign market and how may its competitive strength be improved? To ascertain the answers to these questions it has been necessary to consider a number of specific phases of the lard problem the more important of which are: the production characteristics of lard, the behavior of lard prices, the price relationship and competitive interaction existing between lard and vegetable oils, the effects of the oil tariff policy on the lard market, and the prospective outlook of the lard export trade. Throughout, however, the economic importance of significant structural and functional facts have been stressed, often, indeed, at the expense of technical details and minuteness of description.

¹ Project No. 326 of the Iowa Agricultural Experiment Station.

² The writers wish to acknowledge the assistance given by the Bureau of Agricultural Economics, United States Department of Agriculture; the Institute of American Meat Packers, Chicago; the research department of Swift and Company; the Armour's Livestock Bureau, and especially that given by Dr. K. Brandt, Institut für landwirtschaftliche Marktforschung, Berlin, in securing valuable data and information. Particular acknowledgment is made to Dr. A. G. Black for his valuable criticisms. It was he who initiated the project and aided materially in developing the problem. The writers are also indebted to Professors M. D. Helser and P. Mabel Nelson, Iowa State College, for their assistance.

TABLE 1. UNITED STATES PRODUCTION OF LARD AND PORK.
(Millions of pounds)

Year	Total lard production*	Federally inspected lard production*	Commercial lard production**	Total pork production*	Federally inspected pork*	Commercial pork production**	Percentage		
							Fed. insp. lard of total	Com'l lard of total	Fed. insp. lard of com'l lard
1910-1914	1,614	948		6,361	3,733		99		
1920	2,056	1,321		7,455	4,539		64		
1921	2,114	1,379	1,575	7,645	4,730	5,317	65	74	88
1922	2,357	1,575	1,750†	8,260	5,157		67		
1923	2,783	1,971	2,132	9,595	6,351	7,166	71	77	92
1924	2,746	1,923	2,146†	9,279	6,057		70		
1925	2,223	1,452	1,672	8,255	5,235	6,124	65	75	87
1926	2,324	1,513	1,745†	8,181	5,099		65		
1927	2,356	1,557	1,795	8,533	5,495	6,244	66	76	87
1928	2,594	1,750	2,023†	9,387	6,069		68		
1929	2,598	1,763	2,041	9,223	5,911	7,099	68	79	86
1930	2,344	1,521	1,736†	8,809	5,544		65		
1931	2,385	1,554	1,750	8,907	5,609	6,628	65	73	89
1932	2,413††	1,573	1,771†	8,867††	5,583		65		

Note: Because of the general lack of precision in the use of terms pertaining to lard production, and since available statistical data are often not clearly defined, it is necessary that the following terms be clearly kept in mind. In dealing with figures on the volume of lard production, distinction should be made between "total lard production" which includes all lard produced whether commercially or on farms, and the "federally inspected lard production" comprising only the lard obtained from federally inspected slaughter, and the "commercial lard production" which represents all lard entering market through wholesale trade or retail butcher shops.

* U. S. Dept. of Agr., Bur. of Agr. Ec. Statistics of meat production. ** U. S. Dept. of Com., Bur. of the Census. Biennial Census of the Meat Packing Industry (quoted in Statistical Abstracts of the United States). † Estimates based on the ratio between federally inspected and commercial lard production in the census years. †† Estimates based on the ratio of federally inspected production to total production in 1931.

LARD PRODUCTION AND ITS IMPORTANCE

VOLUME OF LARD PRODUCTION

Lard is a by-product of the hog industry. Its production is dependent upon the production of pork. The demand for pork influences the amount of lard produced much more than does the demand for lard. As a result the output of lard follows closely changes in hog slaughter irrespective of the specific market situation of lard. The dependence of the supply of lard upon the supply and demand situation of pork³ is undoubtedly one of the most important technical factors determining the economic position of lard.

About a fourth of the total lard produced in the United States is rendered and used on farms hence does not appear on the market.⁴ The remainder enters commercial channels

³ The term "pork" as used in this study, excludes lard. The term "hog products" is applied to pork and lard combined.

⁴ The total lard production figures are estimates published by the U. S. Dept. of Agr. The data covering federally inspected slaughter come from the same source, but because they are based upon the actual reports obtained from all federally inspected packing plants they may be considered more accurate and reliable. A. E. Taylor, Corn and Hog Surplus of the Corn Belt, p. 81, discusses the adequacy of the statistical materials covering hogs and hog products. For complete bibliographical information about publications quoted in footnotes, see "List of References."

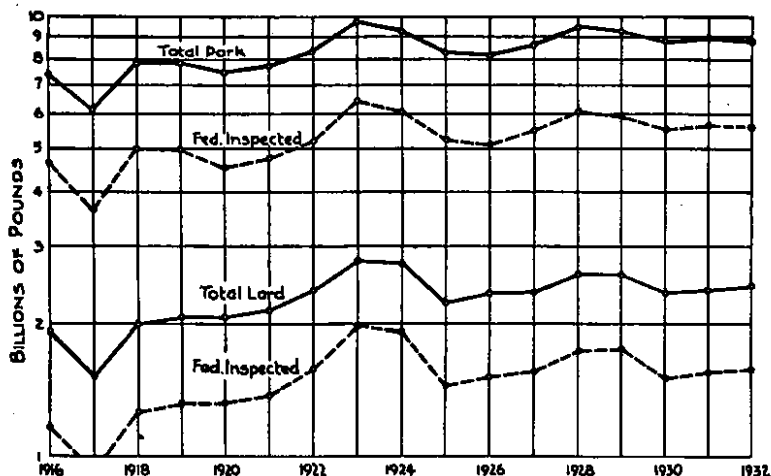


Fig. 1. United States total and federally inspected production of pork and lard.

and constitutes the market supply. Of the lard entering trade channels, approximately 87 percent is obtained from hogs slaughtered under federal inspection.⁵

The secular movements of lard and pork production are shown in table 2. Taking the period 1910-1914 as a base the production index for lard in 1931 was 148; for federally inspected lard it was 164. Two reasons account for the relatively greater increase in federally inspected lard production: (1) the higher proportion of the total hog slaughter that is now covered by federal inspection, and (2) a higher yield from 100 pounds⁶ of live hog as a result of the technical improvements in rendering methods. The second of these can be attributed very largely to the shift in consumers' taste toward a more lean pork, which results in more trimming fats and fat pork cuts being rendered into lard.

TABLE 2. LARD AND PORK PRODUCTION INDEXES AND RATIOS OF LARD TO PORK.*

Year	Total lard	Federally inspected lard	Total pork	Federally inspected pork	Lard obtained for every 100 pounds of pork	
					Total slaughter	Federally inspected slaughter
1910-1914	100	100	100	100	25	25
1923	172	208	151	170	29	31
1930	145	160	138	149	27	27
1931	148	164	140	150	27	28

* Based on data appearing in table 1.

⁶ All pork and lard entering interstate commerce must be slaughtered under federal inspection.

THE FLEXIBILITY OF THE LARD OUTPUT

Although lard production is clearly dependent upon the number of hogs slaughtered, there nevertheless exists some flexibility in the amount of lard rendered. Within narrow limits lard production does respond to the conditions of the lard market. By increasing or decreasing the lard yield per 100 pounds of live hog it is possible for packers and butchers to adjust, to some extent, the supply of lard to market demand.⁶

The lard yield may vary from 9 to 19 percent of the live weight of the hog. In the slaughtering and dressing process, about 9 to 12 percent of the live weight emerges as lard. By rendering part or all of the fat backs and other fat pork cuts into lard, the yield can be increased to nearly 19 percent and in case of heavy hogs to even more. The extent to which fat backs and other fat pork cuts are rendered into lard rather than sold as pork and the extent to which fat is cut from ham, shoulder, loin, bellies and other cuts, determines the actual lard yield much more than does the original live weight of the hog.

TABLE 3. POUNDS OF LARD OBTAINED FROM 100 POUNDS OF FAT PORK CUTS.*

Class of pork cuts	Pounds of lard obtained
Leaf fat	92-94
Fat backs	81-87
Ham facings	75
Clear facings	79-82
Neck fat	70

* Clemen, R. A. *By-products in the Packing Industry*, p. 89.

In going from the 180-220 pound to the 220-250 pound weight class the lard yield is increased considerably, but it does not increase materially for the weight classes over 250 pounds. If the fat backs are not rendered into lard, the yield of the heavier weight hogs is actually less than that of the 180-220 hogs. The percentage of leaf lard obtained from the several weight classes of hogs seems to be constant. Wide variations in lard yield are not uncommon, however, within a given weight class.⁷

Variations in lard yield are attributable to the following physical factors: (1) The proportion of fat backs and other fat pork cuts that are rendered into lard; (2) the care used in trimming of cutting fats in preparing the commercial pork cuts; (3) the live weight of hogs; (4) whether hogs tend towards lard or meat; (5) the feeding methods employed in fin-

⁶ The term, "lard yield," as used throughout this study refers to the amount of lard rendered per 100 pounds of live hog.

⁷ Institute of American Meat Packers, Chicago. *International Swine Show, Chicago, 1931-32.*

TABLE 4. LARD YIELDS BY WEIGHT CLASSES OF HOGS IN PERCENTAGE OF LIVE WEIGHT.*

Hogs, weight classes	Lard from killing and cutting fats, excl. leaf fat and fat backs	Lard from killing and cutting fats, fat backs and leaf fat	Fat backs**	Leaf fat (rendered to lard)
Pounds	Percent	Percent	Percent	Percent
180-220	14.6	16.4	***	2.2
220-250	13.0	18.2	4.0	2.2
250-290	12.0	18.4	5.3	2.2
290-350	11.8	18.8	6.0	2.2

* Made available through the courtesy of Institute of the American Meat Packers, Chicago.

** Commercial cuts, 81-87 percent of which emerges as lard if rendered.

*** No commercial fat backs obtained.

ishing hogs for market. These factors are tentatively listed in the probable order of their relative importance.

Only in rare instances are the extreme ranges of the possible lard yield reached. Some fat backs are sold as meat cuts. Then, too, fat is trimmed and cut off only more or less carefully from hams, loins, bellies and other pork cuts. Moreover, table 4 indicates that there is a tendency for the lard yield from the various weight classes to equalize. With decreasing weights, the lessened lard yield from fat backs is partly offset by larger yield from killing and cutting fats. Light hogs, used chiefly for prime, fresh, lean, pork and cured pork production, are trimmed more scrupulously than the heavier types of hogs, which also tends to equalize the difference in lard yields between the lighter and the heavier weight classes. With the bulk of hogs slaughtered falling into the 220-250 weight class, and with a fairly well established market for salted fat backs in the South, which diverts a considerable part of the fat backs away from the lard kettle, the average yearly lard yield fluctuates relatively little. This is confirmed by table 5. The monthly figures for lard yields fluctuate considerably more than the average annual yields, and the relatively small correlation of monthly lard yields to live weights is quite apparent.

It is worth while to consider more closely the less obvious variations in the lard yield since they are characteristic of the market situation of both pork and lard, and indicate how and to what extent the packer is able to adjust the relative pork and lard output to changes in the relationship of their prices.

As already noted, the proportion of fat backs rendered into lard, and the care used in taking off the trimming and cutting fats from commercial pork cuts, have considerable influence on the lard yield. Hence, the price ratio of pork to lard affects

TABLE 5. YEARLY AND MONTHLY FLUCTUATIONS OF LARD YIELDS IN PERCENTAGE OF LIVE WEIGHT COMPARED WITH THE AVERAGE LIVE WEIGHT OF HOGS, UNITED STATES.*

Year	Lard yield (percent)	Average live weight of hogs (pounds)	Month	Lard yield 1932 (percent)	Average live weight of hogs, 1932
1922	16.22	226	Jan.	15.12	226
1923	16.49	225	Feb.	15.82	227
1924	16.45	222	Mar.	15.63	228
1925	15.04	226	Apr.	15.21	229
1926	15.89	235	May	15.44	227
1927	15.36	233	June	16.22	232
1928	15.40	229	July	15.21	241
1929	15.75	232	Aug.	14.45	240
1930	14.90	231	Sept.	13.85	236
1931	14.96	233	Oct.	13.83	225
1932	15.19	230	Nov.	15.07	226
1933	15.47	232	Dec.	15.81	227

* U. S. Dept. of Agr. Yearbook. Also Crops and Markets reports.

the amount of fat backs and trimming fat rendered to lard. If lard is high in price relative to pork, the tendency is to render more fat backs and to trim more carefully, but if the price of pork is high relative to lard, the reverse tendency prevails. But, here again it should be noted, the reduction in the proportion of cutting fats is effectively checked by the fact that the American consumer insists on lean meat, especially when meat prices are high. It would appear that the most satisfactory way to compute the ratio between pork and lard prices would be to take an average composite price for all pork cuts, except fat backs, and compare it with the price of fat backs. Unfortunately, data are not available to compute such a composite price for all pork cuts. Instead it has been necessary to use the composite price of fresh pork as quoted in the Monthly Labor Review.

The first curve in fig. 2, represents the relationship that has prevailed between the pork to lard price ratios and lard yields. In the second curve the average live weights of hogs were plotted against the deviations from the price ratio—lard yield curve. The remaining residuals are explained fairly well by the influence of the lard export situation on lard yields as demonstrated by curve three.⁸ Good opportunities in the lard export trade, especially during the years 1923, 1924 and 1929, operated toward high lard yields. The reasons why the lard yield in 1926 is so much out of line, that is, why it was so much higher than the combined influences of the three factors—price ratio, live weight of hogs, and exports—appear to indicate, is explained principally by the sharp decline in cotton prices in 1926. They dropped from 18.2 in 1925 to 10.9 cents per pound in 1926, which greatly reduced the demand for fat

⁸ The lard export figures were adjusted for the trend.

backs in the South; consequently, a larger proportion of the fat backs had to be rendered into lard.

The drop in the demand for fat backs probably would be adequately expressed if a composite price of the kind suggested above were employed, but in the fresh pork composite price, used in this analysis, appropriate weight is not given to this factor. But even so it can be stated that the post-war year

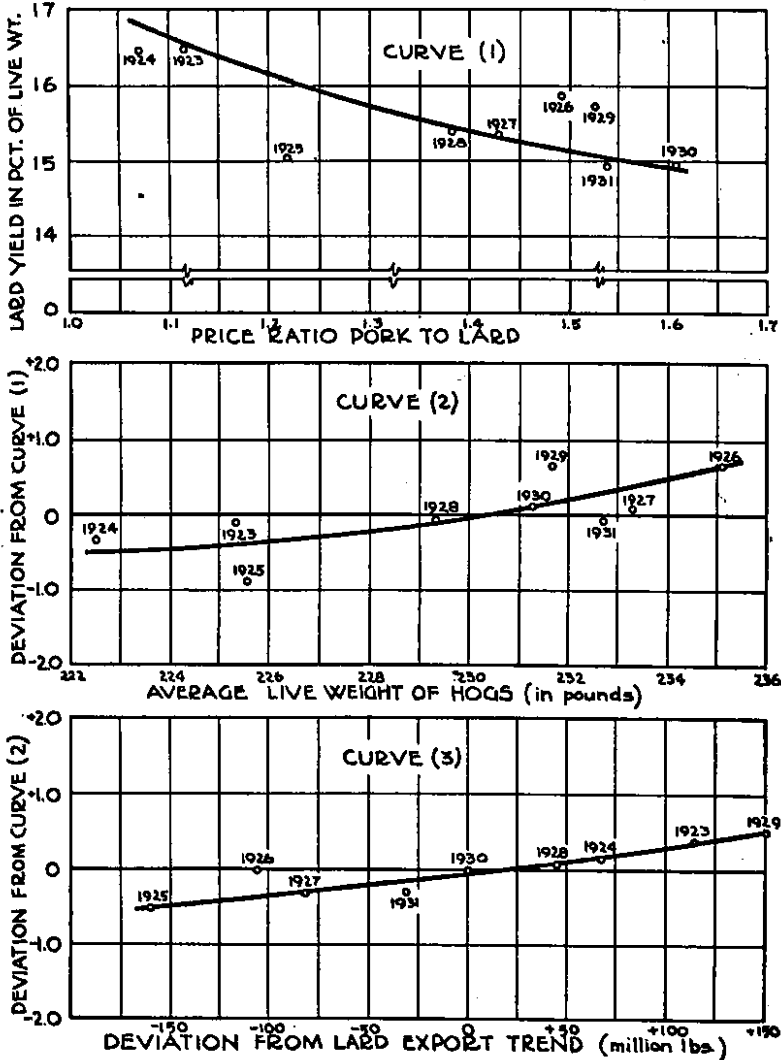


Fig. 2. Correlation between lard yield and pork to lard price ratio, live weight of hogs and lard exports.

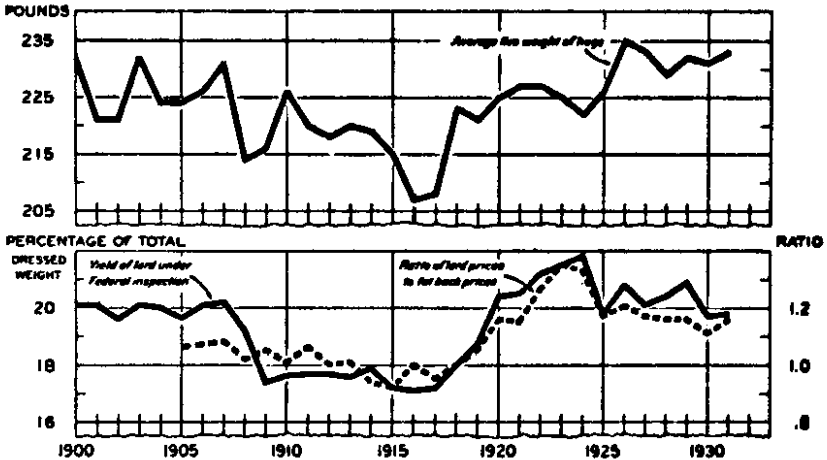


Fig. 3. Live weight of hogs, lard yield and the lard to fat back price ratio.
(Chart from the U. S. Dept. of Agr., Bur. of Agr. Ec.)

to year variations in lard yields are explained fairly satisfactorily by: (1) the pork to lard price ratio, (2) the live weight of hogs, and (3) the export trade.

The relationship of pork and lard prices appears to be first in importance for, as indicated above, it often overshadows the influence of live weights of hogs which is commonly believed to be the predominant factor in determining the lard yield. Figure 3 further supports these conclusions. It shows clearly the close relation that prevails between lard yields and the price ratio of lard to fat backs. On the other hand, it indicates that lard yields are related only secondarily to the live weight of hogs.

COMPARATIVE VALUE OF PORK, LARD AND HOGS

To compare the value of live hogs with lard by using wholesale prices of lard is quite inadequate since lard is already a processed product ready for consumption. In order to make such a comparison valid, one would have to subtract the processing cost (cutting, rendering, etc.) from the wholesale price in calculating its value in comparison with live hogs. But this would necessarily take one into very doubtful grounds, namely, determining the cost of various production processes.

It is possible, however, to make a much more exact and reliable comparison of the relative values of pork and lard. Both are processed products, ready for consumption. In fact the cash income of the hog industry, depends primarily upon the prices received from these products. That the price of lard influences the prices paid for live hogs is obvious. Yet very

TABLE 6. VALUES OF LARD, PORK AND LIVE HOGS COMPARED ON THE BASIS OF 100 POUNDS LIVE WEIGHT.

Year	Value of 100 lbs live hog ^a	Wholesale value of hog products (pork and lard) from 100 lbs. live hog 53.78 lbs.*	Wholesale value of lard from 100 lbs. of live hog**	Value of pork (excl. lard) from 100 lbs. of live hog***	Value of lard in percentage of hog products value (pork and lard combined)	Value of lard in percentage of pork value	Value of lard in percentage of live hog value
	Dollars	Dollars	Dollars	Dollars	Percent	Percent	Percent
1929	10.51	12.14	2.05	10.09	16.9	20.3	19.5
1930	9.85	11.90	1.82	10.08	15.3	18.1	18.5
1931	6.65	9.25	1.33	7.92	14.4	16.8	20.0

^a Edinger, A. T. Retail Meat Prices and Their Relation to Livestock Prices. U. S. Dept. of Agr., Bur. of Agr. Ec., February, 1932 (mimeographed).

^{**} Computed from reports on lard yields obtained at federally inspected packing plants, Crops and Markets, and refined lard wholesale price at Chicago, The National Provisioner.

^{***} Column 2 minus column 3.

little exact information is available showing how and to what extent changes in the price of lard or pork affect the price that the producer receives for hogs.

COMPARATIVE VALUE OF HOG PRODUCTS

According to A. T. Edinger⁹ the packing industry obtains approximately 59.4 pounds of hog products from 100 pounds of live hogs. This is roughly 75 percent of the carcass weight. In the hands of the wholesalers this is reduced to around 53.78 pounds when allowance is made for the processing and shrinkage that takes place while the meat and lard are in the wholesale stage. A further reduction takes place in the retail trade. About 52.64 pounds of hog products are turned over to the consumer for every 100 pounds of live hogs originally slaughtered.

The value of lard compared with the value of pork has declined sharply in recent years (table 6). But since the value of live hogs dropped more than that of hog products the value of lard has increased slightly, compared with the value of live hogs. The latter comparison therefore is likely to be somewhat misleading with regard to conclusions as to the relative value of lard. During the period from 1929 to 1931 the value of the lard obtained from 100 pounds of live hogs dropped about 35 percent, the value of the pork declined around 22 percent, the hog product value 24 percent, and the live hog value 37 percent. This is in line with the general economic rule that raw materials during general price declines drop more rapidly in price than processed goods. Lard, how-

⁹ Edinger, A. T. Recent Trends in Retail Meat Prices and Their Relation to Livestock Prices. U. S. Dept. of Agr., Bur. of Agr. Ec. Feb. 25, 1932 (mimeographed).

TABLE 7. A COMPARISON OF COMMERCIAL PRODUCTION VALUES OF LARD, PORK AND HOG PRODUCTS FOR THE CENSUS YEARS, 1921 TO 1931.

Census year	Value of pork and lard combined*	Value of pork products (excl. lard)*	Value of lard*	Value of lard to hog products	Value of lard to pork	Value of lard to live hogs**
	Millions of dollars	Millions of dollars	Millions of dollars	Percent	Percent	Percent
1921	1,108	918	190	17.1	20.7	...
1923	1,302	1,038	264	20.3	25.4	30.2
1925	1,548	1,268	280	18.1	22.1	22.7
1927	1,356	1,121	235	17.3	21.0	21.0
1929	1,521	1,273	248	16.3	19.5	20.1
1931	1,001	852	149	14.9	17.5	21.6

* U. S. Dept. of Com., Bur. of the Census, Biennial Census of Manufactures, Slaughtering and Meat Packing and Related Industries.

** Based on reports from federally inspected slaughter, U. S. Dept. of Agr., Crops and Markets and weighted average hog prices at Chicago taken from U. S. Dept. of Com., Statistical Abstracts, and refined lard price at Chicago, The National Provisioner, Chicago, Ill.

ever, has shown during the depression period a particularly weak resistance to price decline. Several factors account for this: (1) curtailment of the export markets, (2) the character of lard as a by-product and (3) the increasing competition from substitutes.

Another approach to the question of the relative value of lard is to compare the total values of annual pork and lard production. The data most adequate for that purpose are those published by the Biennial Census of Manufacturers. They are based on reports of all domestic slaughtering and meat packing establishments representing the commercial pork and lard production.¹⁰ Here, too, the relative decline of the value of lard is evident. There is, in fact, a remarkable accordance between the value ratios for 1929 and 1931 of this and those of the preceding comparison of values. (See tables 6 and 7.)

PRICES OF PORK, LARD AND HOGS

A comparison between hog and lard prices has some significance in indicating the relative changes that have occurred between them. To the extent that hog prices are a function of pork and lard prices, the ratio of hog to lard prices should throw some light on the effect which changes in lard prices have upon live hog prices.

¹⁰ For computing the value proportion of hogs and lard or of pork and lard, it seems advisable to base the calculation on commercial slaughter and lard produced therefrom, instead of using the total production, because (a) the estimates of hogs consumed on farms, and the estimates of lard rendered and consumed on farms might have a different degree of accuracy, and because (b) in the valuation of hogs and lard consumed on farms one encounters some difficulties which are nearly impossible to overcome.

The price ratios of pork and of live hogs to lard fluctuates more than the respective value ratios because of the, although limited, adjustability of lard output to the pork to lard price ratio.

In 1923 and 1924 lard was even higher in price than fresh pork, due principally to the exceptionally favorable opportunities in the lard export trade. Lard exports from the United States were at that time the highest on record. In spite of the largest domestic lard and pork supplies ever recorded, lard prices were not as much depressed as pork prices because foreign markets readily absorbed the surplus lard but not the increased production of pork.

From a study of the price differentials between lard and fat backs shown in fig. 4 and the price ratios in the last column of table 8 and the lard yields in table 5, it is evident that if the fat back prices approach lard prices as in 1921, 1925 and 1930, the lard yields are reduced. It then becomes profitable for packers to sell fat backs as pork cuts rather than to render them into lard. The reverse is true for such years as 1923, 1924 and 1927. Note that fat back prices follow more closely the movements of lard prices than those of either pork or hogs. This is also expressed in the small variations in the fat back to lard price ratio as compared with the pork to lard and hog to lard price ratios. The relative variation of the latter two ratios have been about twice (19 percent and 18 percent, respectively) that of the former (9 percent).

TABLE 8. PRICE RATIO OF PORK, FAT BACKS AND LIVE HOG TO LARD, 1923 TO 1932.

Year	Fresh pork composite prices Chicago* (cents per lb.)	Weighted average hog prices Chicago** (cents per lb.)	Fat back prices† Chicago (cents per lb.)	Refined lard prices Chicago*** (cents per lb.)	100 lbs. of pork would buy— lbs. of lard	100 lbs. of live hog would buy— lbs. of lard	100 lbs. of fat backs would buy— lbs. of lard
1923	13.6	7.55	10.33	13.9	98	54	74
1924	14.2	8.11	10.99	14.6	97	55	75
1925	20.5	11.81	15.32	17.9	115	66	86
1926	22.4	12.34	14.02	16.9	133	73	83
1927	18.3	9.95	11.70	13.7	134	73	85
1928	17.0	9.22	11.45	13.3	128	69	86
1929	18.3	10.16	11.13	13.0	141	78	86
1930	17.5	9.47	10.87	12.0	146	79	91
1931	12.3	6.16	7.79	8.9	138	69	87
1932	8.1	4.04	5.00	5.8	140	70	86

* U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

** U. S. Dept. of Com., Stat. Abst. of the U. S.

*** U. S. Tariff Commission, Report 41; and from 1931 on through 1932, The National Provisioner.

† U. S. Dept. of Agr., Stat. Bul. 18, p. 194; and, for 1925 to 1932, estimates by Bur. of Agr. Ec. based on price of dry salt backs at Chicago and New York.

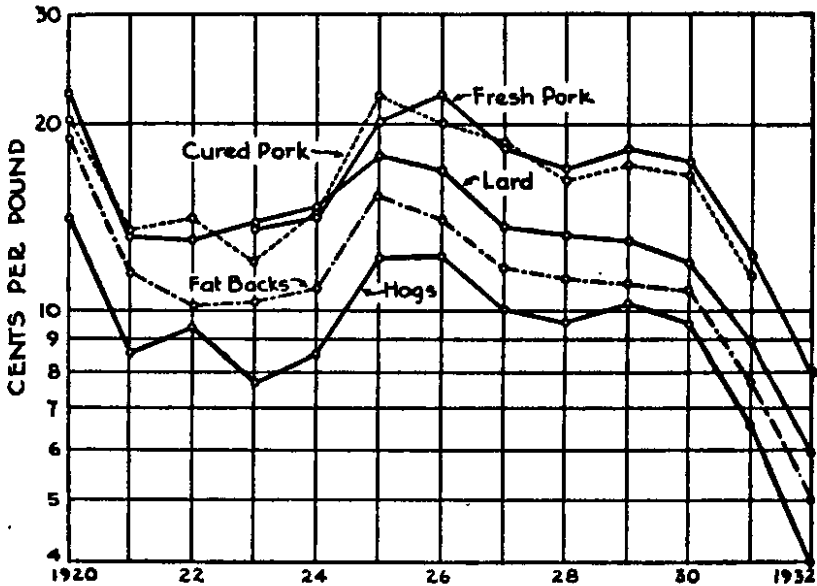


Fig. 4. Wholesale prices of hog products and live hogs.

LARD PRODUCTION ORIGINATING IN IOWA

Iowa produces slightly less than 20 percent of the total hogs of the United States.¹¹ If one assumes that a uniform proportion of the live weight of hogs emerges as lard, of the 2.5 billion pounds annually produced about 475 million originate in Iowa. Hogs produced in Iowa, however, yield considerably more lard than those marketed in most other parts of the United States. They are predominantly fed on corn and, in addition, they are fed to much heavier weights than is usual for the country as a whole. The lard yield, therefore, relative to the live weight tends to be greater than the average.

But even though one allows for the heavier weight, one would still not have satisfactory estimates of the quantity of the lard originating from hogs produced in Iowa. The hog industry of Iowa is highly commercialized, a relatively small part of the total production of hogs in the state is slaughtered on farms or by local butchers. The lard yields of hogs slaughtered in packing plants are considerably higher than those from farm and local slaughter: First, because on farms some killing fats are either discarded or made into soap, and the pork cuts are not trimmed as carefully which results in much of the hog fat being consumed as meat; second, because on the farm and in the small butchering establishment the

¹¹ This figure is an average for 1924-30. For 1931, Iowa's output represented 21 percent of the total. U. S. Dept. of Agr. Farm Value, Gross Income and Cash Income from Farm Production.

technical equipment for rendering fats is rather obsolete compared with that commonly employed in modern packing plants. Certainly, considerably more than one-fifth of the total lard output of the United States is rendered from hogs originating in Iowa.

It is possible to obtain a fairly adequate estimate of the proportion of the total lard supply that originates in Iowa by studying the commercial lard output rather than the total production. By this procedure one can adjust for the highly commercialized status of the hog industry in Iowa. This procedure has a further advantage, namely, commercial lard represents, as already noted, the actual physical market supply. The lard that is used and produced on farms does not influence lard prices as far as it is possible to determine such effect statistically; nor has it had any apparent influence on the market situation. Since this study is primarily an analysis of the role that lard plays relative to the profitableness of the hog enterprise, attention throughout is focused upon those technical and economic factors that influence the market situation of lard.

Tables 9 and 10 indicate the extent to which hog production is commercialized in the various regions of the United States. It is at once apparent that the hog producers in Iowa are much more dependent upon market outlets than those of any other region. In table 9 the commercial and farm slaughter have been segregated. Note that in the Atlantic and Southern States farm slaughter far outweighs commercial slaughter; in contrast, in the North Central and Western States hogs are

TABLE 9. FARM AND COMMERCIAL SLAUGHTER OF HOGS BY REGIONS FOR THE UNITED STATES AND FOR IOWA.*
(Millions of pounds)

Region	1924-1928		1929		1930		1931	
	Com'l slaughter	Farm slaughter	Com'l slaughter	Farm slaughter	Com'l slaughter	Farm slaughter	Com'l slaughter	Farm slaughter
United States	12,488	3,590	13,040	3,475	12,168	3,341	12,433	2,978
Iowa	2,877	129	2,955	120	2,858	115	3,102	122
Iowa (percentage of total)	23	4	23	4	24	3	25	4
North Atlantic	162	262	196	237	157	206	106	166
North Central	11,012	1,321	11,486	1,316	10,859	1,279	11,360	1,200
South Atlantic	231	752	233	735	210	709	170	630
South Central	581	1,100	631	1,025	518	987	358	848
Western states	463	161	494	160	424	159	440	134

* Compiled from U. S. Dept. of Agr., Bur. of Agr. Ec. Preliminary Report on Farm Value, Gross Income and Cash Income from Farm Production.

TABLE 10. DEGREE OF COMMERCIALIZATION OF THE HOG ENTERPRISE FOR THE UNITED STATES BY REGIONS AND FOR IOWA.*

Region	Pounds of hogs marketed for each pound of hog slaughtered on farms			
	1924-1928	1929	1930	1931
United States	3.48	3.75	3.64	4.17
North Atlantic States	0.62	0.82	0.76	0.63
North Central States	8.34	8.72	8.49	9.47
Northeast Central	5.14	5.11	4.86	5.30
Northwest Central	11.49	12.30	11.96	13.16
Iowa	22.21	24.62	24.81	25.34
South Atlantic States	0.31	0.32	0.30	0.27
South Central States	0.53	0.62	0.52	0.42
Western States	2.88	3.08	2.66	2.28

* Based on the figures for "Shipments and Local Slaughter" and "Farm Slaughter" reported in the "Preliminary Report on Farm Value, Gross Income and Cash Income from Farm Production," Part I, U. S. Dept. of Agr., Bur. of Agr. Ec. (Summarized Annually in Yearbook of Agriculture.)

raised primarily for sale. Observe that in Iowa farm slaughter constitutes only 3 to 4 percent of the total, while its commercial slaughter represents from 23 to 25 percent of the total commercial slaughter of the country.

The ratio of commercial to farm slaughter, shown in table 10 is of particular interest because it shows the degree of commercialization of the hog industry in the various regions. The higher the ratio the more dependent the hog producers of the area are upon the market situation of hogs.

In the South Atlantic and South Central States, roughly one-half pound of hog is marketed for each pound of hog slaughtered on farms. Clearly, in this region, the hog enterprise is comparatively non-commercial in character and is intended, to a large measure, to supply the pork and lard necessary for the farmer's family.

Although the table indicates that the North Atlantic States also market a relatively small proportion of their hog production, in certain sections of this area a considerable part of the farm slaughter is sold as pork to retail butchers. The figures given for the Northwest Central States are indeed striking. This area which comprises most of the Corn Belt sells approximately 12 times as much hog tonnage as is slaughtered on farms. This is clear evidence of the high degree of commercialization already emphasized. Note, moreover, that in Iowa approximately 25 pounds of hogs are marketed for every pound that is slaughtered on farms. These data suggest the extraordinary degree to which the hog farmer of Iowa is dependent upon lard and pork markets for his economic well-being. One additional comment is noteworthy. The com-

mercialization processes in hog production have been steadily increasing and it appears that even for the most recent figures the process is still going on; in Iowa, for instance, in 1924-29 the ratio of hogs marketed to farm slaughter was about 22, while in 1931 it was 25.

LARD CONSUMPTION AND ITS COMPETITIVE POSITION

VARIOUS FORMS OF LARD AND THEIR USE

Lard is obtained from pork fat by rendering the fat at high temperature in either open or closed kettles. Pork fat, however, does not represent a homogeneous material. It varies widely in its characteristics, depending upon from what place in the carcass it is derived. For instance, the usual melting point of the back fat (65° F.) is considerably lower than that of leaf fat derived from around the kidneys (74° F.). The quality of lard obtained depends chiefly upon the proportion and quality of the different fats from the various parts of the carcass which are mixed in the rendering kettle.

In addition to these differences in the physical characteristics of pork fats, there are four distinct processes of rendering them which also influence the quality of the lard. They are as follows: (1) About 80 percent of the manufactured lard in the United States is "steam lard" rendered in closed kettles under 30 to 50 pounds of steam pressure and at a temperature of 285° F. and is obtained from the fatty tissues trimmed from hams, bacon, shoulders (cutting fats), from fat backs and parts of visceral fats (killing fats); (2) Most of the remaining 20 percent of the lard is rendered in open steam jacketed kettles at a temperature of 230° to 260° F. from leaf fat and fat backs and represents the highest grade of lard, usually called "leaf lard" and "open kettle rendered lard;" (3) A small percentage of the pork fats are rendered in open kettles at a low temperature of about 126° F. and emerges as "neutral lard" which commonly sells from 1 to 2 cents per pound higher than the other lards and is used almost exclusively as a raw material in the manufacture of margarine; (4) A new process which is called "dry rendering" has been introduced in recent years. The materials usually rendered by the steam method are placed in steam jacketed tanks and heated to about 215° F., the moisture being drawn off by a vacuum process. The lard that results from this method has a flavor different from steam lard. It is darker in color and not so easily bleached. The by-products, that is the remaining cracklings of lard resulting from the dry rendering process, can be disposed of as feed more readily than can the product of the wet rendering processes. The lower moisture content

and acid-free condition (0.3 percent), the higher smoking point (390° F.) and milder flavor may be important factors in establishing the dry rendering method.

An additional word should be added in regard to neutral lard. It is not suitable for direct human consumption and therefore does not appear in the food and retail markets. Production depends entirely on the demand of foreign and domestic margarine manufacturers. This demand appears to have dropped sharply in recent years. Note that in 1924 the production of neutral lard was 68 million pounds or 2.5 percent of the total lard output whereas in 1930 only 27 million pounds of neutral lard were rendered (of which about one-half was exported), representing about 1 percent of all lard produced.

The bulk of the commercial lard is "prime steam lard." Since the proportions of the several pork fats out of which prime steam lard is made vary widely, lard as it is sold to the consuming public is far from a standardized product. The quality of the same brand often varies considerably. It appears that this is likely to be truer for lard sold domestically than for that exported. The lard exported is noted for its uniform quality in the European market. This apparent uniformity, however, is not due so much to the fact that the lard sold abroad is actually better than that sold at home, but it is relatively more uniform than lard coming from European packers, chiefly because of the large output of American packing plants. The fact is that the common lard brands which are sold in the American market do not assure the buyer of a reasonably uniform quality.

One comes to the conclusion that the American packer has not taken enough care nor has he expended considerable effort in attempting to standardize lard. Because of the lack of dependable standards, the competitive position of lard compared with lard substitutes is seriously weakened.

It would appear that packers have in the main considered it more profitable to produce lard substitutes and establish a market for them than to undergo the technical as well as economic difficulties of standardizing their lard.

Several difficulties should be noted which the packer faces if he should attempt to standardize his lard output. Considering the technical difficulties first, it is clear that in order to standardize lard, much more care must be exercised in the rendering process. It is apparent that not sufficient attention has been given to the problem of the proper proportion of the various pork fats, such as back fat, trimming fat, leaf fat, etc., that enter the rendering kettle. Then, too, the effect of the variations in the quality of these various fats upon the final product is not taken into account. It is necessary for the steam rendering business, which today is chiefly a hit and

miss affair, to be refined and separated into a series of rendering processes. Each of these processes should be designed to produce a specific and uniform grade of lard as such processes would have to recognize the proper proportion of the various pork fats as well as the variations in quality and the pressure and temperature that must be applied to obtain desired grades of uniform lard. Another technical consideration is the necessity of rendering pork fats shortly after the hog has been killed¹² in order to reduce the fatty acid content which is closely related to the subsequent rate of deterioration. These are some of the technical difficulties of producing uniform grades of steam rendered lard.

On the economic side the chief difficulty which the packer encounters is that lard is a general commodity produced in numerous establishments widely scattered geographically. The last biennial census of manufacturers indicates that there were 1,200 establishments in the United States producing lard.¹³ Not all of these processed pork. But in view of the many establishments producing lard it is clear that if a particular packer improves his lard rendering processes so as to make a more strictly uniform grade, it is necessary that he establish a market for it separate and distinct from lard in general. The cost of doing this along with loss of alternative opportunities which the lard substitute market heretofore has offered has been an important factor in keeping the packer from developing a more uniform product.

CLASSES OF LARD

There are five classes of lard sold in the domestic market.¹⁴

1. OPEN (KETTLE) RENDERED LEAF LARD.

Made solely from leaf fat. Rendered at a low temperature reaching from 230°F. to 250°F. Smoking point 400°F. Free acid content 0.25 percent. Flavor and odor is neutral or of sweet cracklings. Texture is firm, slightly grainy. Keeping quality excellent.

2. OPEN KETTLE RENDERED LARD.

Made from back fat and leaf fat usually in equal parts. Rendered at 240°F.—260°F., temperature. Flavor nut-like,

¹² The packers here are under obligation to render their lard according to the specifications laid down for prime steam lard in the trade regulations of the Chicago Board of Trade. How difficult it would be to alter this trade regulation has not been investigated during this study.

¹³ While not all of the 1,200 establishments listed by the Census of Manufacturers produce pork, it is important to note that lard production is much more decentralized than the production of lard substitutes. In fact, taking the figure of even 1,200 establishments as producing lard for sale clearly understates rather than overstates the decentralization of lard production since particularly in the East, many small-scale butcher establishments not classified as meat packing plants in the Census, are making small quantities of lard. The significance of this decentralization of lard-producing establishments upon the lack of uniformity of lard is self-evident. See also p. 153.

¹⁴ See Nelson and Lowe, "Use Lard as a Household Fat," and R. A. Clemen, "By-products in the Packing Industry."

odor of sweet cracklings. Texture soft and grainy. Color light, but darker than leaf lard. Keeping quality good.

3. PRIME STEAM OR STEAM RENDERED LARD.

Made from killing and cutting fats. Rendered in closed tanks under 30 to 50 pounds steam pressure at a temperature around 285°F. Smoking point 370°F. Free acid content 0.5 percent. Flavor and odor typically "prime steam" and mild. Texture smooth. Color creamy white. Keeping quality usually satisfactory but varies considerably.

4. REFINED LARD.

Prime steam lard refined by the treatment with Fuller's Earth or some other agent for bleaching, filtering and deodorizing, and by removing moisture and impurities.

5. HYDROGENATED LARD. (For description, see below.)

Lard of the first two classes represents a fairly well standardized product. Its free acid content ranges down from 0.3 to 0.1 percent, and it has, as already noted, good keeping qualities. It brings a price premium, as a rule, over prime steam lard. These two classes, however, comprise only about one-fifth of the commercial lard.

Prime steam lard, which has as a rule a free acid content of about 0.5 percent, is not as good in its keeping qualities as the lard of the first two classes. This lard, which constitutes four-fifths of all lard entering trade channels, is made from a varying mixture of all kinds of pork fat and therefore varies considerably in quality. Again, it should be emphasized that in order that lard may more fairly meet the competition of lard substitutes it will be necessary for the packers to improve lard standards.

Prime steam lard usually does not enter the retail trade unless it has been partly refined, bleached and deodorized.¹⁵ "Refined lard" labeled on the package which the consumer buys in his grocery store means that he is buying a prime steam lard which has been further refined. Open kettle rendered lard, in the main, requires no refining.

HYDROGENATED LARD

During the last few years some of the large packers have experimented with the hydrogenation of lard. By hydrogenation the firmness and texture can be improved considerably and the melting point raised. These properties give it particular advantages when sold in the South, in fact, wherever the climate is hot. The keeping quality is greatly improved

¹⁵ In the trade use the terms "refining" and "bleaching" are interchangeable. Very little lard is actually refined in the sense that it is treated with caustic soda, and still less is deodorized. Furthermore, the process of bleaching lard so as to improve its color and appearance actually harms the lard.

since hydrogenation reduces the rate of deterioration. Furthermore, hydrogenated lard is odorless and of a neutral flavor. This gives it an advantage in some consuming centers, while it tends to be a disadvantage in others. For instance, the demand of the West Indies and the Central and South American countries for a strongly flavored lard¹⁶ operates against the expansion of the lard export market through the use of hydrogenated lard, even though hydrogenation raises the melting point and reduces the perishableness of lard which would appear as factors of advantage in semi-tropical and tropical countries.

Generally speaking, hydrogenated lard has many characteristics similar to those of lard substitutes. As a result its production is primarily dependent upon the price relation that prevails between lard and cottonseed oil, the chief raw material in manufacturing lard substitutes. If the price of cottonseed oil is about the same as the price of lard, hydrogenation is likely to be stimulated; whereas when there is an adverse price differential of several cents hydrogenated lard is not able to compete with lard substitutes. Another difficulty standing in the way of the increased manufacturing of hydrogenated lard is the fact that the processes are protected by patents and therefore cannot be used unless licenses are secured.¹⁷

TRENDS IN THE CONSUMPTION OF LARD AND OTHER FATTY FOODS

GENERAL ASPECTS

In appraising secular changes in consumption of lard and of other fatty foods, it is necessary to distinguish carefully between the dietary and economic aspects. From a dietary viewpoint, the problem involves an analysis of the shifts that have been and are taking place in the proportion of fats relative to protein and carbohydrates consumed. It involves a knowledge of the fat content of meat, milk, cream, cheese, nuts and vegetables (peas, beans, etc.). Because of the wide range of the fat content of many food products other than fats and oils, a quantitative analysis of the dietary position of fats relative to other food ingredients is practically impossible. Nevertheless, some investigations have been made which indicate certain trends in regard to the consumption of fatty food

¹⁶ Clemens, *op. cit.* "Cuba demands a very highly flavored lard called 'Chicarron,'" page 113.

¹⁷ A technical problem which has not been solved involves the degree to which it is desirable to hydrogenate lard. While limiting the process of hydrogenation it is possible not to change very materially the consistency from that of natural lard. Some manufacturers find that the addition of small amounts of certain vegetable oils, not more than 5 percent, to lard in the hydrogenation process improves the quality of the product. The hydrogenation of lard is definitely in the experimental stage.

products.¹⁸ In general, it can be said that with the urbanization of our population and with the greater use of all forms of power machinery, which tends to replace human muscular power, fats and carbohydrates have decreased relative to protein in the average diet. This shift, which has been going on for a long time, is indicated by the growing preference for lean over fat meat and by the increased consumption of milk and meat relative to bread, cereals and potatoes.

The per capita consumption of butter has been markedly upward, while that of margarine slightly upward, since 1921. Lard has remained on about the same general plane, although it fluctuates from year to year depending on the amount produced and exported. Likewise, since 1925, consumption of lard substitutes has been rather stationary, for following the sharp increase in the consumption of lard substitutes in 1925, when manufacturers took advantage of the relative small lard output of that year and of the large cottonseed oil supply and resulting low oil prices, a level of consumption was established which has been maintained.

Although lard consumption increased substantially from the pre-war to the post-war period, this increase appears to be because of the growing demand for pork rather than for lard. The larger supplies of pork brought an increase in the supply of lard and being a by-product of the hog industry, it had to be absorbed. If the development of the foreign markets for lard had not coincided with this increase in hog slaughter, lard prices would have fallen to unprecedented low levels. The present situation definitely supports this opinion. Because of a sharp decline of our lard exports during the past 3 years, lard prices have declined not only absolutely in line with other commodities but also relative to pork prices.

From 1920 to 1924, less than one-half of a pound of lard substitutes was consumed for each pound of lard, but from 1925 to 1931 this ratio stood at two-thirds of a pound of lard substitute for each pound of lard. It is noteworthy that the consumption of lard and lard substitutes combined comprise 55 percent of the total consumption of the four principal fatty foods appearing in table 11.

The various fatty foods have certain production characteristics which are of particular economic significance. For example, an increase in the per capita consumption of butter involves very different production adjustments to those governing the output of lard, chiefly because butter is a major product and lard is, for all practical purposes, strictly a by-product. An upward trend, therefore, in lard consumption cannot be interpreted as implying that the demand for lard

¹⁸ Alsberg and Taylor. *Fats and Oils* (a general view).

TABLE 11. TOTAL AND PER CAPITA CONSUMPTION OF THE PRINCIPAL FATTY FOOD PRODUCTS.

Year	Lard*		Lard substitutes consumption		Per capita consumption of lard and substitutes	Butter† consumption		Margarine‡ consumption		Per capita consumption of butter and margarine
	Total consumption	Per capita consumption	Total**	Per capita***		Total	Per capita	Total	Per capita	
	Million pounds	Pounds	Million pounds	Pounds		Million pounds	Pounds	Million pounds	Pounds	
1905-09	1,046	11.9				1,587	18.2	64	.7	18.9
1910-14	1,095	11.5				1,626	17.0	133	1.4	18.4
1915-20	1,321	12.9				1,529††	14.6††	258	2.5	17.6††
1921-25	1,552	13.9	843	7.4	21.3	1,857	16.6	224	2.0	18.7
1926-30	1,683	14.0	1,170	9.7	23.7	2,103	17.6	288	2.4	20.0
1921	1,223	11.3	763	7.0	18.3	1,714	15.8	275	2.6	18.4
1922	1,558	14.2	752	6.5	20.7	1,774	16.2	189	1.7	17.9
1923	1,707	15.3	748	6.5	21.8	1,879	16.9	205	1.9	18.8
1924	1,749	15.4	814	7.0	22.4	1,966	17.3	238	2.1	19.4
1925	1,522	13.2	1,155	9.8	23.0	1,953	17.0	215	1.9	18.9
1926	1,584	13.5	1,130	9.6	23.1	2,069	17.8	247	2.1	19.9
1927	1,634	13.8	1,166	9.9	23.7	2,100	17.8	256	2.2	20.0
1928	1,763	14.7	1,136	9.5	24.2	2,077	17.4	294	2.5	19.9
1929	1,735	14.3	1,215	9.9	24.2	2,093	17.3	332	2.8	20.1
1930	1,701	13.8	1,205	9.8	23.6	2,174	17.7	312‡‡	2.5	20.2
1931	1,784	14.4	1,149	9.4	23.8	2,223‡	18.0	222‡‡	1.8	19.8

* Statistics of Meat Production, Consumption and Foreign Trade, U. S. Dept. of Agr., Bur of Agr. Ec., p. 9.

** U. S. Tariff Commission, Report 41, p. 159, and, for 1930 and 1931 (production minus exports), Foreign Crops and Markets, July 25, 1932.

*** U. S. Tariff Commission, Report 41, p. 208.

† Snodgrass, Margarine as a Butter Substitute, p. 311. Figures for 1930: Yearbook of Agriculture, factory production 1930 plus estimated farm production 1929, minus net exports.

‡ Average of 1917-1920.

‡‡ Snodgrass, op. cit., p. 314.

‡‡‡ "The Cotton and Cotton Oil News," Dallas, Texas, Vol. 33, no. 37, Sept. 10, 1932.

‡‡‡ U. S. Dept. of Com., Stat. Abst. of the U. S., 1932, p. 619.

has necessarily increased. In fact, the increased consumption of lard, observed for the post-war period, is to be attributed primarily to the greater demand for pork.

Obviously when an expanding demand for pork brings about a larger run of hogs and an increase in pork production, the resulting increase in lard supplies must be sold at whatever price they can command. For butter and margarine the situation is entirely different. These commodities are major products and hence the supply responds more readily to changes in the demand that may manifest itself in the price situation. Lard substitutes, on the other hand, which consist chiefly of cottonseed oil take a position somewhere between these two extremes with regard to their production characteristics. The minimum quantity of lard substitutes produced depends primarily upon the size of the cotton crop since alternative uses of the by-product, cottonseed oil, are limited. Yet cottonseed oil has relatively more uses than those that exist for pork fat. On the other hand, if the demand requires larger quantities of lard substitutes than can be readily provided from a short cottonseed oil supply, the manufacturers simply draw upon the many other vegetable oils offered in the market to supplement the deficient amount of cottonseed oil until they can satisfy the demand for lard substitutes. This happened, for instance, in 1931. (See pages 159 and 173.)

It is very important that one keep in mind the production characteristics of the major fatty foods. Butter, margarine, salad and cooking oil are principally major products. Lard is virtually a by-product, and lard substitutes find a place somewhere between these two groups.

The consumption trends and some of the production characteristics of the fatty foods just discussed, while they apply to domestic conditions do not hold for European countries. In Europe their respective dietary position is quite different. In the United States butter and margarine are most exclusively used as a bread spread, while lard and lard substitutes are used primarily as cooking fats and shortenings. As is shown later, this is far from being true in European countries.

LARD CONSUMPTION IN IOWA

Morgan and Hoyt of Iowa State College¹⁹ in a survey covering 145 farm families in Iowa found that the average farm family for the period 1927-1929 consumed approximately 64 pounds of lard. From one-half to two-thirds of the lard was rendered on the farm; the remainder was purchased from the retail market. The following figures give the annual lard consumption per Iowa farm family for the two districts covered by the survey.

¹⁹ Morgan, E. C. and Hoyt, E. E., Unpublished data. Iowa State College, 1932.

ANNUAL LARD CONSUMPTION OF IOWA FARM FAMILIES

	OELWEIN DISTRICT	CORNING DISTRICT
	1927-1928	1928-1929
Home rendered	33 lbs.	44 lbs.
Bought	24 lbs.	22 lbs.
Total	57 lbs.	66 lbs.

The above figures indicate that even in the center of the hog production area, farm people do not render enough lard to satisfy their domestic requirements.

CONSUMPTION OF FATTY FOODS BY REGIONS

The consumption of lard substitutes relative to lard is largest in the Western and South Central States and smallest in the North Central States. One reason for this geographical variation is the greater firmness, and better keeping quality of substitutes. This gives them a decided advantage over lard in the Southern States. Then, too, most of the lard substitutes are produced in the Cotton Belt, using cottonseed oil as their raw material which further facilitates their use in that area. On the other hand, in the North Central States, where the climate is somewhat cooler and where the hog industry is highly developed, lard dominates.²⁰

TABLE 12 CONSUMPTION OF FATTY FOODS PER FAMILY, BY REGIONS.*
(Pounds per family, 1918)

Region	Butter	Margarine	Lard	Vegetable lard compounds	Butter and margarine	Lard and lard compounds	Consumption ratio, lard to lard compounds
United States	66	22	34	9	88	43	3.8:1
N. Atlantic States	75	12	27	6	87	33	4.5:1
S. Atlantic States	56	14	38	10	70	48	3.8:1
N. Central States	53	41	45	5	94	50	9:1
S. Central States	60	19	38	22	79	60	1.7:1
Western States	89	10	18	16	99	34	1.1:1

* U. S. Dept. of Labor, Bur. of Labor Stat. Bul 541, p. 570.

In the competition between butter and margarine, one finds a totally different situation. It comes somewhat as a surprise to learn that the North Central States, which comprise the dairy section of the country, consume more margarine, both absolutely and relatively to butter, than any other region. Table 12 further indicates that there is a very defin-

²⁰ 1918 is not what could be called a normal and adequate year for gathering these consumption figures which have been used up to the present time for the weighting of the food price index. Indeed, for the United States as a whole, the proportion of the various fats consumed as indicated by the figures in table 12 do not correspond to those resulting from the per capita consumption of the respective fats, presented in table 11.

ite inverse relation between the quantity of butter and margarine consumed; that is, they display marked substitutional character for each other—when butter consumption increases less margarine is used and vice versa. If such a relationship exists between lard and lard substitutes it certainly is not as well defined as that between butter and margarine.

LARD AND LARD SUBSTITUTES

Lard substitutes in the domestic market are the strongest and most direct competitor of lard. These substitutes are frequently referred to as lard compounds or vegetable shortening. Butter hardly enters into this competition because it is too high in price and perhaps also, due to dietary habits, it is not used extensively as a cooking fat. Margarine, too, sells at a considerably higher price than lard, and until 1930, also at a premium over lard substitutes in the retail market. In Europe, however, where the lower grades of margarine sell for less than lard, where margarine and butter are widely used as cooking fats, and where lard, in large areas, is used as a bread spread, the competitive situation of lard is naturally very different from that of the United States.

A study of the price structure of fats and oils shows that in the United States butter and margarine do not to any considerable extent compete with lard as a cooking fat. But there is some competition between vegetable cooking oils, such as cottonseed oil (Wesson) and corn oil (Mazola) and lard. Although the data on these vegetable cooking oils are very fragmentary, it appears that the cheaper cottonseed oil (Wesson) has replaced the high priced olive oil in the American household, that is, the competition has been between these latter two rather than between cottonseed oil (Wesson) and lard. Likewise, the effect of the consumption of corn oil (Mazola) as a cooking oil in its competitive aspects toward lard, probably has been negligible. In general, it may be said that lard faces primarily the competition of lard substitutes,

TABLE 13. DOMESTIC CONSUMPTION OF FATTY FOODS, 1931.*

	Million pounds	Percentage of total
Butter (including farm consumption)	2,223	41
Lard (including farm consumption)	1,784	33
Lard substitutes	1,153	21
Margarine	222	4
Olive oil**	66	1
Total	5,448	100

* Basic data from table 11. Consumption of cooking and salad oils are not included, since no data for 1931 could be obtained. For 1927 and 1929, around 300 million pounds of vegetable cooking and salad oils were produced. See page 162.

** "The Cotton and Cotton Oil News", Dallas, Texas, Vol. 13, No. 37, September, 1932.

and for that reason our attention is being concentrated upon the competition between these two major cooking fats.

OILS USED IN THE MANUFACTURE OF LARD SUBSTITUTES

Lard substitutes include all cooking fats commonly known as lard compounds and vegetable shortenings. They consist of a mixture of animal and vegetable fats and oils, or of pure vegetable oils and appear under various trade names such as Crisco, Snowdrift, etc. Part or all of the vegetable oil is hydrogenated in order to obtain the desired consistency. Blends of lard and tallow were originally used in making these lard compounds, but such blends have been practically discontinued. At present most lard substitutes are made from cottonseed oil, with or without some minor ingredients, such as oleo, stearin, lard, tallow, peanut oil, soybean oil, etc. Upward of 90 percent of the lard substitutes produced in the United States are made from vegetable oils.²¹ Cottonseed oil alone accounts for 80 to 90 percent of the raw material used. Nor is it probable that other oils will soon replace cottonseed oil in the manufacture of lard substitutes. Certain physical characteristics of cottonseed oil, which are described more fully later, definitely restrict its alternative uses. Thus far, at least, the bulk of cottonseed oil production has found its most profitable outlet in the manufacture of lard substitutes.

ADJUSTABILITY OF COTTONSEED OIL PRODUCTION TO DEMAND

Considerable stress has been placed in the above analysis upon the fact that the production of lard does not readily adjust itself to changes in domestic demand. The chief adjustments are made by varying the proportion of fat backs and fat pork cuts rendered into lard and, as is shown when our export trade is considered, by increasing or decreasing lard exports. In the case of changes in the demand for lard substitutes the principal production adjustment necessitated falls upon cottonseed oil. Although cottonseed oil, like lard, is a by-product it does have several alternative uses. It is used in the manufacture of salad and dressing oils, soap and other products of the oil industries. A reduction in the quantity of cottonseed oil employed in making lard substitutes increases the amount available for these alternative uses. Also, the quantity of cottonseed oil exported either as oil or with uncrushed cottonseed is varied. Then, too, the amount of cottonseed that is crushed for oil and the proportion of the oil that is recovered is variable and responds to changes in demand.

Although they differ in degree the production of both lard and lard substitutes does not readily respond to variations in demand. The inelasticity and non-adjustability of the supplies

²¹ See table 17, p. 159, for relative combination of raw materials used in the lard substitute manufacture.

TABLE 14. LARD SUBSTITUTES PRODUCTION,
BY INDUSTRIES AND KINDS.*

	1927		1929		1931	
	Million pounds	Percent	Million pounds	Percent	Million pounds	Percent
TOTAL PRODUCTION	1,239	100	1,257	100	1,208	100
PRODUCTION BY INDUSTRIES						
Lard substitute industry	775	62.5	833	66.2	833	69.0
Packing industry	438	35.4	405	32.2	364	30.2
Other industries	26	2.1	19	1.6	10	0.8
PRODUCTION IN LARD SUBSTITUTE INDUSTRY	775	100	833	100	834	100
Made from vegetable oils and fats solely	537	69.3	639	79.1	601	72.1
Made from animal and vegetable oils and fats	238	30.7	174	20.9	233	27.9

* U. S. Dept. of Com., Bur. of the Census, Biennial Census of Manufactures, 1927, 1929 and 1931.

of these two principal fats bears more severely upon lard prices and the hog producer than it does upon lard substitutes—cottonseed oil and the cotton farmer. This difference is chiefly because the demand curve for lard substitutes seems to be more elastic in character than that for lard. A drop in the price of lard substitutes is likely to increase the amount consumed more than a similar drop in lard prices increases the consumption of lard. Furthermore, since lard makes up about 17 percent of the value of all hog products, while cottonseed oil represents only around 6 percent of the value of all raw cotton products, a decline in the price of lard reduces the income of hog producers relatively more than a similar drop in cottonseed prices cuts down the income of the cotton growers.

PRODUCTION OF LARD SUBSTITUTES

At least 51 percent of the lard substitutes are produced in the cotton growing states.²² Between 1927 and 1931 from 30 to 35 percent of them were produced by the meat packing industries which were, of course, producing lard at the same time; and it is not amiss to emphasize that such packing plants are just as much interested in making profits in the production and sale of lard substitutes, whether it was by taking advantage of low vegetable oil prices and by profitably disposing of their tallow, as they were in obtaining reasonable prices for their lard. It should be noted, however, that the production of lard substitutes by the packing industry appears to be on a decline. Their production dropped from 438 million pounds in 1927 to 364 million pounds in 1931, while the total production of the lard substitute industry showed a slight increase.

²² This estimate is based on figures in the 1927 Biennial Census of Manufactures.

In 1931, 146 establishments reported the manufacture of lard substitutes and vegetable cooking oils.²³ About 40 of these, those primarily engaged in the production of lard substitutes, produce approximately 70 percent of the total. This, however, does not imply that these 40 plants are independent enterprises either in their corporate organization or financial set-up. But no data are available making it possible to determine how many of these establishments are controlled by the packing industry. Such control presumably would modify the competitive relationship between lard and its substitutes.

PHYSICAL PROPERTIES OF LARD AND LARD SUBSTITUTES

Lard substitutes, at present, are superior to lard in two characteristics which account in part at least for the price premium the consumer is willing to pay for them. These characteristics are longer keeping quality and much better standardization of the various brands. Hydrogenated lard alone is likely to meet these qualifications.

Lard substitutes contain practically no moisture, protein or free fatty acids.²⁴ Increased amounts of free fatty acids are closely associated with the decomposition of fats. Furthermore, through the hydrogenating process, desirable firmness, texture and melting point can be obtained. Lard substitutes stay firm outside the ice box in the summer, an advantage especially in the Southern States. Their smoking point²⁵ is higher than that of lard, which is convenient when they are used for frying purposes. In addition, they have good shortening powers. Lard substitute manufacturers vary the melting point and texture of the shortenings according to season, climate and purpose for which they are used. This helps particularly the baking industry to better control and standardize the routine aspects of their production processes. On the other hand, lard substitutes do not have the typical lard flavor popular with some people and desired for some pastry and bakery products and, in general, the shortening power of lard is recognized to be superior to that of lard substitutes. But consumer's taste, in general, has shifted away from the stronger lard flavors toward more odorless, neutral and flavorless cooking fats. The lessened demand for highly flavored "country lard" is evidence of this shift, as well as of the popularity of lard substitutes. To be sure, extensive advertising probably has added a great deal to this popularity. The increase in the production of "dry rendered" lard, however,

²³ Four of these were located in Iowa.

²⁴ Free fatty acid content: around 0.04 percent. See "Soap" Vol. VIII, No. 1, p. 74, 1932.

²⁵ 415°F. as against 380°F. for lard.

which does not have the typical lard flavor, also suggests this shift in consumer's taste.²⁶

Many commercial bakeries desire a shortening as nearly neutral in flavor as possible, because such a shortening can be employed in making a large variety of bakery goods. In the larger establishments lard and butter are used chiefly for those specific goods that require these particular flavors.

The difference in the centralization of the production of lard and lard substitutes has, undoubtedly, a decisive effect upon their relative market position. As mentioned above, 40 factories produce around 70 percent of the lard substitutes, while more than 1,200 establishments are engaged in lard production. Obviously, then, standardization and advertising of some few uniform lard brands on a nation-wide scale involves many more difficulties than with lard substitutes.

In the advertising of lard substitutes, manufacturers have taken advantage of the vegetarian tendencies of the consuming public. They have appealed, like the producers of vegetable oil and nut margarine, to the sentimental belief of many people that vegetable oils are more pure and clean and healthful than animal oils. The packages of vegetable shortenings often indicate that the contents are made from pure vegetable oils.

PRICE RELATIONSHIP

Although lard substitutes are generally quoted lower than lard in the wholesale trade, they sell from 5 to 10 cents higher in the retail trade. Even though full allowance is made for the fact that the two price series may not be strictly comparable, that is, in gathering the retail prices, the grades for lard and for lard substitutes may not be exactly analogous or the influence of quantity units may have been neglected, nevertheless the trade margin²⁷ for lard substitutes is much wider than that for lard. In the decade from 1921-1930, the trade margin for lard ranged from 3.8 to 5.6 cents, for lard substitutes from 10.1 to 13.3 cents, the latter being considerably more than twice as large as the former. This discrepancy in the wholesale and retail prices of lard and lard substitutes is rather difficult to explain. The decentralized character of lard production, resulting in strong competition in local markets, may account for much of this difference in trade margins. The differences in transportation cost also are probably a factor. Since lard production is more decentralized than the production of lard substitutes, it follows that the average price of the 51 cities from which the retail prices have been gath-

²⁶ U. S. Dept. of Com., Bur. of the Census, Meat Packing and Related Industries.

²⁷ A "trade margin" is the price differential between the wholesale and retail price of a specific commodity.

ered, involve more freight cost for lard substitutes than for lard. Undoubtedly the pricing policies of packing plants, lard substitutes manufacturers and grocery stores play a part in this situation. For instance, lard is often used as a leader in chain stores.²⁸

Whatever the reasons for the wider trade margin of lard substitutes may be, the fact that they sell from 5 to 10 cents higher than lard indicates the strong competitive position that the substitutes hold relative to lard. If, by some change in the marketing mechanism, the substitutes' trade margin were to decrease and the retail price were to approach that of lard, lard prices would in all probability suffer a serious decline.

It is remarkable, however, how resistant this wide trade margin for lard substitutes has proved during the depression. This resistance suggests either that actual additional distribution costs account largely for the margin, or that the lard substitutes production is very effectively controlled. From 1929 to 1932, the trade margin of lard fell from 5.3 to 2.1 cents, whereas that of lard substitutes actually increased from 13.1 to 13.8 cents.

CONSUMPTION AND PRICE MOVEMENTS

In 1925, as a result of the small supply of lard, retail prices²⁹ rose from 19 cents in 1924 to 23.3 cents in 1925, and lard consumption declined by 227 million pounds. The consumption of lard substitutes increased 321 million pounds despite an increase in retail price from 24.9 to 25.8 cents per pound. The increase in consumption of lard substitutes more than offset the drop in lard consumption. From 1928 to 1930, lard consumption fell 62 million pounds, even though the retail price of lard dropped from 18.6 to 17.0 cents; consumption of lard substitutes, however, increased 69 million pounds with prices remaining practically unchanged, 24.9 cents and 24.2 cents, respectively. Here, too, the consumption decrease of lard was more than offset by increases in the use of lard substitutes. In the following year, 1931, the retail price of lard dropped to 13.3 cents in order to induce an 83 million pounds larger consumption. This drop in lard prices reduced the consumption of lard substitutes, which had remained at practically the same price, only 56 million pounds. In 1932, lard retail prices fell to 8.9 cents, but substitutes' prices only to 20.2 cents, leaving an unprecedented price differential of 11.3 cents in favor of substitutes.

The preceding analysis points clearly to the stronger market position of lard substitutes and the greater elasticity of

²⁸ Chain stores may very well be strongly represented among the stores from which the Department of Labor collects its retail prices. This, of course, would tend to understate the retail price of lard. E. L. Rhoades, "The Management of Chain Meat Markets."

²⁹ It seems to be more adequate to compare consumption movements with retail prices rather than with wholesale prices.

TABLE 15. WHOLESALE AND RETAIL PRICES OF LARD
AND LARD SUBSTITUTES.
(Cents per pound)

Year	Wholesale prices		Retail prices		Retail price differentials of lard substitutes over lard	Wholesale price differentials of lard substitutes over lard	Trade margin (differential between wholesale and retail prices)	
	Lard*	Lard*** substitutes	Lard††	Lard substitutes††			Lard	Lard substitutes
1913	10.8	....	15.8	....	....	....	5.0	....
1919	28.4	26.2	36.9	36.3	-0.6	-2.2	8.5	10.1
1920	22.2	18.6	29.5	35.1	5.6	-3.6	7.3	16.3
1921	13.2	10.2	18.0	22.6	4.6	-3.0	4.8	12.4
1922	13.1	11.9	17.0	22.5	5.5	-1.2	3.9	10.6
1923	13.9	12.8	17.7	22.9	5.2	-1.1	3.8	10.1
1924	14.7	13.8	19.0	24.9	5.9	-0.9	4.3	11.1
1925	17.9	13.2	23.3	25.8	2.5	-4.7	5.4	12.6
1926	16.9	13.6	21.9	25.7	3.8	-3.3	5.0	12.1
1927	13.7	11.8	19.3	25.1	5.8	-1.9	5.6	13.3
1928	13.3	12.0	18.6	24.9	6.3	-1.3	5.3	12.9
1929	13.0	11.6	18.3	24.7	6.4	-1.4	5.3	13.1
1930	12.0	10.9†	17.0	24.2	7.2	-1.1	5.0	13.3
1931	9.0	8.8†	13.3	23.1	9.8	-0.2	4.3	14.3
1932	5.8**	6.4†	8.9	20.2	11.3	0.6	3.1	13.8

* U. S. Dept. of Agr., Yearbook of Agriculture, Refined Lard, Chicago.

** The National Provisioner, Refined Lard, Prices, Chicago.

*** U. S. Tariff Commission, Report 41, p. 208.

† The National Provisioner, Vegetable Lard Compounds, Prices, Chicago.

†† U. S. Dept. of Labor, Bur. of Labor Stat., Monthly Labor Review, Average Retail prices in 51 cities.

their demand as compared with lard. An increase in the consumption of lard is usually accompanied by falling lard prices, and there is little or no adverse effect upon lard substitutes (1926, 1927, 1928, 1931); in contrast, larger quantities of lard substitutes are readily absorbed with virtually no reduction in price when lard prices increase slightly or remain unchanged (1924, 1925, 1929). During the depression lard substitutes proved far more resistant to the general price decline than lard prices. The same held true for the trade margin of lard substitutes. The wholesale price of lard substitutes, however, follows rather closely that of lard. It is noteworthy that the wholesale price differentials between them did not change materially since 1922, with the exception of 1925 and 1926 when a relative shortage in lard and a strong foreign demand drove lard prices up without apparently affecting the price of lard substitutes. In 1932 the wholesale price of lard substitutes exceeded the price of lard, which suffered severely from the curtailment of its export outlets.

INFLUENCE OF MARGARINE ON LARD AND BUTTER

Though margarine is used to some extent by bakeries for puff pastry products, pies and certain rolled-in goods, it replaces butter in these products rather than lard. The economic

position of lard in the United States is little influenced by margarine. In European countries these two products compete very sharply for the same market, but domestically the competition is rather between butter and margarine.

Butter, however, holds a decidedly more advantageous position in its competition with margarine than does lard in withstanding the inroads of lard substitutes. In the first place, consumption of margarine is less than one-sixth as large as that of butter; the consumption of lard substitutes is two-thirds as large as that of lard. Lard indeed has much more to gain in ousting its chief competitor, but it also has a much harder task in attempting to do so. Briefly, the competitive positions of these products differ in that margarine is on the defensive, whereas lard substitutes are on the offensive. Secondly, butter is undoubtedly superior to margarine, while lard, as it is rendered and marketed at present, is less dependable than lard substitutes. As a result retail as well as wholesale prices of margarine are lower than butter. Because of these demand characteristics an excise tax on margarine is very effective in reducing its consumption, hence protecting the dairy farmer.³⁰ But an excise tax on lard substitutes would not materially affect the consumption unless the rate be strictly prohibitive, chiefly because of the strong competitive position in which lard substitutes find themselves.

COMPETITIVE POSITION OF COTTONSEED OIL RELATIVE TO FATS AND OTHER OILS

INTERCHANGEABILITY OF OILS

The close competitive connection that prevails between lard and cottonseed oil is patent from the three following fundamental facts: (1) Four-fifths of the annual domestic production of lard substitutes is made from cottonseed oil; (2) cottonseed oil represents only a small fraction of the total value of raw cotton products, and its production depends chiefly upon the size of the cotton crop, thus indicating its by-product character, and as such it hardly can be undersold since it is characteristic of by-products to be sold at whatever price they may bring; (3) about 85 percent of the yearly production of cottonseed oil is used in the manufacture of lard substitutes which is further evidence of the direct dependency of cottonseed oil upon the lard substitutes market.

What other channels are open to cottonseed oil besides lard substitutes, and what is the possibility of diverting it away from lard substitutes into other industries or into export chan-

³⁰ The federal excise tax on margarine is 0.25 cents a pound on uncolored margarine and 10 cents a pound for yellow margarine. The latter tax is practically prohibitive of the manufacture of yellow margarine.

TABLE 16. FACTORY CONSUMPTION OF COTTONSEED OIL
BY INDUSTRIES.
1923, 1929 and 1931†

Industry using cottonseed oil	1923*		1929**		1931***	
	Million pounds	Percent- age of total	Million pounds	Percent- age of total	Million pounds	Percent- age of total
Lard substitute	640	86.5	1,083	73.5	929	89.9
Margarine	19	2.5	28	1.9	16	1.5
Other food	70	9.5	351	23.8	84	8.2
Soap	11	1.5	12	0.8	2	0.2
Miscellaneous	..	...	....	....	2	0.2
Total factory consumption††	740	100	1,474	100	1,033	100

Note: The figures for 1931 are the most satisfactory for the purpose of this study since they "designate the ultimate uses of the primary oil." In other words, they actually show oil consumption separated into the several products for which it was used rather than by industries. The 1929 figures show it by industries. It is, therefore, very likely that part of the 351 million pounds used by "other food industry" in 1929 was manufactured into lard substitutes. If oil consumption shown for 1929 were segregated by ultimate uses, lard substitutes probably would appear as having absorbed over 80 percent of the total factory consumption, as was the case in the other 2 years. See also fig. 7.

† The years appearing in this table were employed because of their general representativeness of the post-war period.

†† Factory consumption of crude and refined cottonseed oil, minus refining losses and foots as reported by industries. These foots are chiefly used by the soap industry. Cottonseed oil foots consumption amounted to 53 million pounds in 1923, and 109 million in 1929, and 108 million in 1931. The poundage consumption figures of the 3 years are not strictly comparable, since methods in collecting statistical data, the percentage of reporting establishments from the total number, the classification of industries and so on, have changed.

* U. S. Tariff Commission, Certain Vegetable Oils, Part II. Washington, D. C., 1926.

** U. S. Tariff Commission, Report 41, Second Series. Washington, D. C., 1932.

*** U. S. Bur. of the Census. Factory Consumption of Fats and Oils, for 1931. Washington, D. C. June 21, 1932.

nels? The answer to this question has a direct and vital bearing upon the economics of lard. In order to understand the probable importance of the various alternative uses of cottonseed oil, considerable attention is given to the technical and economic limitations of replacing other oils, for example, the oils now used in the manufacturing of salad dressings, margarine and soap by cottonseed oil.

Roughly only about 15 percent of the cottonseed oil produced is used in making products other than lard substitutes. The industries included in the class, "Other food industry," are chiefly engaged in the manufacture of salad oils and dressings, mayonnaise and of vegetable cooking oil, the bulk of which is made from cottonseed oil by a process of refining, winterizing and deodorizing. These products account for approximately 8 or 9 percent of the total cottonseed oil supply. Margarine absorbs about 2 percent, while the amount employed in the soap industry is even less and apparently it is declining. Refining losses, however, such as foots and soap stock, depending upon the processing method used in refining and the degree

of purity attained, amount to about 9 percent or more of the crude oil. These are rather valuable by-products of the food industries and usually are sold to soap manufacturers or as a side line are turned into soap at the same plant. Other oil industries, such as those manufacturing paint and varnish, linoleum and oilcloth, and printing inks, employ only negligible quantities. At present, cottonseed oil is disposed of most profitably chiefly as edible oil in the manufacture of food.

MANUFACTURE OF LARD SUBSTITUTES

Of the many raw materials used in the various formulas employed in making lard substitutes, about four-fifths are cottonseed oil. Tallow and oleo stearin, representing somewhat less than 10 percent of the raw materials, are second in importance. No other fat or oil commonly used exceeds 3 percent of the total oils used. Nor is the position of tallow and oleo stearin secure. The technique of hydrogenation at present provides manufacturers with an alternative method for making substitutes of the desired firmness, for which purpose they formerly used animal fats (table 17).

Certain aspects of the amount of substitution that is likely to take place among the various oils when price conditions warrant is shown by the year to year variations in the amount of oils used. For instance, in 1931 relatively more palm oil, sesame oil and tallow were used in making lard substitutes than in 1929. These increases were not at the expense of cottonseed oil, however, although superficially this may appear to

TABLE 17. RELATIVE PROPORTION OF FATS AND OILS USED IN THE MANUFACTURE OF LARD SUBSTITUTES.
(Percentage of total oils used)

Class of oils	1914*	1920*	1923*	1929*	1931**
Cottonseed	92.2	80.1	84.5	88.8	76.9
Coconut .....	...	1.3	2.8	1.6	2.8
Peanut	0.2	6.4	0.5	...	0.5
Soybean	0.1	2.3	0.1	...	0.9
Corn .....	...	0.9	0.9	...	0.5
Palm .....	...	***	***	0.1	2.9
Sesame .....	...	***	***	...	2.8
Other vegetable	0.5	0.9	1.1	...	1.5
Edible animal stearin {	5.6	5.5	5.7	3.6	2.3
Oleo { .....	...	...	0.4	0.6	0.8
Edible tallow	1.3	1.3	3.1	2.1	5.8
Lard	0.1	1.3	0.9	1.9	0.7
Fish and marine .....	...	...	...	1.2	1.6
Total vegetable	93.0	91.9	89.9	90.6	88.8
Total animal	7.0	8.1	10.1	9.4	11.2
Total fat and oil consumption (million lbs.)	1,143	756	758	1,220	1,208

* U. S. Tariff Commission, Report 41, Second Series, p. 160.

** Basic data from: U. S. Dept. of Com., Bur. of the Census. Factory Consumption of Animal and Vegetable Fats and Oils, for 1931. June, 1932.

*** Included in "Other Vegetable Oils."

be the case. The governing facts, however, are the changes in cottonseed oil production; in 1931, it was 200 million pounds less than in 1930, while 1931 had shown a 160-million pound drop from 1929 figures; but in spite of these reductions in the amount of cottonseed oil produced, the production of lard substitutes continued at about the same rate, dropping only 3 and 12 million pounds, respectively. In 1929 about 75 percent of the cottonseed oil output was converted into lard substitutes, while in 1931, with shorter supplies, 90 percent went into lard substitutes. In 1929 when cottonseed oil was relatively abundant a greater proportion of it was used in making margarine, soap and food products other than lard substitutes. Certainly, it would be erroneous to interpret the increase in the use of palm oil, sesame oil and tallow in 1931 as a technical replacement of cottonseed oil. Quite to the contrary, because of the short supply of cottonseed oil an unusually large proportion of it was manufactured into lard substitutes. But, inasmuch as the quantity of cottonseed oil available was insufficient to satisfy the oil demand of the lard substitutes industries, they were forced to draw upon other oils. One comment upon the price situation of oils in 1931 is necessary. In 1920, under somewhat similar circumstances, additional amounts of soybean and peanut oils were used to supplement the shortage of cottonseed oil. But in 1931 the tropical oils—palm, sesame and coconut—depending entirely upon world markets, were unusually depressed in price.³¹ This naturally induced manufacturers to use these oils instead of domestic oils which were less depressed in price.

The amount of coconut oil employed in the manufacture of lard substitutes is limited by technical circumstances; i. e., in mixture with other oils it causes strong foaming and smokes readily when used in frying. Nor is its shortening power satisfactory. The upper limits of the amount of coconut oil that can be effectively used in making lard substitutes is said to be about 10 percent, but usually not more than 2 to 3 percent is actually employed.

Technically, many other oils can be readily substituted for cottonseed oil in the manufacture of lard substitutes. But cottonseed oil has a number of distinct advantages over other oils. It is high in shortening power. It is easy to refine, to bleach and to hydrogenate. It can be obtained in large quantities of reliable standard qualities. These are some of the characteristics that make cottonseed oil so well suited for large scale lard substitutes manufacture. These factors combined are instrumental in keeping the price of it above the oils used in soap making, which, naturally, diverts it away from that industry. Should the price position of a competing oil decline relative to cottonseed oil, the price incentive would have to be

³¹ See pp. 183-194, influence of tariffs on oil prices.

rather strong to induce manufacturers of lard substitutes to resort to other oils, since the whole processing mechanism is developed to use cottonseed oil, and to shift toward a wider use of other oils would necessitate new processes and considerable experimentation, both in hydrogenation and processing methods. Then, too, manufacturers want to avoid materially changing the composition of the brands that have been widely advertised. It is always hard to foresee how the public will react to even slight changes in the quality of products to which it has become accustomed.

Peanut oil, for most manufacturing purposes, is virtually equivalent to cottonseed oil. Some manufacturers claim it needs less processing, and that they would prefer it if it were available at approximately the same price. The higher price range of edible peanut oil is the principal reason why little of it is used in making lard substitutes.³²

Soybean oil is more costly to refine, and even after having been deodorized and bleached it tends to regain the objectionable taste and color associated with soybean oil. It also impairs the keeping quality of the final product. Hydrogenation, though more difficult to carry through than with cottonseed oil, tends to remove these disadvantages.

Corn oil can readily be substituted for cottonseed oil. But little of it is used in lard substitutes largely because of the conditions governing its supply³³ and the fact that it commonly is higher in price than cottonseed oil.

Palm oil is difficult to refine and bleach sufficiently and permanently. In recent years, however, refined and bleached palm oil has been obtainable from Sumatra at prices low enough to induce greater consumption. In 1931 almost 3 percent of the oils used were palm oil. For the lower grades of lard substitutes it is claimed that 40 percent of the oil used may be palm oil. It has the advantage of being a hard oil, consequently a proportion of it needs no hydrogenation.

Sesame oil, too, offers difficulties in removing permanently its reddish color, but modern technique will probably overcome this difficulty.

From the technical point of view the unusually strong position of cottonseed oil in the manufacture of lard substitutes is to be attributed to the ease with which it can be processed, and to the large and uniform supply annually available. The latter greatly facilitates the stabilization and standardization of the production processes.

³² The peanut oil domestically produced is usually of a low grade, since it is obtained primarily from the culls of the peanut crop. This accounts for the relatively low peanut oil price as presented in table 31. Edible peanut oils are mostly of foreign origin and as such they are subject to an import duty.

³³ Corn oil is only a minor by-product of the corn starch and sugar industry.

A common formula for the manufacture of lard substitutes includes 80 to 85 percent cottonseed oil with 15 to 20 percent oleo stearin and tallow. While many different combinations are used, more than one-half of the total production consists entirely of vegetable oils.

VEGETABLE COOKING OILS, SALAD OILS AND DRESSINGS

It is estimated that in 1927, 509 million pounds and in 1929, 498 million pounds of vegetable salad and cooking oils were produced.³⁴ Production of mayonnaise and other salad dressings, including sandwich spreads but excluding salad and cooking oils, is estimated at 230 million pounds in 1930. The principal oil used in this industry is cottonseed oil, especially for the manufacture of salad dressings and mayonnaise. When it is used as a cooking oil, it must be refined, bleached, winterized and deodorized. It is then known under the name of "Wesson Oil." In 1923, about 70 million pounds of cottonseed oil were absorbed by the Wesson oil industries.³⁵ Cottonseed oil competes with corn oil, commonly called "Mazola," and with olive oil, which is, however, far superior and commands a considerable price premium. The lower solidifying point of corn oil gives it an advantage seasonally and in colder climates. Approximately 80 percent of corn oil production is used in making salad oils and dressings.³⁶

Peanut oil is extensively used in making vegetable cooking oils, salad oils and dressings. In general, edible peanut oil, most of which is imported, sells for more than cottonseed and corn oil; consequently its use is partly restricted to products requiring the particular nut-flavor of peanut oil. Were it not for the difference in prices it would be a strong competitor to both corn and cottonseed oil.

Sesame oil contains only little stearin, therefore needs no winterizing. Some claim it has better keeping qualities than cottonseed and corn oil. Its use depends chiefly upon its price relation to the other oils. Technically there is probably no reason why sesame oil could not replace cottonseed and corn oil in the manufacture of cooking oils, salad oils and dressings.

Cottonseed, corn, peanut and sesame oil compete directly with each other in this industry. They provide most of the raw material that is used. Olive oil, selling for a much higher price, takes a separate position among the salad and cooking oils.

³⁴ U. S. Tariff Commission, Report 241, p. 164. Available data on the manufacture of vegetable cooking oils, salad oils and dressings, mayonnaise, etc., are very incomplete. In some industries it seems that vegetable cooking oils are not completely segregated from lard substitutes or from salad oils and dressings. It is not unlikely, for instance, in table 16 under the heading of lard substitutes, that some vegetable cooking oils are included. No itemized statement of the specific oils used for the manufacturing of vegetable cooking oils and salad dressings is available.

³⁵ U. S. Tariff Commission, Certain Vegetable Oils, Part II.

³⁶ "Manufacturers' Record." Vol. 101, No. 16. April 21, 1932.

The confectionery and baking industry absorbs annually about 50 million pounds of coconut oil and 10 million pounds of palm-kernel oil. These oils can hardly be considered interchangeable with the oils just discussed except that in some kinds of candies and bakeries it is possible to use butter in their place.⁸⁷

MANUFACTURE OF MARGARINE⁸⁸

Before the war, practically all margarine was made from a mixture of animal and vegetable oils, or solely from animal oils. But since the war, vegetable oil has increased rapidly in importance as a raw material in the manufacture of margarine. In the United States, pure animal oil margarine has entirely disappeared, whereas, pure vegetable oil and nut margarine production have increased steadily. In 1922, about 40 percent of the total margarine production was made solely from vegetable oils; in 1930, this percentage stood at nearly 70 percent. Most of the additional vegetable oil used in making margarine consisted of coconut oil. In 1920, 26 percent of the oil used by the margarine industry was coconut oil; by 1931 it had risen to 67 percent. Margarine containing animal fats more closely resembles butter and sells for somewhat higher prices than vegetable oil margarines. Coconut oil has become almost as predominant in the manufacture of margarine as cottonseed oil is in the production of lard substitutes.³⁰

The physical properties that give coconut oil such a distinct advantage in margarine production are as follows: It has

TABLE 18. RELATIVE PROPORTION OF FATS AND OILS USED IN THE MANUFACTURE OF MARGARINE.*
(Percentage of total oil used)

Class of oils	1920	1923	1929	1931
Coconut	26.5	37.0	59.9	66.8
Cottonseed	13.0	10.6	9.8	9.4
Peanut	15.9	3.9	2.3	2.3
Other vegetable .....	...	...	0.5	2.3
Oleo	29.4	26.3	16.5	12.0
Neutral lard	12.6	16.6	8.5	4.4
Oleo stearin and stock	2.6	4.0	2.5	2.8
Other animal oils including edible tallow .....	...	1.6	...	...
Total vegetable	55.4	51.5	72.5	80.8
Total animal	44.6	48.5	27.5	19.2
Total fat and oil consumption in industry (million pounds)	306	178	286	233

* U. S. Tariff Commission, Report 41, p. 152.

⁸⁷ U. S. Tariff Commission, Report 241, p. 41.

⁸⁸ The manufacture of margarine is restricted by federal law; if sold it must be labeled, "Oleomargarine," and, in addition, a federal excise tax of $\frac{1}{4}$ cent per pound from margarine not yellow in color and 10 cents per pound if yellow in color, is collected.

⁸⁹ Because palm-kernel oil is also solid at ordinary temperatures it occasionally is used to replace coconut oil.

a sharp melting point at around 77°F. and thus melts quickly in the mouth without leaving a greasy sensation. Its color is white, and in texture it is firm and smooth and similar to animal fats, with a taste that is mild to almost neutral and with good keeping qualities. It requires little processing. Coconut oil emulsifies easily, and only 10 to 30 percent of it needs to be hydrogenated to obtain margarine of the desired firmness.

Peanut and cottonseed oil are largely interchangeable in the manufacture of margarine, though most manufacturers prefer peanut oil because of its nut flavor. In making margarine, cottonseed oil can be replaced to some extent by soybean, palm, corn, sesame, sunflower seed and oleo oil. Peanut oil and neutral lard are the most expensive ingredients and are often replaced in lower grade margarine by cottonseed oil or some of the other oils mentioned. In recent years, the margarine industry has absorbed between 1 and 2 percent of the cottonseed oil supply.

A specific grade of animal oil margarine is being produced for the baking trade which usually consists of oleo stearin (25-65 percent) and cottonseed oil (75-35 percent). The proportion of both ingredients is altered according to climate, season and special requirements of bakers. Here, margarine competes directly with lard, which cannot offer the same advantageous physical adaptability to climate and special requirements. Furthermore, this particular grade of margarine contains primarily cottonseed oil and almost no coconut oil. Again, as in the lard substitutes, lard is confronted with cottonseed oil. Quantitatively, however, the effect of this competition on lard at present is probably negligible.

To increase the amount of cottonseed oil going into margarine it would be necessary for cottonseed oil to sell for considerably less than coconut oil since cottonseed oil requires more hydrogenation and involves other additional processing costs. Cottonseed oil has no important qualities which make it superior to other oils in making margarine. Expanding the proportion of animal oil in margarine⁴⁰ in all probability would increase the amount of cottonseed oil used for margarine. The coincidence of the relative increase in vegetable oil margarine with the decline in the use of cottonseed oil suggests such a relation. Moreover, it is reinforced by the popular formulas for margarine manufacture.

Some of the typical formulas are:⁴¹

(1) For vegetable oil margarine:

94 percent coconut oil and 6 percent peanut or cottonseed oil.

⁴⁰ In 1916, 99 percent of all margarine was animal oil margarine. This term covers all margarine types containing animal oils.

⁴¹ U. S. Tariff Commission, Report 41, p. 154.

80 percent coconut oil and 20 percent peanut oil, or 15 percent palm and 5 percent cottonseed oil.

(2) For animal oil margarine:

70 percent oleo oil, 20 percent neutral lard, 10 percent cottonseed oil.

6 percent oleo stock, 70 percent oleo oil, 24 percent cottonseed oil.

According to these formulas, animal oil margarine contains considerably more cottonseed oil than vegetable oil margarine. The United States Tariff Commission Report gives five typical formulas for vegetable oil margarine, only three of which contain more than 6 percent cottonseed oil and always as an apparently less suitable alternative to peanut oil. Of the six formulas for animal oil margarine, four contain cottonseed oil running from 10 up to 24 percent, without indicating alternative oils. The tariff aspect of the problem of diverting more cottonseed oil into the margarine industry is taken up later.

SOAP PRODUCTION

Since 1914, the amount of cottonseed oil used in making soaps has rapidly decreased. In 1912, 18 percent of the oil used in the production of soap was cottonseed oil; in 1931, it was only 0.1 percent. In fact, in 1931, more corn than cottonseed oil was used. On the other hand, the relative amount of coconut oil and palm oil employed increased from 12 to 37 percent. Indeed, cottonseed oil has been replaced by other oils in the making of soap.

The retreat of cottonseed oil from the soap kettle is not to be attributed entirely to undesirable physical properties or technical difficulties of cottonseed oil when converted into soap. This retreat was partly brought about by the fact that after the war the lard substitute and vegetable cooking oil and salad dressings industries offered a more profitable utilization for cottonseed oil than did the soap kettle, and consequently the price rose above that of comparable grades of coconut and palm oil. The rapid post-war development of the manufacture of lard substitutes, vegetable cooking oils and salad dressings, gave cottonseed oil a strong foothold against the flood of cheap coconut and palm oils which at present dominate the manufacture of margarine, soap and confectioneries. Coconut and palm oils, however, have been unable to enter the shortening and salad dressing fields to any appreciable extent, because the physical properties of these hard oils make them unsuitable for these particular products.

Tallow and grease⁴² find their chief utilization in the soap industry. Tallow is the most important ingredient quantitatively in soap and usually constitutes over one-third of the total raw materials. It makes a hard white soap, which lathers slowly, especially in cold water, but the lather is thick and last-

⁴² Zapoleon, L. B. *Inedible Animal Fats in the United States.*

TABLE 19. RELATIVE PROPORTION OF FATS AND OILS USED IN THE
MANUFACTURE OF SOAP.
(In percentage of total oils used)

Class of oil	1912*	1923*	1929*	1931**
Cottonseed	17.8	0.9	0.7	0.1
Cottonseed oil foots	12.0	4.4	6.4	...
Coconut	10.6	22.4	20.3	24.5
Palm	1.0	8.6	11.4	12.4
Palm-kernel	2.8	0.3	4.3	2.0
Olive oil foots and olive oil, inedible	0.8	2.4	3.2	3.0
Corn	1.3	0.5	0.3	0.3
Miscellaneous oils and soap stock	8.6	5.5	4.4	1.5
Tallow	32.2	34.5	25.7	37.8
Grease, red oil, etc.	11.5	14.4	15.4	9.3
Whale and fish oil	1.4	6.1	7.9	9.1
Total fat and oils used (million pounds)	741	1,196	1,692	1,390

* Taken from U. S. Tariff Commission, Report 41.

** Taken from U. S. Dept. of Com., Bur. of the Census. *Factory Consumption of Fats and Oils, By-products, for 1931. June, 1932.*

ing. The soap also has good keeping and cleansing qualities. Grease soaps are softer, darker in color, lather more quickly, but tend to become rancid. Of the several oils, tallow can be most satisfactorily replaced by palm oil, but since the cost of bleaching palm oil is high its use is restricted to colored soap. Hydrogenated whale and fish oil is used instead of tallow in the manufacture of various kinds and grades of soap.

Coconut oil is the second most important ingredient that enters the soap kettle. Soap made from it lathers quickly and profusely even in cold, hard or salt water (marine soaps). Its white color and pleasing odor make it particularly suited for toilet purposes. Because of its high solubility coconut oil is a regular ingredient of textile soaps. It is seldom used alone since the lather, though abundant, is foamy, dries quickly and is somewhat irritating to the skin. The increasing demand for hard, white soap, hard water soap, soap flakes and chips and many kinds of laundry soaps has fostered the use of coconut oil in the soap industry. Moreover, it yields a higher output of the valuable by-product, glycerine, than most of the other oils.

Coconut oil and tallow supplement each other as to solubility and quality of lather, for when both are used together they broaden the conditions to which the resulting soap can readily be applied. Consequently, soaps generally used for toilet, household and laundry purposes, such as chips and flakes, are usually made from a combination of tallow and coconut oil.

Cottonseed oil makes a soft soap which in soft water lathers quickly and profusely. The lather is thick and lasting.

Unbleached cottonseed oil imparts to the soap a yellow color, and if bleached and blended with tallow or coconut oil or both, the resulting soap is fairly white. But its tendency to rancidity prevents its wider use in toilet soap. Since laundry soap contains large quantities of sodium silicate acting as a preservative, cottonseed oil can readily be used in making laundry soap. Bleached cottonseed oil mixed in about equal proportions, with coconut oil or with tallow, makes a good white laundry bar soap. Laundry flakes and chips do not contain much cottonseed oil because of the softness of this oil.

In most of the lower grade toilet and laundry soaps, cottonseed oil could readily be substituted for every other soft oil, such as corn, sesame, peanut and soybean oil. If cottonseed oil is hydrogenated, which reduces the tendency to rancidity, the range of its use in soap making is considerably broadened. The resulting soap is harder and can be used for laundry as well as for toilet purposes. But the prices of the competing oils do not permit this additional cost in preparing cottonseed oil for the soap kettle.

If more cottonseed oil is to be used by the soap industry, it would have to be in laundry soaps. Here it competes primarily with coconut and palm oil, tallow and grease, and in the case of yellow laundry soap, also with rosin and whale and fish oil. In almost every case, cottonseed oil can be substituted for other oils to only a limited extent, if the quality of the final product is not to be markedly changed. In order to maintain the standard qualities of the various kinds and grades of soap, certain proportions of the specific oils in the composition of the fat and oil mixtures must be observed. This limits the interchangeability of oils, even though, from a technical view, the process of hydrogenation greatly increases the interchangeability, especially in the soap industry. In the final analysis it is the price structure of the various fats and oils which decides in each case which oils are used and in what proportions, of course, each within the range of its technical limits.

Lard substitutes, vegetable cooking and salad oils and salad dressings, margarine and soap absorb practically all of the cottonseed oil supply (see table 16). Very little cottonseed oil is used in the production of paint and varnish, linoleum and oilcloth and printing inks. These industries draw chiefly upon linseed oil and China wood oil. Even a drastic change in the price relation between cottonseed oil and these oils is not likely to bring about a wider use of cottonseed oil in the paint and varnish industry. At present, linseed oil constitutes 70 percent, China wood oil 22 percent, fish oils 4 percent and soybean oil 2 percent of the oils used in making paints and varnish.⁴³

⁴³ U. S. Dept. of Com., Bur. of the Census. 1931.

TECHNICAL LIMITS OF THE INTERCHANGEABILITY OF OILS

The limits of replacing one oil by another in the various industries are fixed by two sets of factors: (1) The physical characteristics of the specific oils, and (2) their respective price relationships as determined by supply and demand. The less suitable an oil is for a specific purpose, the cheaper it must be relative to other more suitable oils, in order to offset the higher processing cost or possible economic results that come as a consequence when the quality of the finished product is altered.

The two main groups of animal and vegetable oils are: (1) The non-drying oils primarily used for food and soap making, (2) the drying oils primarily used for paint, varnish, linoleum and oilcloth. The principal oils of the first group include cottonseed, coconut, palm, palm-kernel, sesame, corn, peanut, tallow, grease and some other animal and fish oils. These, to a rather appreciable extent, are interchangeable, one with another. The principal oils of the second group, linseed, China wood and perilla oil, are also partly interchangeable. Some fish oils and soybean oil are used for food and soap purposes as well as for paint and varnishes. But in the main, and for our purposes the interchangeability of oils between the two groups may be considered as negligible.

There is also a third group, within which the oils are practically not interchangeable, owing to their specific characteristics which determine their use. For example, in pharmaceutical products and dyes, castor, cod-liver, craton and rape oils and others are used. These oils because of their desired individual qualities, are usually higher in price. They seldom compete with the oils of the other two groups. Nor can they be replaced by oils from the first and second group.

TECHNICAL POSITION OF COTTONSEED OIL SUMMARIZED

In the manufacture of lard substitutes, cottonseed oil can readily replace all other fats and oils. But since it already constitutes 80 to 90 percent of all raw materials used in making lard substitutes, only little can be gained by having cottonseed oil replace the small amounts of tallow, oleo stearin and coconut oil that are employed. Other ingredients in addition to these three are negligible. Edible tallow and oleo stearin are by-products of packing plants, many of which make lard substitutes; this has provided the plants with a profitable outlet for their tallow and oleo stearin. It is not probable that coconut oil will ever become a strong competitor of cottonseed oil in the field of lard substitutes. Sesame and palm oil were used to some extent in 1931, when they supplemented rather than replaced the small cottonseed oil supply of that year; techni-

cally, however, they fall into the same class as corn and peanut oil in that they can readily replace cottonseed oil, if and when prices favor their use.

In the vegetable cooking oils and salad dressings industry, cottonseed oil competes mainly with corn, peanut and sesame oils. From a technical viewpoint there is no reason why cottonseed oil cannot be substituted for these oils to a very great extent. In vegetable oil margarine, coconut oil dominates; cottonseed oil is used only in small amounts. In the manufacture of animal-oil margarine, cottonseed oil is readily interchangeable with peanut oil, although the latter is usually preferred by the manufacturer. In combination with animal oils, cottonseed oil seems to be more suitable, since animal oil margarine contains considerably more cottonseed oil and less coconut oil than pure vegetable oil margarine. In this case, the animal oils, such as oleo oil and stearin and neutral lard, are at the same time promoters and competitors for cottonseed oil. A reversal of the present trend towards vegetable oil margarine back to animal oil margarine probably would promote the use of cottonseed oil, at the expense of coconut oil.

In the soap industry, cottonseed oil can be used in making yellow kitchen and laundry soaps, and under certain restric-

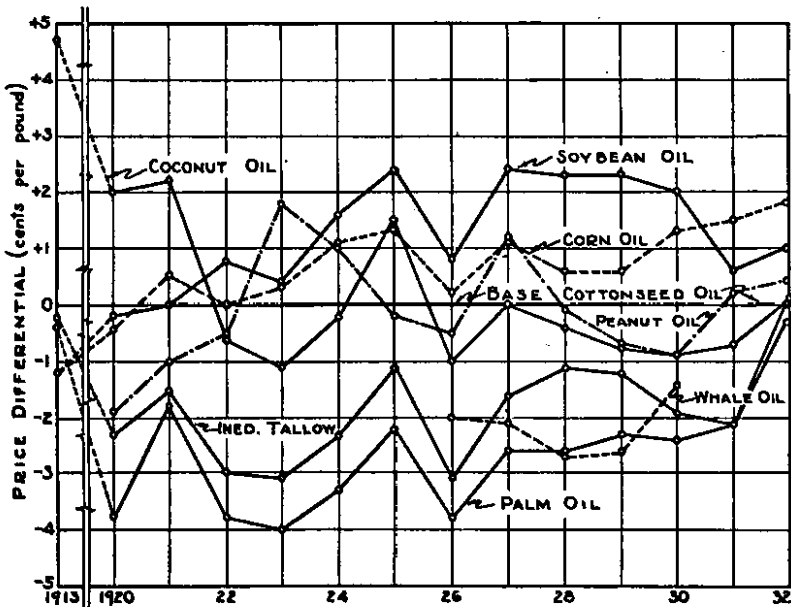


Fig. 5. Price differentials of principal oils on the base of cottonseed oil.

(Based on data in table 20.)

tions, in low grade toilet soaps. In this field it competes with most all of the other soft oils, such as corn, peanut, soybean, sesame and also whale and fish oil, without offering any preferable physical properties. Rather to the contrary, its tendency to rancidity, its color and the softness of the soap it makes renders it inferior to many of the competing oils. To be used extensively in the soap industry, cottonseed oil not only would have to be offered at a price parity, but even at lower prices than coconut oil, palm oil, tallow and other cheap oils.

Generally speaking, cottonseed oil lacks any physical property which makes it decidedly superior for any one use. But as it is easy to process, and since it has no particular disadvantage it can be substituted, within limits, for almost any other oil. The only outstanding virtue it possesses is economic in character, namely, it is the only domestically produced soft oil regularly available in large and uniform quantities of dependable standard grades. (See figs. 7 and 8.)

PRICE RELATIONSHIPS OF PRINCIPAL OILS

In analyzing the price situation of vegetable oils it should be kept in mind that the price quotations available often fail to indicate clearly the grade of oil quoted. The importance of grades can be seen in refined, bleached and deodorized cottonseed oil, which is usually quoted from 3 to 3½ cents higher than crude oil; the same price difference prevails between refined and crude coconut oil.⁴⁴ As mentioned earlier, imported peanut and olive oils sell for more than the domestic oils because they are better in quality.⁴⁵ The reversal of the price differential that coconut showed over cottonseed oil prior to 1922 is to be attributed not to technological changes in the production process nor to any shift in the utilization of these oils, but to the fact that coconut oil, prior to the 1922 tariff act, came chiefly from Ceylon and Cochin and it was of a much higher grade than the oil that comes from the Philippine Islands. Since the tariff act of 1922, the Philippines have become almost the exclusive source of coconut oil. It is possible that the price series presented in this study embody other similar inconsistencies which have not been detected. The conclusions drawn in this section certainly should be regarded as tentative and subject to modifications.

⁴⁴ Computed from quotations in the "The National Provisioner". In 1922, refined white cottonseed oil sold more than twice as high (6.54 cents) as crude oil (3.23 cents), and the same held for refined and crude coconut oil (6.93 cents and 3.20 cents, respectively).

⁴⁵ Most of the domestic peanut and olive oils seem to be inedible and are primarily used for the making of soap, while a considerable part of that which is imported finds its way into the food industries.

TABLE 20. PRICES OF PRINCIPAL FOOD AND SOAP OILS AND THEIR PRICE DIFFERENTIALS
OVER COTTONSEED OIL, 1920 to 1932.
(Cents per pound)

Year	Cotton- seed* oil	Coconut oil**		Palm oil***		Peanut oil†		Soybean oil††		Corn oil‡		Ined. tallow‡‡		Whale oil‡‡‡	
	Price	Price	Diff.	Price	Diff.	Price	Diff.	Price	Diff.	Price	Diff.	Price	Diff.	Price	Diff.
1913	7.3	12.0	+4.7	6.9	-0.4	.....	.....	6.1	-1.2	6.1	-1.2	7.1	-0.2	...	...
1920	15.4	17.4	+2.0	11.6	-3.8	13.5	-1.9	15.2	-0.2	15.0	-0.4	13.1	-2.3	...	...
1921	7.9	10.1	+2.2	6.1	-1.8	6.9	-1.0	7.9	0.0	8.4	+0.5	6.4	-1.5	...	...
1922	10.1	9.5	-0.6	6.3	-3.8	9.6	-0.5	10.9	+0.8	10.1	0.0	7.1	-3.0	...	...
1923	11.3	10.2	-1.1	7.3	-4.0	13.1	+1.8	11.7	+0.4	11.6	+0.3	8.2	-3.1	...	...
1924	10.8	10.6	-0.2	7.5	-3.3	11.8	+1.0	12.4	+1.6	11.9	+1.1	8.5	-2.3	...	...
1925	10.8	12.3	+1.5	8.6	-2.2	10.6	-0.2	13.2	+2.4	12.1	+1.3	9.7	-1.1	...	...
1926	11.8	10.8	-1.0	8.0	-3.8	11.3	-0.5	12.6	+0.8	12.0	+0.2	8.7	-3.1	7.7	-2.0
1927	9.7	9.7	0.0	7.1	-2.6	11.4	+1.7	12.1	+2.4	10.8	+1.1	8.1	-1.6	7.6	-2.1
1928	9.9	9.5	-0.4	7.3	-2.6	9.8	-0.1	12.2	+2.3	10.5	+0.6	8.8	-1.1	7.2	-2.7
1929	9.7	8.5	-0.8	7.4	-2.3	9.0	-0.7	12.0	+2.3	10.3	+0.6	8.5	-1.2	7.1	-2.6
1930	8.1	7.2	-0.9	5.7	-2.4	7.2	-0.9	10.1	+2.0	9.4	+1.3	6.2	-1.9	6.7	-1.4
1931	6.0	5.3	-0.7	3.9	-2.1	6.2	+0.2	6.6	+0.6	7.5	+1.5	3.9	-2.1	...	...
1932	3.2†††	3.3†††	+0.1	2.9	-0.3	3.6	+0.4	4.2	+1.0	5.0	+1.8	3.2	0.0	...	...

* Prime Summer yellow, New York (except 1913 and 1920 which are for San Francisco), U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

** Crude, New York. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

*** Niger, New York. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

† Crude, f. o. b. Mill. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

†† Crude, in bargels, New York. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

††† Crude, Chicago. The National Provisioner.

‡ Crude, in barrels, New York. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

‡‡ Packers' Prime, Chicago. U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

‡‡‡ New York. U. S. Tariff Commission, Report 41, p. 118.

During the pre-war period coconut oil, tallow and palm oil, the three chief raw materials of soap manufacturing, were decidedly higher in price relative to cottonseed oil than after the war; correspondingly, the relative amount of cottonseed oil used in making soap fell from 18 percent in 1912 to about 0.1 percent in 1931, while that of coconut and palm oil rose from approximately 12 to 37 percent. In margarine, peanut oil, quoted at 1.9 cents below cottonseed oil in 1920 and 1.8 cents above it in 1923, represented 16 percent and 4 percent, respectively, of the total oils used. A similar drop occurred in peanut oil consumption for lard substitute manufacturing during this period; it fell from 6.4 to 0.5 percent, which was paralleled by a relative increase in cottonseed oil which rose from 80.1 to 84.5 percent. (See tables 17, 18, 19 and 20, and fig. 5.) Neither price quotations nor records of the industries are sufficiently accurate and elaborate to permit a more exhaustive analysis of the manufacturers' response to changing price relations between the competing oils.

Within certain limits and between certain oils the price relation determines the amount that is used by a particular industry. But counteracting forces determine the limits of alternative replacements induced by prices. As already indicated, the most effective forces are (1) the necessity of technical readjustment of the entire production process in the case of a substantial change in the combination of raw materials, and (2) the principle of maintaining standard qualities in the finished products, especially of widely advertized and popularized brands. Hence, shifts in price relations between oils must give promise of a degree of permanency before they will induce manufacturers to change their production processes to take advantage of the change in the price situation accordingly.

During the decade from 1923 to 1932, with one exception, no fundamental changes have taken place in the proportions of oils used in the various oil-using industries. In the margarine industry the price relation between coconut oil, and oleo oil and neutral lard, changed sufficiently in favor of coconut oil to warrant far reaching readjustments in the industry. Oleo oil and neutral lard maintained their prices up to 1930 on a relatively high level, while the price of coconut oil showed a tendency to decline. In the manufacture of margarine the proportion of these oils used during 1920 to 1930 changed accordingly from 42 to 16 percent for oleo oil and neutral lard and from 26 to 67 percent for coconut oil. To be true, food legislation also fostered the shift toward coconut oil as the principal raw material for margarine. Yellow margarine consisting primarily of animal oils and cottonseed oil, pays an excise tax of 10 cents, while an uncolored margarine, for the production of which the naturally white coconut oil is particularly suited, a tax of only one-fourth cent is collected.

FOOD AND SOAP OIL MARKETS IN THE UNITED STATES

After having analyzed the position of cottonseed oil in the various manufacturing industries, and its price relationship to other oils, a detailed examination will be made of its production characteristics and the influence of oil imports and tariff policies on the markets of fats and oils. This section will be limited to the few major oils which according to the preceding section, affect most directly the position of cottonseed oil.

PRODUCTION OF COTTONSEED OIL

The production of cottonseed oil, as a by-product of the cotton industry, is closely correlated with the production of cotton. During recent years, cottonseed oil has represented about 6 percent of the total value of the products of raw cotton. Its price can be held to have little or no effect upon cotton production. The price of cottonseed oil influences the oil output only in determining the extent to which cottonseed is crushed and to which its oil is recovered from the seed. Indications are that the cottonseed oil supply can be increased about 20 percent through a more complete recovery of the oil from the seed, if an adequate price incentive existed.⁴⁶ This represents a rather large potential supply ready to be resorted to as soon as oil prices advance enough to justify a more complete recovery of the oil.

In years of low cottonseed oil prices, the relative amount of oil recovered decreases as in 1921, 1927, 1931 and 1932, while

TABLE 21. UNITED STATES PRODUCTION OF COTTON AND COTTONSEED OIL.*

Year	Cotton** production (1,000 bales)	Cottonseed*** oil production (1,000 pounds)
1913	14,156	.....
1914	.....	1,790
1919	11,421	.....
1920	13,440	1,143
1921	7,954	1,277
1922	9,755	935
1923	10,140	974
1924	13,628	1,154
1925	16,104	1,511
1926	17,977	1,761
1927	12,955	1,807
1928	14,478	1,460
1929	14,828	1,584
1930	13,932	1,616
1931	17,095	1,417
1932	12,727	1,572†

* Cottonseed oil production lags one year behind the corresponding cotton production. See fig. 6.

** U. S. Dept. of Agr., Yearbook.

*** U. S. Dept. of Com., Bur. of the Census and U. S. Dept. of Agr., Stat. Bul. 24. Statistics of Fats, Oils and Oleaginous Raw Materials.

† Oil, Paint and Drug Reporter.

⁴⁶ U. S. Tariff Commission, Report 41, p. 19.

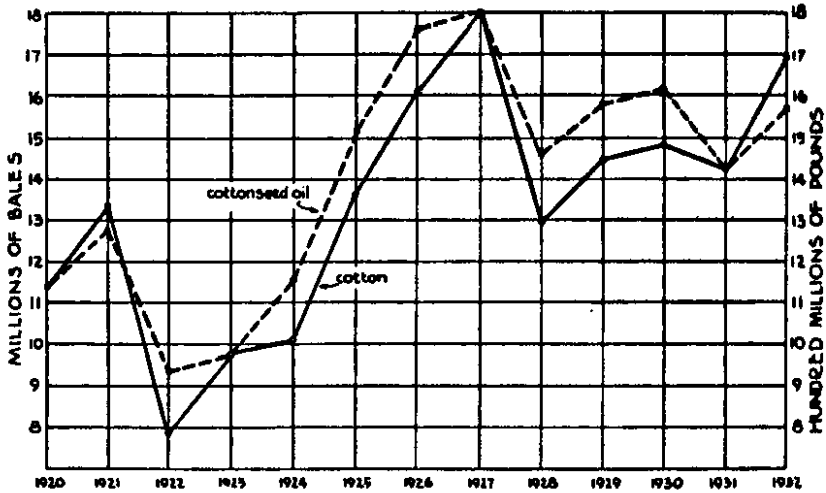


Fig. 6. Production of cotton and cottonseed oil. The cotton figures have been advanced one year, since the cotton crop season lies between September and December, and most of the oil obtained from one crop appears on the market during the following year.

the opposite is true when prices are high of which the years 1922-26 are examples. (See fig. 6 and table 23.) The demand for protein feed in the dairy industry and for fertilizer also affects the production of cottonseed oil and thereby its price. Cottonseed cake and meal, the residuals of the crushing process, are valuable protein feeds, and in the southern regions where artificial nitrogen fertilizers are expensive cottonseed meal furnishes an important source of nitrogen, especially for cotton and truck crops.

In general, the oil constitutes slightly more than one-half, and the meal and cake about one-third of the total value

TABLE 22. COMPARISON OF VALUES OF COTTONSEED PRODUCTS.*

Year	Oil		Meal and cake		Hulls and linters		Total cottonseed products	
	Value (million dollars)	Percentage of total	Value (million dollars)	Percentage of total	Value (million dollars)	Percentage of total	Value (million dollars)	Percentage of total
1906-1910	40	48	32	39	11	13	83	100
1911-1915	75	52	52	36	17	12	144	100
1916-1920	179	57	92	30	41	13	312	100
1921-1925	91	51	61	34	26	15	178	100
1926-1930	132	53	82	33	34	14	248	100
1923	85	49	59	34	29	17	173	100
1927	142	59	72	30	26	11	240	100
1929	134	50	91	34	40	16	265	100
1930	115	50	82	36	32	14	229	100
1931	92	54	59	35	19	11	170	100

* Taken from Stat. Abst. of the U. S., 1931 and 1932. U. S. Dept. of Com.

of the several products made from cottonseed. (See table 22.) Meal and hulls are used chiefly for feed, and the linters, the short fibers adhering to the seeds after ginning, are manufactured into cotton batting which is used for quilting and upholstery. And as already indicated a considerable amount of cottonseed meal is annually used as fertilizer.

TABLE 23. PERCENTAGE OF COTTONSEED PRODUCTION CRUSHED AND COTTONSEED OIL PRICES.*

Year	Percentage of cottonseed crushed	Cottonseed oil prices (cents per pound)
1908-1912	67.4	6.3
1913	75.0	7.3
1916-1919	85.0	17.5
1920	79.1	15.4
1921	68.1	7.9
1922	85.2	10.1
1923	74.8	11.3
1924	73.5	10.8
1925	76.1	10.8
1926	77.7	11.8
1927	78.9	9.7
1928	80.8	9.9
1929	78.6	9.7
1930	76.1	8.1

* U. S. Tariff Commission, Report 41, p. 206.

In the production of vegetable oils from domestic materials cottonseed ranks first. It constitutes over 90 percent of the total, excluding linseed oil; corn oil is second with 7 percent, followed by peanut oil with 1 percent, except in 1931, when the increasing production of soybean oil furnished 3 percent of the total domestic oil production.

The dominating position of cottonseed oil among the domestic vegetable oils has an important bearing upon the problem of tariff on fats and oils. It should be kept in mind that hog producers are interested in high cottonseed prices because an advance in the price of cottonseed oil increases the cost of production of lard substitutes and thereby strengthens the competitive position of lard. High cottonseed oil prices, however, prevent cottonseed oil from being diverted into other uses, such as soap production. Returning to the tariff for a moment, even if tariff protection were to provide enough of a price inducement to domestic peanut and soybean growers to double or even treble their production, such an expansion would, in the first place, increase the total domestic supply of vegetable oil relatively little, and, secondly, it would have practically no effect upon the price of cottonseed oil. It is not probable that tariffs can bring about any considerable increase in the production of corn oil since corn oil represents only a minor by-prod-

TABLE 24. VEGETABLE OIL PRODUCTION FROM DOMESTIC MATERIALS.*

Class of food and soap oils***	1920		1923		1925		1927		1929		1931	
	Million pounds	Percentage of total	Million pounds	Percentage of total	Million pounds	Percentage of total	Million pounds	Percentage of total	Million pounds	Percentage of total	Million pounds	Percentage of total
Cottonseed	1,143	91	974	89	1,511	93	1,806	93	1,584	90	1,417	89
Corn	99	8	111	10	104	6	117	6	134	8	113	7
Peanut	13	1	5	1	15	1	11	1	16	1	14	1
Soybean	..	..	1	..	2	..	3	..	11	1	39	3
Olive	..	..	..	..	..	..	1	..	1	..	2	..
Total vegetable food and soap oils	1,255	100	1,091	100	1,632	100	1,938	100	1,746	100	1,585	100

* Basic data taken from U. S. Dept. of Com., Bur. of the Census.

** Production in 1920: 643,000 lbs.; in 1923: 574,000 lbs.; in 1925: 532,000 lbs.

*** In addition to these five oils, only linseed oil is produced in the United States to any considerable extent. Since linseed oil has no direct relation to cottonseed oil and is used almost exclusively in the paint and varnish industry, it has been omitted.

uct of the starch and sugar industry.⁴⁷ Regardless of the protection given domestic producers of these oils, cottonseed oil has not much to fear from its domestic competitors.

The expansion of soybean oil production from 3 million pounds in 1927 to 39 million pounds in 1931 undoubtedly was hastened by a 3½ cents per pound tariff and by the increased demand for soybean meal as a protein supplement for livestock rations. The increase in domestic production has tended to reduce imports, which dropped during this period from 15 to 5 million pounds, and inasmuch as soybean oil is a semi-drying oil it has probably also had some influence on the production and importation of linseed oil, which dropped from 778 million pounds to 521 million pounds. It does not appear that soybean oil has replaced cottonseed oil in food and soap manufacture. If the domestic supply of soybean oil were to become considerably larger than the demand for it in the paint and varnish industry and for liquid soaps in the soap industry, it would forfeit the price premium it now commands over cottonseed oil, which would weaken its competitive position on the cost side. Indications are that this is already taking place. Observe the reductions of the price differential between cottonseed and soybean oil from 2.4 cents in 1927 to 0.6 cents in 1931. (Table 20.) If soybean oil production continues to expand, this price differential probably will soon turn in favor of cottonseed oil, and soybean oil prices, at least relatively, will no longer act as an incentive for its production. In this case, soybean meal might come to represent a greater part of the total value of the raw products made from soybeans, and, if so, soybean meal prices and the advantages of soybeans in the crop rotation will chiefly determine the course of its production.

As to the domestic production of peanut and olive oil, their expansion is possible, but not probable unless strong price incentives are given. Peanuts and olives in the United States are produced chiefly for direct food consumption as nuts or peanut butter and as fruits. Only the culls of the crop are crushed for oil, and the oil consequently is of a low grade. This explains the fact that in spite of high tariff protection the domestic production of olive and peanut oil has not increased materially.⁴⁸

⁴⁷ The situation would be very different if corn alcohol were to be blended with gasoline on a national scale. It has been estimated that 600 million bushels of corn might be used in this way; if so, upward of 900 million pounds of corn oil would emerge as a by-product from the processing of this corn into alcohol. This amount would be about two-thirds of the present annual cottonseed oil production, and it would be more than the total import of vegetable oils used for food and soap manufacture. It would indeed upset the vegetable oil market.

⁴⁸ In the case of peanut oil, production actually decreased after the 1922 tariff act became effective, declining from 13 million pounds in 1920 to 5 million pounds in 1923. It again dropped after the 1930 tariff act, as is shown in table 24.

CONSUMPTION OF MAJOR OILS USED FOR FOOD AND SOAP

In order to get an adequate picture of the oil market in which cottonseed oil finds itself, it is advisable to segregate the oils with which cottonseed oil is concerned from those outside of its sphere with which it does not compete. Cottonseed oil is primarily used for food, and to a limited extent for soap making. The consumption of cottonseed oil is virtually confined to these two types of uses. All kinds of fats and oils used in other fields have very little or no effect on cottonseed oil. The factory consumption of various oils, both domestic and foreign, that are important to this analysis are given in table 25.

The domestic consumption of animal and vegetable oils increased over 70 percent from 1914 to 1929, largely because

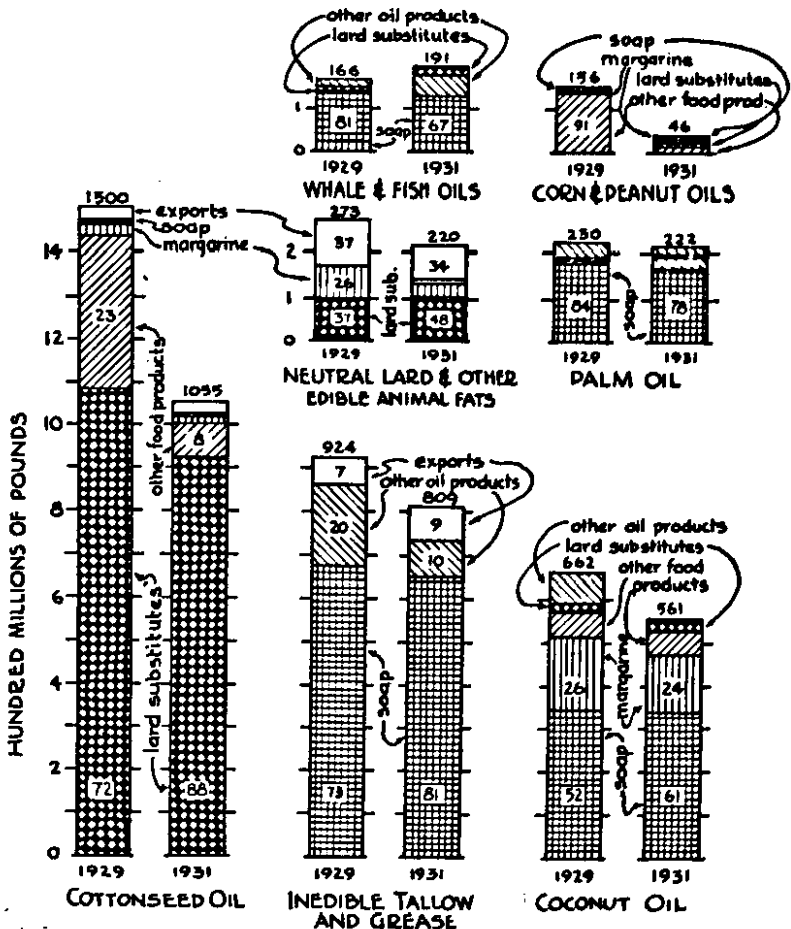


Fig. 7. Distribution of specific oil consumption in various industries. (Based on data in tables 26 and 27. The figures in columns indicate percentages.)

TABLE 25. FACTORY CONSUMPTION OF OILS USED PRIMARILY FOR FOOD AND SOAP WITH BUTTER, LARD AND EDIBLE OLIVE OIL EXCLUDED.

	1914*		1929*		1931**	
	Million pounds	Percentage of total	Million pounds	Percentage of total	Million pounds	Percentage of total
OILS OF DOMESTIC ORIGIN						
Cottonseed	1,481	63.0	1,474	36.6	1,141	33.1
Cottonseed oil foots	108	4.6	109	2.7	108	3.1
Corn	76	3.2	138	3.4	43***	1.3
Soybean	3	0.1	11	0.3	24	0.7
Peanut	1	...	15	0.4	13	0.4
Vegetable oils		70.9		43.4		38.6
Inedible tallow and grease	331	14.1	839	20.8	777	22.5
Edible tallow, neutral lard, oleo oil	107	4.5	172	4.3	158	4.6
Fish oil	11	0.5	64	1.6	71	2.1
Whale oil	1	...	11	0.3	...	...
Animal oils		19.1		27.0		29.2
TOTAL DOMESTIC OILS	2,119	90.0	2,833	70.4	2,335	67.8
OILS OF FOREIGN ORIGIN						
Coconut and palm-kernel	115	4.9	746	18.6	647	18.7
Palm	49	2.1	231	5.6	236	6.9
Inedible olive oil and foots	19	0.8	54	1.3	47	1.4
Soybean	12	0.5	8	0.2	4	0.1
Peanut	7	0.3	2	...	1	...
Sesame	1	...	30	0.8	45	1.3
Vegetable oils		8.6		26.5		28.4
Whale oil	4	0.2	60	1.5	73	2.1
Other animal and fish oils	27	1.2	60	1.6	58	1.7
Animal oils		1.4		3.1		3.8
TOTAL FOREIGN OILS	234	10.0	1,191	29.6	1,111	31.2
TOTAL FACTORY CONSUMPTION	2,353	100.0	4,024	100.0	3,446	100.0

* U. S. Tariff Commission, Report 41, p. 10.

** Basic data taken from U. S. Dept. of Com., Census reports.

*** This figure is probably too low. It is arrived at by deducting from crude and refined oil consumed the quantity of refined oil produced. A part of the refined corn oil, however, is probably sold directly for food consumption as cooking oil, known as "Mazola" and therefore does not appear as "factory consumption."

TABLE 26. PERCENTAGE DISTRIBUTION OF THE PRINCIPAL OILS CONSUMED BY INDUSTRIES, AND OIL EXPORTS.*

Class of industries using oil	Cottonseed oil		Coconut oil		Palm oil		Corn and peanut oil	
	1929	1931	1929	1931	1929	1931	1929	1931
Lard substitutes	72.1	88.0	3.0	6.0	0.4	15.8	...	26.1
Margarine	1.9	1.5	25.9	23.7	0.4	1.0	4.5	10.9
Other food products**	23.5	8.0	8.1	9.5	...	0.5	91.0	47.8
Soap	0.8	0.2	52.0	60.8	83.5	77.5	4.5	8.7
Paint and other oil products	...	0.2	11.0	...	15.7	5.2	...	4.3
Exports	1.7	2.1	...	...	...	...	...	2.2
TOTAL	100	100	100	100	100	100	100	100

	Sesame oil		Inedible tallow and greases		Neutral lard and other edible animal oils		Whale and fish oils	
	1929	1931	1929	1931	1929	1931	1929	1931
Lard substitutes	16.7	81.0	...	...	36.6	47.7	9.6	9.9
Margarine	...	...	...	...	26.0	15.0	...	...
Other food products**	66.6	...	...	...	...	2.7	...	...
Soap	16.7	19.0	73.6	80.7	...	...	80.7	66.5
Paint and other oil products	...	...	19.9	10.0	...	0.5	9.7	23.6
Exports	...	...	6.5	9.3	37.4	34.1	...	...
TOTAL	100	100	100	100	100	100	100	100

* Basic data taken from table 27.

** Chiefly cooking oils, salad dressings, mayonnaise, etc.

of the expansion of soap production and the increased production of lard substitutes, vegetable oil margarine, candies and bakery products. Since 1929, however, oil consumption has declined, dropping 14 percent from 1929 to 1931, and another 14 percent from 1931 to 1932.⁴⁹ This most likely reflects the general depression rather than a downward turn of the trend.

Before the war, cottonseed oil accounted for 63 percent, almost two-thirds, of the total factory consumption of oils in the United States. Today it contributes slightly over one-third. Coconut oil, palm and palm-kernel oil are the principal oils that have increased, although sesame oil, whale and fish oil have shown some increase. The chief use of all these oils, sesame oil excepted, is for soap making. Sesame oil is chiefly consumed by the lard substitutes and salad dressing industry and competes directly with cottonseed oil, though it is quantitatively only of minor importance; it constituted less than 3 percent of the oils used in the lard substitute industry in 1931. From 1929 to 1931, consumption of soybean oil increased

⁴⁹ "Soap", p. 40. March, 1933.

TABLE 7. APPARENT CONSUMPTION OF PRINCIPAL OILS BY INDUSTRIES, AND OIL EXPORTS.*
(Millions of pounds)

Class of industries using oil	Cottonseed oil**		Coconut oil		Palm oil		Corn and peanut oil	
	1929	1931***	1929	1931***	1929	1931***	1929	1931***
Lard substitutes	1,083	928	20	34	1	35	...	12
Margarine	28	16	171	133	1	2	7	5
Other food products	351	84	54	53	...	1	142	22
Soap	12	2	344	341	192	172	7	4
Paint and other products	...	2	73	...	36	12	...	2
Exports	26	23	...	...	...	...	...	1
TOTAL	1,500	1,055	662	561	230	222	156	46

	Sesame oil		Inedible tallow and greases		Neutral lard and other edible animal oils		Whale and fish oils	
	1929	1931	1929	1931	1929	1931	1929	1931
Lard substitutes	5	34	...	...	100	105	16	19
Margarine	...	...	...	...	71	33	...	...
Other food products	20	...	...	...	...	6	...	...
Soap	5	8	680	653	...	...	134	127
Paint and other products	...	...	184	81	...	1	16	45
Exports	...	...	60	75	102	75	...	...
TOTAL	30	42	924	809	273	220	166	191

* Data for 1929 from U. S. Tariff Commission, Report 41, p. 31; and for 1931 from U. S. Dept. of Com., Bur. of the Census.

** Cottonseed oil foots excluded. They amount to 109 million pounds in 1929 and 108 million pounds in 1931 and are primarily consumed by the soap industry. The foots of other oils used for soap making are also excluded.

*** The 1931 data seem to be more reliable for our purpose, since they designate the ultimate uses of the primary oils, while the 1929 data give the oil consumption of the various industries without reference to the ultimate uses.

from 10 to 28 million pounds as a result of the expansion of domestic production.

Relative to the total, the amount of vegetable oils used in the United States has declined while that of animal and fish oils has increased. Observe the following figures:

Percentage of total consumption	1914	1929	1931
Vegetable oils	80 percent	70 percent	67 percent
Animal and fish oils	20 percent	30 percent	33 percent

The development of the soap industry entailed a more careful recovery of tallow and greases on the side of the packers, and the increase in cattle and hog production brought about a larger supply of tallow and grease. The improvements in the

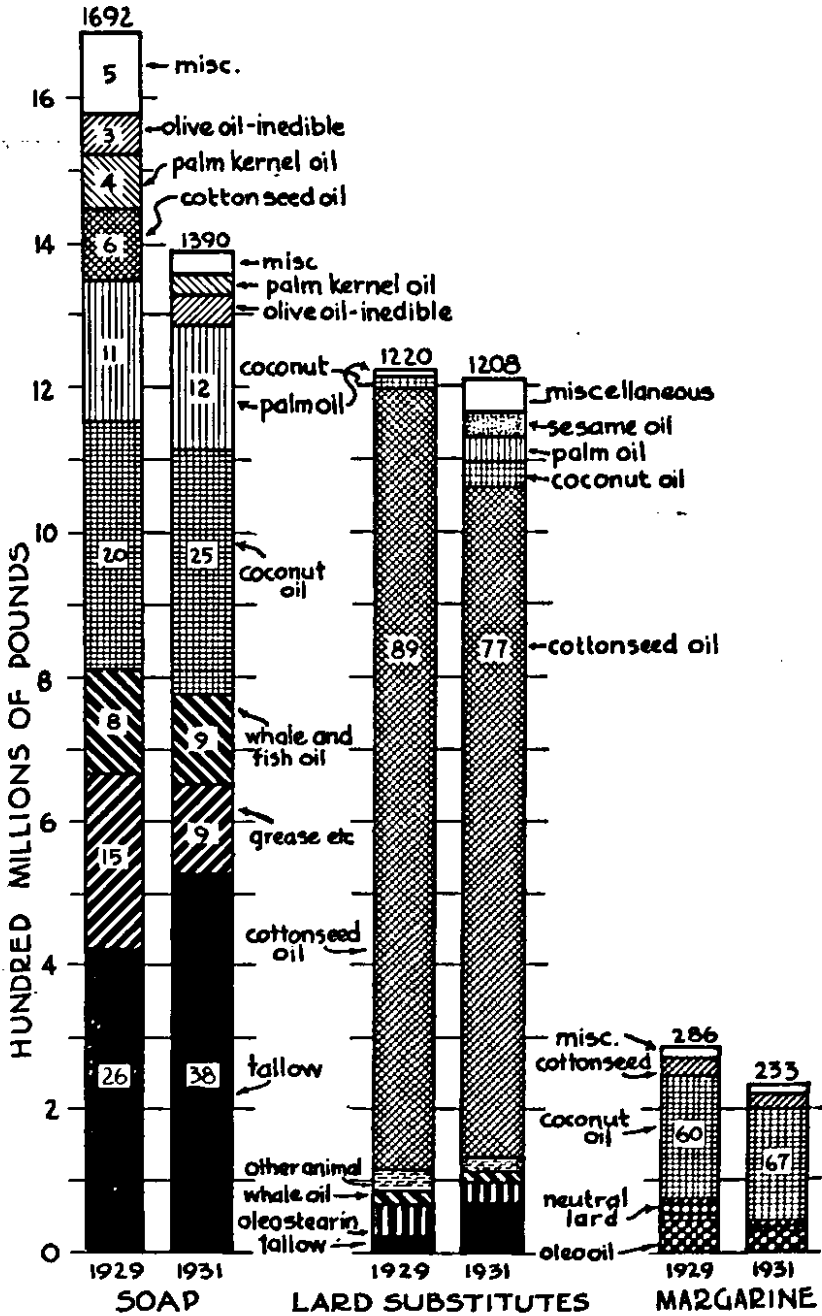


Fig. 8. Consumption of oils by specific industries.

(Based on data in tables 17, 18 and 19. Figures in columns indicate percentages.)

technique of hydrogenation and deodorization opened new fields for whale and fish oils. The hardening of fish oils through hydrogenation brought it into direct competition with animal fats.⁶⁰ These two groups of oils are chiefly responsible for the larger share of animal oils used as compared with the amounts used during the pre-war period. The smaller proportion of cottonseed oil in the total consumption is therefore not due to an absolute decline in cottonseed oil consumption, but to an increase in the consumption of other vegetable and animal oils.

Coconut, palm, whale and fish oils are primarily used for soap making, though about one-fourth of the coconut oil is consumed by the margarine industry. Four-fifths of the inedible tallow and grease is poured into the soap kettle, and about 9 percent is exported. Nearly two-thirds of the edible tallow and animal fats is manufactured into lard substitutes and margarine; the remainder is exported. Most of the corn and peanut oil is used for cooking oils and salad dressings. In 1929 this industry absorbed two-thirds of the sesame oil, but in 1931 it supplemented cottonseed oil in the production of lard substitutes, and four-fifths of it was used by the makers of lard substitutes. As for the rest, tables 26 and 27 are self explanatory. They give a detailed picture of the situation. The tariff aspect will be dealt with more fully in the following pages.

IMPORTS OF FOOD AND SOAP OILS AND THE TARIFF

Although the domestic production of food and soap oils more than doubled from 1914 to 1929, imports of these oils increased about five times. In 1914, 90 percent of the oils primarily used in these industries were of domestic origin; in recent years around 70 percent have been produced from domestic raw materials. An exception to this general trend is the domestic production of animal fats, which not only maintained its relative position but even gained ground, accounting for nearly 30 percent of the total in 1931 as against 19 percent in 1914. The proportion of vegetable oils from domestic origin dropped from 71 to 39 percent during these years. The bulk of the imported oils consist of coconut, palm, palm-kernel and marine oil. (See tables 25 and 28.)

Imported oils, of course, compete with the domestic oils, even though they are only in rare cases completely interchangeable. The most enthusiastic protectionist would not believe the United States could increase, in the course of a few years the production of vegetable oil by 1 billion pounds merely by imposing protective duties on imports. But from a

⁶⁰ Indications are that the consumption of whale and fish oil has increased tremendously in 1932. See oil imports, table 28.

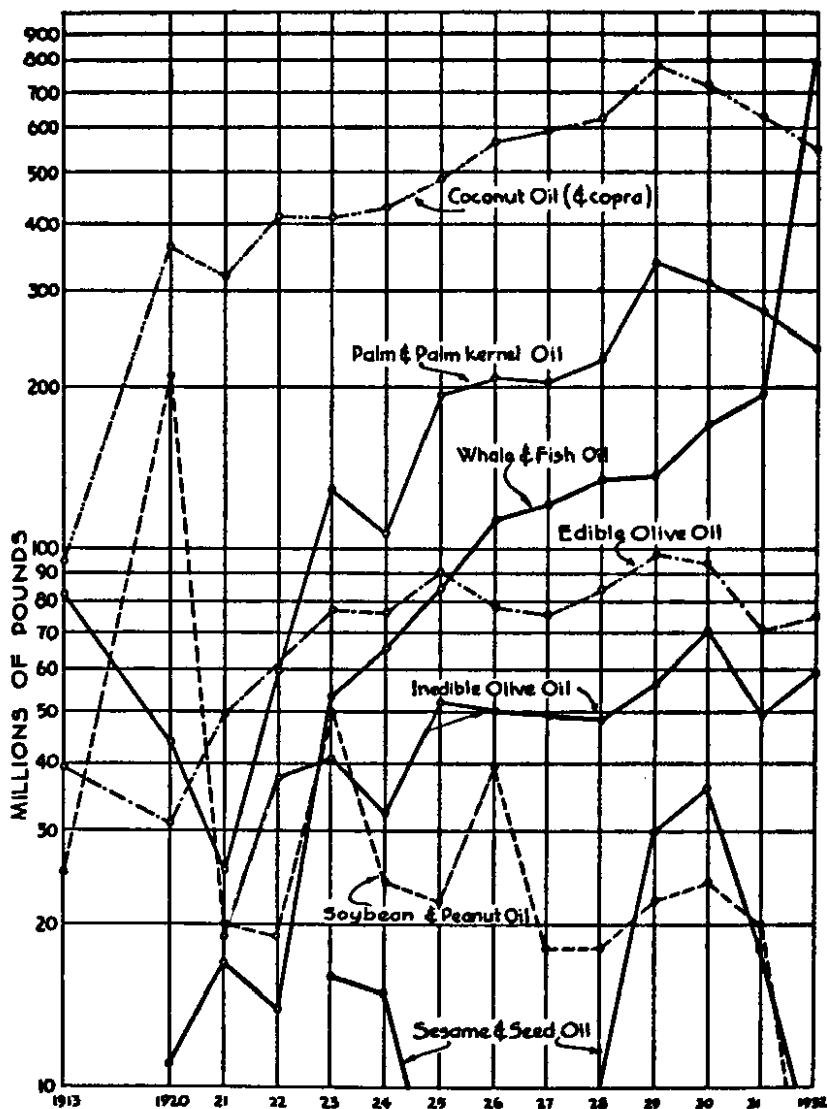


Fig. 9. Imports of principal food and soap oils, 1913, 1920 and 1932.

physical viewpoint he may claim that the United States is capable of becoming nearly self-sufficient with regard to the food and soap oils; provided corn, peanut and soybean oil production are increased and the present exports of 800 to 900 million pounds of lard and animal oils, and 40 million pounds of cottonseed oil are directed into domestic channels.

TABLE 28. IMPORTS* OF PRINCIPAL FOOD AND SOAP OILS AND OLEOGENIOUS RAW MATERIALS CONVERTED INTO OIL.
(Millions of pounds)

Year	Coco- nut oil	Copra in terms of oil	Palm and palm kernel oil	In- edi- ble- olive oil and foots	Olive oil edi- ble	Se- same oil	Se- same seed in terms of oil	Pea- nut oil	Soy- bean oil	Whale oil ††	Fish and other ma- rine oils †††
1913	72	23	82	4	39	..	..	11	14	..	..
1910-14	60***	..	89	18	37	..	..	..	19	..	..
1920	216	145	44	9	31	1	..	95	112	..	11
1921	190	128	25	19	50	..	..	3	17	3	17
1922	227	182	59	38	61	..	..	2	17	32	14
1923	183	225	128	41	77	9	7	8	42	30	23
1924	225	196	106	32	76	8	7	15	9	38	27
1925	232	246	192	52	90	4	2	3	19	55	29
1926	245	309	206	50	78	9	1	8	31	63	49
1927	293	293***	203	49	75	2	1**	3	15	40	80
1928	291	326	223	48	83	6	4	5	13	68	65
1929	412	371	332	56	97	22	8	3	19	55	80
1930	318	387	317	70	93	11	25	16	8	75	92
1931	325	298	271	49	70	..	63	15	5	140	50
1932	249	295	233†	58	74	..	9	1	..††	723	46

* 1913-1926: U. S. Dept. of Agr., Stat. Bul. 24, p. 33; 1927-1932: U. S. Dept. of Com., Monthly Summary of Foreign Commerce.

** Computed from raw material imports and average oil content as indicated in U. S. Dept. of Agr., Foreign Crops and Markets, 1932, July 25, p. 129, for 1927-1932. Imports of perilla and sesame seed not segregated in Monthly Summary of Foreign Commerce, but indications are that perilla seed imports are negligible. The rapid increase of seed imports from 1928 to 1931 can safely be attributed to sesame seed.

*** Average 1913-1914.

† Includes 14 million pounds of oil from 29 million pounds of imported palm nuts and kernels.

†† 405,000 pounds sunflower seed imports, negligible in previous years, amounted to 16.4 million pounds in 1932.

††† U. S. Dept. of Com., Monthly Summary of Foreign Commerce. Conversion of gallons into pounds by assuming 7.5 pounds per gallon.

PURPOSE AND EFFECT OF THE TARIFFS ON OILS

Complete prohibition of all oil imports, of course, is not the objective of the tariff policy pursued by the United States. The intention is merely to support and to encourage somewhat the domestic producers of oil and oleaginous raw materials. The food and soap oil tariffs have four groups of supporters; the dairy farmers, the cotton farmers, the hog farmers and the peanut, soybean and olive growers.

The dairy farmers want oil imports reduced in the hope that thereby the price of the oils used in making margarine would rise and that this in turn would reduce its consumption and strengthen the butter market.

The cotton growers' interest in reducing oil imports is to raise the prices of foreign oils and thereby force the manufacturers of soap and margarine to return to cottonseed oil as one of their principal raw materials.

The hog producers want to see the price of cottonseed oil increased and thus also the price of lard substitutes, and to see as much cottonseed oil as possible diverted into other oil prod-

ucts. By increasing the cost of producing lard substitutes the competitive position of lard would be improved.

The peanut and olive growers, though they produce oil only as a by-product from the culls of the crop, want tariff protection so that in case the price of peanuts or olives drop they can profitably shift by crushing a part of their crop for oil. The few farmers growing soybeans for oil are not only interested in a protected food and soap oil market, but also in the protection of the drying oil market, since soybean oil as a semi-drying oil is used in the paint and varnish industry; in the latter the soybean growers join hands with the flaxseed producers.

In spite of the comparatively high oil duties imposed by the tariff acts of 1921 and 1922 the soybean growers alone appear to have attained their objectives. Margarine production, for example, went steadily upward during the post-war period. Cottonseed oil, after 1922, continued to lose ground in the soap and margarine industry, while the competition that lard had to face grew ever more intensive. Soybean oil seems to be the only domestic oil whose production increased under the influence of the recent tariff acts. But most farmers grow soybeans for forage, green manure or seed and not for crushing. Hence, the benefit brought to farmers even by this tariff is insignificant.

The tariff on olive oil raised the domestic price virtually by the full amount of the duty, but domestic production did not respond to the increased price, since olive oil, like peanut oil, is only a by-product obtained from the culls of the olive crop not suitable for fruit. Quantitatively, the tariff did not affect imports; in fact, the only result has been that Americans from South-European stock have paid more for olive oil, which they believe an indispensable food in their diet, and that Italy, the chief exporter of olive oil, has reflected her resentment by restricting, among other commodities, her lard imports.⁵¹

In the case of cottonseed oil, the tariffs on oils and fats certainly have not prevented other oils and fats, especially foreign oils, from gradually capturing the soap industry and crowding out cottonseed oil. To the extent that this has had an adverse influence upon the price of cottonseed oil it has increased the economic pressure upon lard. As already noted the use of cottonseed oil has been concentrated more and more in the manufacture of lard substitutes. If the tariff on food and soap oil has any effect at all on cottonseed oil and lard prices the effect has been incommensurably small.

It is a well established fact that duties on commodities that are by-products in the domestic economy benefits the pro-

⁵¹ In 1932 Italy raised the tariff on lard imports from 0.74 to 3.58 cents per pound.

ducer only to a very limited extent. A low tariff on butter is likely to be much more effective than even a high tariff on all competing oils as far as benefiting the respective producer is concerned.⁵² There is, in addition, the important fact that the United States is on an export basis for cottonseed oil, lard substitutes and lard. Protection for these products can only be obtained by imposing duties on other net imported oils competing with cottonseed oil. This, certainly, disperses whatever effectiveness the tariffs on the food and soap oils may carry for these two important groups of producers, the cotton and hog farmers.

As a matter of fact, to a certain extent tariffs bring about the replacement of some oils, but, in general, not by those in whose behalf the duties were imposed.⁵³ For instance, the duty on coconut oil virtually stopped imports from foreign countries, but instead of being replaced by cottonseed oil it merely shifted the demand for coconut oil to the Philippines, and imports from that source soon exceeded by far the former foreign imports. Take another example. From 1920 to 1925, imports of peanut and soybean oil decreased by 189 million pounds, but their domestic production increased only 4 million pounds, not necessarily due to the tariff protection, while imports of palm, palm-kernel and marine oils rose 192 million pounds. Palm and palm-kernel oils entered duty free. In general, it can be said that as a consequence of the 1921 and 1922 tariff acts, the decline in the imports of dutiable oils has been more than offset by a rise in the imports of duty-free oils. The tariff act of 1930 raised the duties on soybean and edible palm-kernel oil by 1 cent and on edible sesame oil by 3 cents. The other rates remained practically the same. While it curtailed the imports of these particular oils it did not even raise the domestic price of these oils to any considerable extent, relative to their prices abroad, or to prices of competing oils.

THE TARIFF RATES AND THEIR EFFECT ON SPECIFIC OILS

In the emergency tariff act that was proclaimed in May, 1921, and that became law with only slight modifications in the tariff act of 1922, soybean, peanut and olive oils were provided with high duties, 2.5, 4.0 and 6.5 cents a pound, respectively. A high rate on peanuts was intended to protect the peanut market rather than the peanut oil market. The rate of 3 cents which was placed on cottonseed oil is purely nominal, cottonseed oil being strictly on an export basis and, for the same reason, so are the rates that were placed on animal fats. The duties on marine oils were relatively low (0.67 - 0.8 cents). Coconut oil was the only major oil of exclusively foreign

⁵² Considerable emphasis was placed, in an earlier section, upon the fact that both lard and cottonseed are strictly by-products.

⁵³ Wright. *The Tariff on Animal and Vegetable Oils*. p. 117.

**TABLE 29. RATES OF DUTY ON THE PRINCIPAL FOOD AND SOAP OILS
IN THE TARIFF ACTS OF 1922 AND 1930.†**
(Cents per pound)

Food and soap oils	1922		1930	
	Rate	Increase over 1913	Rate	Increase over 1922
OILS PRODUCED IN THE UNITED STATES :				
Peanut oil	4	1.2	4	no change
Soybean oil	2.5	2.5	1.5 ^{aa}	1
Olive oil	6.5 ^a	4	6.5 ^a	no change
Cottonseed oil	3	3	3	no change
Whale and seal oil	0.8	0.13	0.8	no change
Herring and menhaden oil	0.67	0.27	0.67	no change
Other fish oil	20 percent	20 percent	20 percent	no change
OILS EXCLUSIVELY OF FOREIGN ORIGIN :				
Coconut oil	2	2	2	no change
Palm kernel oil	Free	..	1	1
Sesame oil	Free	..	3	3
DOMESTIC OIL SEEDS :				
Peanuts	4	1.25		
Soybeans	0.5	0.5		

ENTERING DUTY FREE UNDER BOTH TARIFF ACTS : Palm oil
Inedible olive oil and foets
Copra
Sesame seed

**ENTERING DUTY FREE UNDER 1930 ACT,
IF DENATURED :** Denatured palm-kernel oil
Denatured sesame oil

^a Duty on olive oil in containers of less than 40 pounds, 7.5 cents in 1922 Act, and 9.5 cents in 1930 Act, and 8 cents by presidential proclamation of July, 1931.

^{aa} But not less than 45 percent ad valorem.

† Tariff Act of 1930 and Comparison of the Tariff Act of 1913 and 1922 by the U. S. Tariff Commission.

origin, on which a duty of 2 cents was imposed. For oils not specially provided for a 20 percent ad valorem rate was established. Palm, palm-kernel, sesame, inedible olive oil remained duty free. The 1930 tariff act raised the rate on soybean oil from 1 to 3.5 cents a pound and imposed new duties on edible palm-kernel and sesame oil. Inedible palm oil, olive oil and denatured palm-kernel and sesame oil remained duty free. So did copra and sesame seed. The increase in the tariff on soybean oil occurred partly in connection with an increase in the rate on linseed oil, of which soybean oil is, in part, a competitor. The provision for duties on non-denatured (edible) palm-kernel and sesame oil were intended to check the then increasing use of these oils in the food industries and thereby to protect primarily cottonseed, peanut and corn oils.

It should be kept in mind that the consumption of the highly protected domestic oils which are on an import basis,

i. e., peanut, soybean and olive oil, amount to only 1 or 2 percent of the total consumption of food and soap oils, or to less than 8 percent equivalent of the total domestic consumption of cottonseed oil. Consequently, even though the tariffs on peanut, soybean and olive oils were fully effective they are not likely to have any appreciable effect on the price of cottonseed oil.

In considering the effect of post-war tariff legislations upon oil imports, production and domestic prices, one must realize that after 1922 general business activity was on the up-grade; prices rose and imports increased. After the passage of the 1930 tariff act, business activity continued to contract, prices dropped and imports declined. The variations in the general state of business activity overshadow, in most cases, the effect of the tariff, so that it is hard, in fact often impossible, to segregate the latter from the former. (Tables 30 and 31.)

Coconut oil, which is the most important among the imported oils, came primarily from Ceylon and Cochin before the

TABLE 30. NET IMPORTS OF PRINCIPAL OILS BEFORE AND AFTER THE TARIFF ACTS OF 1922 AND 1930.

(Millions of pounds)

Oil and oil materials	1920*	1923**	In-crease (+) or de-crease (-)	1929***	1931***	In-crease (+) or de-crease (-)	Percentage increase (+) or decrease (-)	
							1920 to 1923	1929 to 1931
OILS PRODUCED IN THE UNITED STATES:								
Peanut oil*	95	5	-90	3	2	-1	-95	-33
Soybean oil	113	33	-80	11	..	-11	-71	-100
Edible olive oil	31	74	+43	97	70	-27	+139	-28
Inedible olive oil	9	43	+34	56	49	-7	+378	-13
Fish and whale oil	16	55	+39	134	188	+54	+244	+40
OILS EXCLUSIVELY OF FOREIGN ORIGIN:								
Coconut oil	188	166	-22	381	306	-75	-12	-20
Palm kernel oil	2	3	+1	69	23	-46	+50	-67
Sesame oil	1	9	+8	23	..	-22	+800	-100
Palm oil	42	128	+86	259	256	-3	+205	-1
Total oil imports	497	516	+19	1032	894	-138	+4	-13
OIL MATERIALS:								
Copra	215	333	+118	571	458	-113	+55	-20
Sesame seed	..	..	....	18	140	+122	....	+678
Peanuts	119	52	-67	31	10	-21	-56	-68
Soybeans	3	4	+1	..	..	....	+33	....

* Wright, the Tariff on Animal and Vegetable Oils, p. 262.

** U. S. Dept. of Com., Monthly Summary of Foreign Commerce, and Wright, op. cit.

*** U. S. Dept. of Com., Bur. of the Census. Animal and Vegetable Fats and Oils.

TABLE 31. WHOLESALE PRICES OF PRINCIPAL FOOD AND SOAP OILS BEFORE AND AFTER THE PASSAGE OF THE TARIFF ACTS OF 1922 AND 1930.
(Cents per pound)

Class of oil or fat	1921	1923	Rise (+) or decrease (-) in price	1929	1931	Rise (+) or decrease (-) in price
Cottonseed*	7.9	11.3	+3.4	9.7	6.0	-3.7
Peanut*	6.9	13.1***	+6.2	9.0	6.2	-2.8
Soybean*	7.9	11.7	+3.8	12.0	6.6	-5.4
Corn*	8.4	11.6	+3.2	10.3	7.5	-2.8
Olive*	28.6	23.3	-5.3	28.7	22.1	-6.6
Coconut*	10.1	10.2	+0.1	8.5	5.1	-3.2
Palm*	6.1	7.3	+1.2	7.4	3.9	-3.5
Edible tallow**	7.0	9.1	+2.1	8.9	4.7	-4.2
Inedible tallow*	6.4	8.2	+1.8	8.5	3.9	-4.6

* U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

** Wright, op. cit., p. 278.

*** For 1924: 11.8 cents, an increase of 4.9 cents.

1922 tariff act. The 2-cent rate that was imposed, however, caused a shift in the source. Coconut oil from the Philippine Islands, which, as originating from an American Possession, enters duty free, replaced that which formerly came from Ceylon and Cochin. The decrease in imports from 1920 to 1923 was due chiefly to the fact that the Philippine Islands were not prepared to satisfy immediately the greatly increased demand. But while imports temporarily dropped there is no evidence that coconut oil was replaced by using domestic oils, but instead the 22 million pound drop was more than offset by an increase of 118 million pounds in the importation of copra, which corresponds to at least 70 million pounds of oil. By 1925, the Philippine production had adapted itself to the increased demand, and net coconut oil imports rose to 214 million pounds and kept on rising until 1929 to a record import of 411 million pounds. In addition, the imports of copra increased from 333 million pounds in 1923 to 571 million pounds in 1929. The price of coconut oil was not affected by the tariff, as practically all of it entered duty free. The fact that coconut oil prices did not increase much from 1921 to 1923, although all other oil prices increased materially, may be explained on the ground that prior to the tariff act of 1922 the imported oil was of a higher grade. From 1929 to 1931, the yearly imports of oil and copra dropped 87 and 133 million pounds, respectively, and the oil price declined by 3.2 cents a pound.

Palm oil, which takes second place in the imports of oil, is duty free. Imports increased sharply after the 1922 act, rising from 42 million pounds in 1920 to 128 million pounds in 1923, and 262 million pounds in 1929, and declined only 4 million pounds in 1931, which is a remarkably small drop. Its price fell from 7.4 cents in 1929 to 3.9 cents in 1931, which is about the same rate of decline as that of coconut oil.

Imports of *palm-kernel* and *sesame oil* grew more steadily up to 1929, when 69 and 22 million pounds, respectively, were imported. The 1930 tariff act, with its rate of 3 cents a pound, apparently stopped nearly all sesame oil imports, and the duty of 1 cent a pound, along with the general business depression, pushed the palm-kernel oil import back to 23 million pounds in 1931. On the other hand, imports of sesame seed increased from 18 million pounds in 1929 to 140 million pounds in 1931, which is equivalent to about 61 million pounds of oil. At the outside, the net result of the tariff was to decrease the imports of sesame and palm-kernel oil 64 million pounds, but at the same time it brought about an increase of sesame seed imports which enters duty free equivalent to 61 million pounds of oil; consequently, the effect of the tariff was merely a shift from oil imports to a corresponding import of oil seeds.

Edible olive oil imports increased after the passage of the 1922 tariff act by 43 million pounds and declined after the 1930 act by 27 million pounds. Since the domestic production of edible olive oil is negligible, and since it commands a high price premium on account of its specific taste, it cannot readily be replaced by other oils. The duty on olive oil is, therefore, almost fully effective in increasing the domestic price. For instance, the price differential between the foreign and domestic prices is about 7 or 8 cents,⁵⁴ corresponding roughly to the duty of 6.5 and 9.5 cents and transportation cost. The effect of the tariff on the domestic production of edible olive oil has been negligible.

Imports of *soybean* and *peanut oil* dropped sharply following both the 1922 and 1930 tariff acts. The decline, however, was more than offset by increased imports of competing oils. Despite the high protective duty of 4 cents, the domestic production of peanut oil declined from 1921-22 to 1923-24.⁵⁵ Soybean oil production increased only slightly. To what extent the tariff may have contributed to the rise in the price from 1921 to 1923, 6.2 cents for peanut oil and 3.8 cents for soybean oil, it is impossible to say. Indications are that only the best edible grades of peanut oil are actually benefited by the tariff. Peanut oil from domestic origin, however, is of a low grade, and it appears that most of it is used for soap. The increase of soybean oil production from 11 million pounds in 1929 to 39 million pounds in 1931 might be attributed to the 3.5 cents duty, though there are probably other contributing factors, some of which have been mentioned.

Cottonseed oil production decreased 170 million pounds from 1920 to 1923, chiefly because of the small cotton crops,

⁵⁴ Wright, op. cit. p. 206.

⁵⁵ Peanut oil produced domestically dropped from 30 million pounds in 1921-22 to 4 million pounds in 1923-24. U. S. Dept. of Agr. Yearbook, 1931. Table 338.

and for similar reasons it decreased 167 million pounds from 1929 to 1931. Exports dropped from 252 million pounds in 1921 to 50 million pounds in 1923, and from 26 million pounds in 1929 to 22 million pounds in 1931. P. F. Wright maintains, in his elaborate study of the effect of tariffs on animal and vegetable oils, that the 1921-22 tariff act contributed to the breakdown of the American export trade in cottonseed and other vegetable oils by seriously impairing the competitive strength of the American crushing mills and refineries relative to their European competitors. Cottonseed oil certainly did not benefit from the oil tariff, and neither did lard. A comparison of cottonseed oil prices in the English and American markets upholds this statement in that the price differential is practically the same in 1920 as in 1923, and it shows even a relative price decline in the American market for 1924 and 1925.

In general, it can be held that the rise in oil prices as a whole after 1922 was not due to the tariff, but to general business conditions and other specific factors. Furthermore, the decline in the general level of oil prices after 1930 has not been checked and the drop in imports is not to be attributed to the tariff. From 1921 to 1923 all oil prices rose, irrespective of tariffs, and all oil prices fell from 1929 to 1931, virtually irrespective of tariffs. In fact, one cannot even distinguish, with some minor exceptions (as in the case of olive oil), a greater increase or a smaller decline in the prices of the dutiable oils compared with those of oils entering duty free, or those produced in excess of domestic requirements. Duties on animal fats, except butter, can have no consistent effect on their respective prices. This holds true not only for lard, but also for oleo oil, oleo stearin, grease and tallow as well. The United States is strictly on an export basis with regard to animal fats.

TARIFF AND IMPORT SITUATION OF FOOD AND SOAP OILS SUMMARIZED

The tariff structure on food and soap oils benefits the domestic producer very little, chiefly for the following reasons: (1) There is enough interchangeability among the various oils to permit users of oils to shift from oils with high duties (soybean, peanut, sesame oil, etc.) to oils that are duty free or to those with low duty rates (palm, coconut, marine oils, etc.), thus nullifying, in the end, the effects of a moderately protective tariff; (2) the by-product character of all domestically produced oils tends to prevent, at least partially, if not completely, an eventual increase in oil prices from appreciably increasing the income of the producers of oil-bearing materials and fats; and (3) the export surplus of the major domestic oils (cottonseed oil, lard, other animal fats) impedes the separation of the domestic oil prices from the world price level by tariff duties.

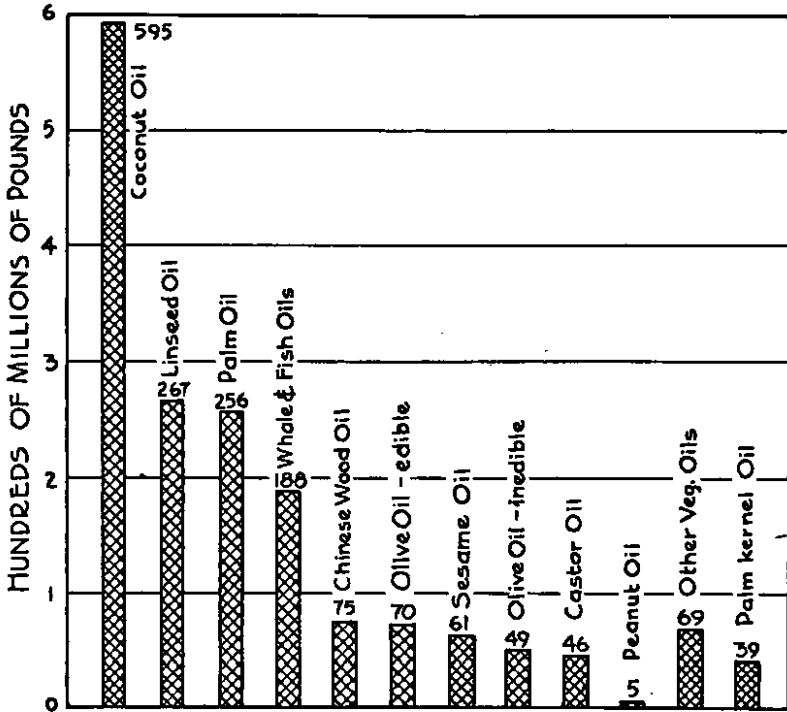


Fig. 10. Net imports of oils and oleaginous raw materials in terms of oils, for 1931.

With regard to the lard and cottonseed oil situation, it must be realized that the raw materials used for the manufacture of lard substitutes are almost entirely of domestic origin. Hence, there is no direct way to protect lard by tariffs on oils. Such tariffs can only indirectly help the hog farmer. The cottonseed oil, hitherto used by the lard substitute industry, would have to be diverted to the making of soap and margarine and other products through the restriction of oil imports. The possibilities, however, of satisfactorily replacing these imported oils by cottonseed oil are rather limited. Increasing the domestic production of such competing oils as soybean, corn and peanut oil, in order to replace the imported oils would, obviously, not benefit the hog farmer.

The effect of the oil tariffs on the competitive strength of domestic lard prices depends entirely upon the extent to which the domestic price structure of oils is changed so that cottonseed oil is actually shifted from lard substitutes manufacture to other industries, especially to soap, without, at the same time, having other oils take its place in lard substitutes. Such a shift in the use of cottonseed oil may not even result from

extremely high tariffs, since the soap industry, for instance, may find it more profitable to use the high priced foreign oils and raise soap prices correspondingly, than to use cottonseed oil which has several distinct disadvantages as a soap oil.

The tariffs on oils have not succeeded in stimulating the use of cottonseed oil in the manufacture of soap nor in industries other than those making lard substitutes. As a matter of fact, they were unable to prevent the concentration of the cottonseed oil in the lard substitute industry. Since lard substitutes themselves and lard are on an export basis, there is no possibility, under a system of competitive prices, to raise their price directly by tariff duties. Consequently, protection of lard by means of tariffs on oils can safely be held to be impracticable.

AMERICAN LARD IN INTERNATIONAL TRADE RELATIVE IMPORTANCE OF LARD EXPORTS

Before the war and again in recent years the export value of American lard has been about as large as that of wheat. The export values of both lard and wheat in 1931 and 1932 were below those of the pre-war period. Relative to the export value of edible animals and animal products, as reported by the United States Department of Commerce, lard exports have constantly increased; the export values of live animals, meat products, including pork, and dairy products have all decreased relative to lard. Lard apparently holds a comparatively strong position in export channels since it has been able to resist somewhat more effectively the general shrinkage in export trade than have most of the other export commodities. The significance of this apparent resistance will be considered later.

TABLE 32. EXPORT VALUES OF WHEAT AND LARD COMPARED.
(Millions of dollars)

Year	Wheat*	Lard*	Lard in percentage of wheat
1910-1914	55	57	104
1921-1925	228	119	52
1926-1930	152	98	64
1923	116	133	115
1926	202	112	55
1927	239	95	40
1928	120	102	85
1929	111	108	97
1930	88	75	85
1931	50	52	104
1932	33	32	97
1933	5	34	680

* U. S. Dept. of Com., Statistical Abstract for 1932, and Monthly Summary of Foreign Commerce.

LARD EXPORTS RELATIVE TO LARD PRODUCTION

The United States exports between one-fourth and one-third of its total lard production. But, as indicated at the out-

TABLE 33. LARD'S PORTION IN THE TOTAL EXPORT VALUE OF
"EDIBLE ANIMALS AND ANIMAL PRODUCTS" (GROUP 00).^a
(Millions of dollars)

Year	"Group 00" total value	Lard	Lard in percentage of "group 00"
1910-14	168	57	34
1921-25	342	119	35
1926-30	234	98	42
1931	118	52	44
1932	70	32	46
1933	75	34	46

^a U. S. Dept. of Com., Statistical Abstract for 1932, and Monthly Summary of Foreign Commerce.

set of this study, total lard production is not a satisfactory basis for estimating the importance of any factor relative to market supplies since at least 25 percent of the total lard produced does not appear on the market but is consumed on the farms where it has been rendered. Therefore, in order to evaluate the influence of the export outlet for lard on the lard market, commercial lard production or lard produced under federal inspection, is more dependable and adequate.

Up to 1929 about half of the lard produced under federal inspection was exported; since then the proportion exported

TABLE 34. LARD EXPORTS IN PERCENTAGE OF LARD PRODUCTION,
AND PORK EXPORTS IN PERCENTAGE OF PORK PRODUCTION.^a

Year	Lard			Pork		
	Lard exports including neutral lard	In percentage of federally inspected lard production	In percentage of total production	Pork export (excluding lard)	In percentage of federally inspected pork production	In percentage of total production
	Million pounds	Percent	Percent	Million pounds	Percent	Percent
1910-14	519	54.7	32.2	422	11.3	6.6
1920	643	48.7	31.3	929	20.5	12.5
1921	903	65.5	42.7	759	16.0	9.9
1922	799	50.7	33.9	727	14.1	8.8
1923	1,075	54.5	38.6	960	15.1	10.0
1924	986	51.3	35.9	735	12.1	7.9
1925	719	49.5	32.3	549	10.5	6.7
1926	733	48.4	31.5	426	8.3	5.2
1927	717	46.1	30.4	316	5.7	3.7
1928	801	45.8	30.9	334	5.5	3.6
1929	866	49.1	33.3	379	6.4	4.1
1930	674	44.3	28.8	314	5.7	3.6
1931	601	38.7	25.2	193	3.4	2.2
1932	552	35.1	22.9	108	1.9	1.2
1933	584	....	....	142	...	...

^a From U. S. Dept. of Agr., Statistics of Meat Production, and Monthly Summary of Foreign Commerce.

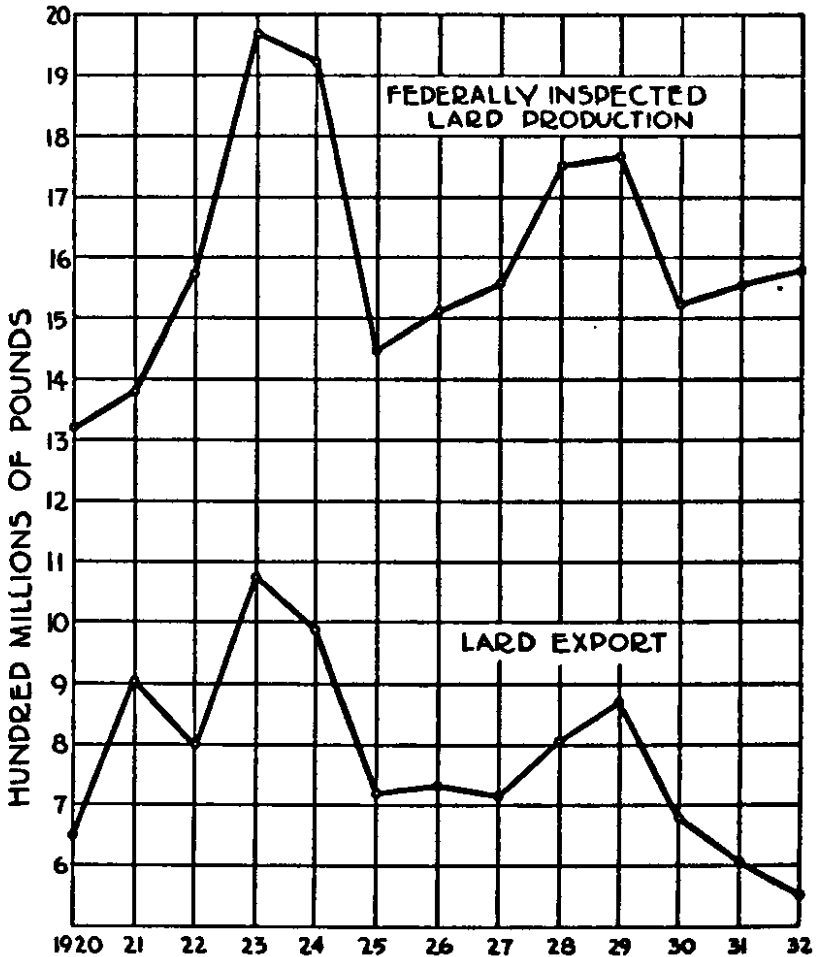


Fig. 1: Lard export and federally inspected lard production.

has fallen off. Pork exports have always been less important. Although the poundage of pork exports, up to 1924, was approximately equal to that of lard, it never accounted for more than 20 percent of the federally inspected pork production. Since 1924, pork exports have been steadily declining, representing only about 3 percent of the production in 1931. As a result, foreign outlets play a much more important role in the price determination of lard than they do in the case of pork. Figure 11 indicates the equalizing effect that lard exports have upon the domestic lard market. In years of high lard production, exports rise thus relieving the domestic market from its surplus.

LARD EXPORTS RELATIVE TO PORK EXPORTS

Considering hog products as a whole, the export trade absorbed slightly over 10 percent of the total production and 16 percent of federally inspected production during the 5 years preceding the depression (1925-29). In 1931, only 11 percent of the federally inspected production, and 7 percent of the total production, was exported; about three-fourths of this volume consisted of lard.

TABLE 35. EXPORT OF HOG PRODUCTS (PORK AND LARD) COMPARED WITH PRODUCTION.

Year	Total* pork and lard production (Millions of pounds)	Federally* inspected pork and lard production (Millions of pounds)	Pork* and lard exports (Millions of pounds)	Exports in percentage of federally inspected production (Percent)	Exports in percentage of total production (Percent)
1910-1914	7,975	4,681	941	20.1	11.8
1925-1929	11,135	7,169	1,168	16.3	10.5
1930	11,153	7,065	988	14.0	8.9
1931	11,292	7,163	794	11.1	7.0
1932	11,280	7,156	660	9.2	5.9

* U. S. Dept. of Agr., Statistics of Meat Production.

Of greater concern to this study, however, is the specific behavior of the different hog products in the export trade. Before the war, lard constituted both in quantity and in value, approximately one-half of the exports of hog products. During the war, the proportion of lard exports dropped to less than one-third as to quantity, and to slightly more than one-fourth as to value. Since then, lard has gained an ever increasing share of the total hog products entering export trade; in

TABLE 36. RELATIVE DISTRIBUTION OF EXPORT QUANTITIES AND VALUES OF HOG PRODUCTS BY THE THREE CHIEF EXPORT GROUPS.* (Lard, plus hams, shoulders and bacon, plus salted and pickled pork equals 100)

Year ending June	Lard (exclusive of neutral)		Hams, shoulders, bacon		Salted and pickled pork	
	Quantity	Value	Quantity	Value	Quantity	Value
1900-04	45.5	42.9	45.1	49.2	9.4	8.9
1905-09	50.7	46.5	39.1	44.0	10.2	9.5
1910-14	54.4	51.0	40.1	44.1	5.5	4.9
1915-19	30.2	27.0	67.1	71.1	2.7	1.9
1920-24	50.2	44.0	47.5	54.0	2.3	2.0
1925-29	66.2	60.6	31.0	36.5	2.8	2.9
1930	72.3	63.9	24.1	32.0	3.7	4.1
1931	77.2	68.2	20.0	28.6	2.8	3.2
1932	83.2	76.0	14.5	22.0	2.3	2.0
1933	83.4	75.3	14.2	22.4	2.4	2.3

* Basic data for 1900-1929: Taylor, A. E., Corn and Hog Surplus in the Corn Belt, p. 594. For 1930-1933: U. S. Dept. of Com., Monthly Summary of Foreign Commerce.

1932, it represented 83 percent or over four-fifths as to quantity and 76 percent or over three-fourths as to value. The decline of the American exports of cured pork, which already had begun before the war, though at a slower rate, is primarily attributable to the expansion of the hog industry in the European countries, especially in Germany and Denmark. But since the European hog industry has developed almost exclusively the bacon types of hogs and has tended steadily toward a lighter weight of hog slaughtered, the American lard export to these countries has not been affected nearly as much as the exports of pork cuts. At present the lard yield in Germany is estimated at about 4.5 percent of the live weight compared with 15 percent in the United States. This difference in yield practically explains why American lard retained its market outlets in the European countries despite the increase in their hog production.

TABLE 37. EXPORT QUANTITIES AND VALUES, BY SPECIFIC HOG PRODUCTS IN PERCENTAGE OF TOTAL PORK AND LARD EXPORTS.*

Year ending June	1925-29		1930		1931		1932	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Total hog products	100	100	100	100	100	100	100	100
Lard	64	58	69	60	74	64	80	70
Bacon, hams, shoulders	30	35	23	30	19	26	14	21
Fresh pork	1	1	2	2	1	2	1	2
Salted or pickled	3	2	3	3	3	3	2	2
Neutral lard	2	3	2	2	2	1	1	1
Canned pork	.	1	1	3	1	4	2	4

* Basic data from U. S. Dept. of Com., Monthly Summary of Foreign Commerce.

The only hog product besides lard, which gained in volume and value, was canned pork, but it represents such a small percentage of the total hog products exported that for the hog industry as a whole, this relative increase in the export of canned pork is negligible. Because of the higher price of hams, shoulders and bacons, their share in the export value is considerably greater than it is in export volume. But it has been this group of hog products, more than any other, whose exports have dropped most abruptly in the last 3 years. And there is not much hope that it is likely to regain its former importance in the export trade. Lard is gradually becoming the only important, strongly predominating export product of the American hog industry. In the future lard is likely to command over all other exportable hog products a comparative advantage, chiefly because the demand for lard in the European countries, for the years to come, will probably not be supplied from their own hog industry, and because the corn surpluses of the United States provide in abundance a raw material readily converted into lard.

EXPORT MOVEMENTS OF LARD AND PORK

It is very illuminating to observe how the exports of the various hog products responded to the price depression of the last 3 years. The volume of lard exports has kept up remarkably well, decreasing only by one-fourth, while the export of the next most important group—hams, bacon and shoulders—decreased by almost three-fourths. The lard export value in 1932 dropped to 35 percent of the 1925-1929 average, while the export value of hams, bacon and shoulders dropped to 17 percent, clearly indicating the relative strength of the lard in the export trade. Fresh pork shows the least relative decline as to value, though its volume decreased considerably more than that of lard. But since fresh pork constitutes only 2 percent of the export value of hog products, its relative resistance against the general shrinkage in exports has only a negligible effect on the hog industry.

TABLE 38. EXPORTS OF HOG PRODUCTS IN THE DEPRESSION YEARS, 1930, 1931 AND 1932.*
(1925-29 export=100)

Year ending June	Total hog products		Lard (excluding neutral)		Bacon, hams, shoulders	
	Quantity	Value	Quantity	Value	Quantity	Value
1925-29	100	100	100	100	100	100
1930	99	85	108	88	77	73
1931	69	53	80	58	44	40
1932	59	29	74	35	28	17

	Salted or pickled pork		Fresh pork		Neutral lard	
	Quantity	Value	Quantity	Value	Quantity	Value
1925-29	100	100	100	100	100	100
1930	128	121	123	119	82	66
1931	68	58	73	69	52	37
1932	49	26	61	39	37	19

* Basic data from U. S. Dept. of Com., Monthly Summary of Foreign Commerce.

American lard exports increased sharply immediately following the World War, totalling in 1923 twice the pre-war average, but since then they have gradually declined, with a slight upturn in 1928 and 1929, to almost the pre-war level. Both lard production and exports are converted into index numbers in table 39. Changes in the production index coincide with even greater variations in the export index. Note that in 1923, 1924 and 1929, high production indexes coincide with relatively still higher exports indexes and that the converse was true in 1920, 1925, 1927 and 1930-1931. If one makes allowance

TABLE 39. LARD EXPORTS AND INDEX OF LARD EXPORT AND PRODUCTION.*

Year	Lard exports (million pounds)	Lard export index	Federally inspected lard production index	Total lard production index
1910-14	519	100	100	100
1920	643	124	139	127
1921	903	174	145	131
1922	799	154	166	146
1923	1,075	207	208	172
1924	986	190	203	170
1925	719	138	153	138
1926	733	141	160	144
1927	717	138	164	146
1928	801	154	185	161
1929	866	167	186	161
1930	674	130	160	145
1931	601	116	164	148
1932	552	106	166	149

* Basic data from U. S. Dept. of Agr., Statistics of Meat Production. (Neutral lard is included.)

for the increase of federal inspection with regard to lard production, the interrelation between federally inspected lard production in percentage of total production and exports is even

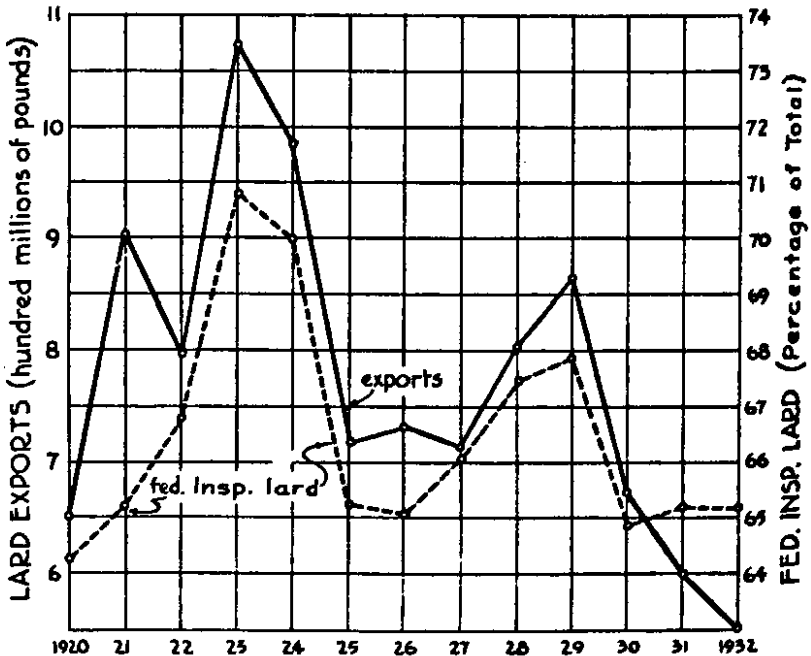


Fig. 12. Lard exports and federally inspected production in percentage of total lard production.

closer than that observed for total lard production. (See fig. 12.) The index for federally inspected lard production not only gives weight to variations in total domestic output but also to whatever response packers made to the lard price situation in the amount of fat backs rendered into lard and care used in taking off trimming and cutting fats from pork cuts.

LARD EXPORTS AND DOMESTIC CONSUMPTION

What determines the distribution of lard production between domestic consumption and exports? By comparing the variations in the relative amount that enters each of these two outlets a rather deep insight can be gained as to what lard exports mean to the domestic market. See figs. 13 and 14 which

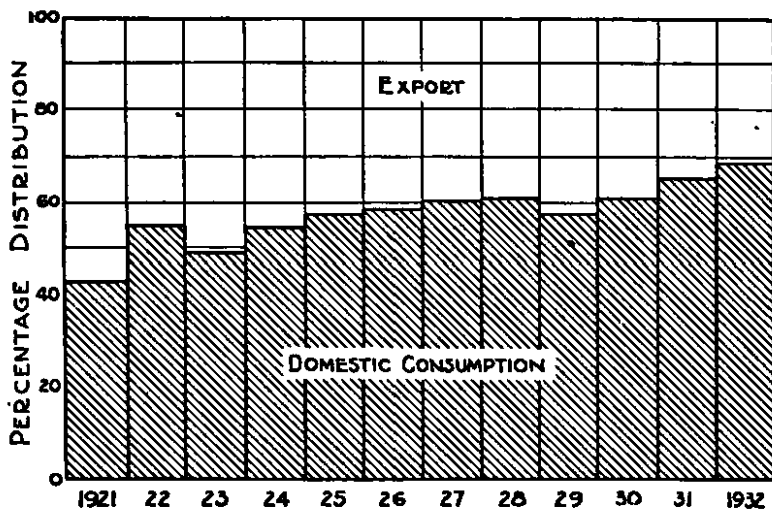


Fig. 13. Percentage of distribution of lard exports and domestic consumption.

show the percentage distribution of exports and domestic consumption, and the deviations in production, domestic consumption and exports from the 1921 to 1932 average. In spite of the small lard production of 1921, domestic consumption fell off relatively more than production, while exports were above average. The chief explanation appears to be in the unusually wide price differential that prevailed between New York (11.1 cents) and Liverpool (14.7 cents), providing a strong incentive to export. (See table 40.) In 1923, an extremely large lard production increased exports much more than domestic consumption. Since the export outlet was strong it even allowed domestic lard prices to rise which in turn induced packers to increase their production of lard relative to pork. With a small lard supply in 1925 and high domestic lard prices (16.8

cents), consumption dropped more than exports. The European market for lard continued to be strong. Were it not for the foreign demand domestic lard prices would not have risen so high. In 1928, after 3 years of relatively small production, and with rather low domestic prices, consumption rose far above the average, while exports fell. There was no special incentive to export, for foreign markets were weak. From 1930 to 1932 small supplies were accompanied by an abrupt drop in exports and a rise in domestic consumption with low lard prices. The decline in exports resulted chiefly from the worldwide depression and contraction of international trade.

In general it can be stated that from 1921 to 1925 exports held a stronger position in the distribution of the lard supply

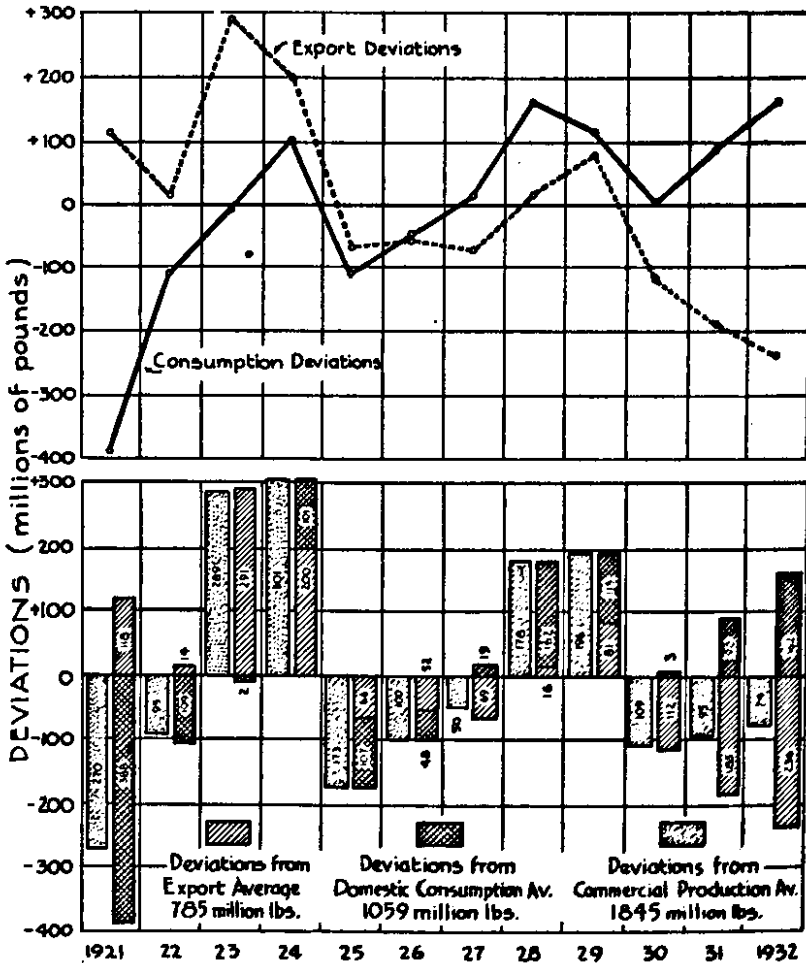


Fig. 14. Deviations of commercial lard production, exports and domestic consumption from the 1921 to 1932 average.

TABLE 40. LARD PRICES IN DOMESTIC AND FOREIGN MARKETS.
(Cents per pound)

Year	Refined lard, Chicago*	Lard prime contract, New York**	American prime western steam lard, Liverpool*	Lard, Hamburg***
1909-1913	10.7	11.0	12.0	13.3
1921	13.2	11.1	14.7	....
1922	13.1	11.5	13.1	13.3
1923	13.9	12.3	13.7	16.9
1924	14.6	13.3	14.7	15.3
1925	17.9	16.8	18.2	18.8
1926	16.9	15.0	16.5	17.0
1927	13.7	12.9	14.2	14.5
1928	13.3	12.3	13.5	14.3
1929	13.0	12.0	13.2	13.8
1930	12.0	10.9	12.1	12.4
1931	9.0	8.0	9.2	10.3
1932	6.2	5.0	6.9	7.6

* U. S. Dept. of Agr. Yearbook.

** U. S. Dept. of Labor, Bur. of Labor Stat., Wholesale Prices.

*** U. S. Dept. of Agr., Foreign Crops and Markets.

than domestic consumption; that is, with a supply above average, exports increased more than domestic consumption, and with a supply below average exports decreased less than consumption. This situation contributed markedly to the rise of lard prices. From 1926 to 1932, the export position weakened, chiefly because of the expansion of the European hog industry, the depression and the increase in tariffs, especially in Germany and Cuba; as a result, with a supply above average, domestic consumption had to absorb more of the surplus than exports, and with a supply below average, exports decreased more than consumption. The export and consumption deviation in fig. 14 clearly illustrates this change in the relative position of export and domestic consumption to the distribution of the lard supply.

FOREIGN MARKETS FOR AMERICAN LARD CHIEF LARD EXPORTING COUNTRIES

The United States is by far the most important lard exporting country. Before the war, over 97 percent of the total volume of world exports (net exports) of lard came from the United States; the remaining 3 percent originated in Denmark and China. After the war, the Netherlands took second place among the lard exporting countries with a net export of 5 to 8 percent of the total volume. Denmark has increased her share continually, and in 1931 accounted for nearly 8 percent. China held a rather stable position in the international lard trade at around 1 percent. Hungary participated to the

TABLE 41. DISTRIBUTION OF THE WORLD LARD EXPORTS BY PRINCIPAL EXPORTING COUNTRIES.

	1911-1913	1925-1929	1926	1927	1928	1929	1930	1931
Total volume* of net exports (million pounds)	543	843	818	802	861	920	740	701
Total volume=100	100	100	100	100	100	100	100	100
Net exports from countries (in percentage of total):								
United States	97.3	86.8	85.5	85.0	88.2	90.1	86.8	81.2
Netherlands	....	6.9	6.7	8.1	6.2	4.8	5.0	8.3
Denmark	1.4	2.9	2.4	3.5	3.4	3.0	5.0	7.6
China	1.3	1.3	1.4	1.2	1.0	1.1	1.1	1.1
Hungary	..	1.1	2.8	1.2	0.4	0.5	1.3	1.0
Irish Free State	}	1.0	1.2	1.0	0.8	8.7	0.8	0.8
Australia								
Canada								
Madagascar								

* Basic data from U. S. Dept. of Agr., Yearbook, 1931, p. 855; 1932, p. 793. Exports minus imports of the respective countries giving the net exports of lard.

extent of almost 3 percent of the world exports in 1926, but dropped again to 1 percent in 1931. The lard exports from Irish Free State, Australia, Canada and Madagascar never exceeded 5 million pounds each, which is but a fraction of 1 percent of the world lard exports.

DISTRIBUTION OF AMERICAN LARD EXPORTS BY COUNTRIES OF DESTINATION

From 1910 to 1914, Great Britain and Germany absorbed over 65 percent of the American lard exports; from 1920 to

TABLE 42. PERCENTAGE DISTRIBUTION OF AMERICAN LARD EXPORTS, BY COUNTRIES OF DESTINATION.*

Year	Great Britain	Germany	Cuba	Mexico	Netherlands	Belgium	France	Italy	Canada	Other countries
1910-14	35.6	30.0	8.7	1.5	7.7	3.6	2.5	...	2.1	8.3
1920	21.0	20.9	10.7	2.8	14.9	9.0	8.0	3.8	2.1	6.8
1921	26.7	32.0	8.3	5.0	8.9	5.9	4.6	1.4	1.5	5.7
1922	30.9	29.2	10.5	5.7	3.9	5.7	3.5	2.1	1.5	7.0
1923	22.5	35.7	8.6	4.0	7.2	4.5	3.7	5.0	1.5	7.5
1924	24.9	32.3	9.8	4.1	7.8	3.5	2.4	6.5	1.2	7.5
1925	31.2	28.0	11.2	6.8	5.4	2.4	0.6	4.1	1.5	8.8
1926	32.2	28.5	11.4	6.5	6.9	1.7	0.6	0.8	1.8	9.6
1927	32.4	27.1	11.8	6.4	5.5	1.9	0.7	1.8	2.3	10.1
1928	31.0	23.7	11.0	7.5	5.1	1.9	1.0	3.5	2.3	13.0
1929	29.2	25.9	9.6	7.5	5.3	2.4	1.3	3.3	2.1	13.4
1930	37.2	17.4	10.1	11.6	5.3	2.0	0.9	1.7	2.1	11.7
1931	44.1	23.4	7.9	8.1	4.9	1.3	0.3	1.3	1.5	7.2
1932	43.3	28.9	4.0	7.1	6.9	1.2	0.4	1.3	1.1	5.8

* Exclusive of neutral lard.

Sources of data:

1910-1924, Wrenn, International Trade in Meats and Animal Fats, p. 14.

1925-1932, from U. S. Dept. of Agr., Monthly Summary of Foreign Commerce.

1927; they took roughly 60 percent; and from 1928 to 1930 only 55 percent. During the world-wide depression of the last 3 years (1930-32), however, German and especially English purchases of American lard have not fallen off as much as those of other countries; consequently, in 1931 and 1932, these two countries took virtually 70 percent of the total American lard exports. Cuba and Mexico, which before the war took 10 percent, increased their purchases of American lard in 1930 to nearly 22 percent of the American exports. These dropped to 11 percent in 1932. During the last decade, Colombia and Peru temporarily absorbed considerable quantities of the American lard. There seems to be a possibility of developing the Central and South American lard market in the event that the European lard market contracts. Great Britain, however, is by far the most stable and dependable market for American lard. The lard exports to Great Britain in 1931 even exceeded those of the preceding years, while Germany's imports of American lard have declined. In 1930, Mexico and Cuba absorbed even more of the American lard exports than did Germany. In 1931, 44 percent of the export went to Great Britain, and 23 percent to Germany.

Although American lard exports have suffered until recently much less than other hog products from import restrictions abroad, tariffs on lard imports have been raised in many countries. The United Kingdom, since 1931, is collecting a small ad valorem duty of 10 percent on lard imports. Germany, until February, 1933, allowed lard to enter practically unhampered, but since then she has raised the duty on lard repeatedly; the present duty is extraordinarily high.⁵⁶ Cuba began to build up high tariff barriers against lard following 1930. Mexico moderately increased the duty on lard. The Netherlands allow lard to enter duty free, but an internal tax, at least on part of the imported lard, is levied. Table 43 gives the import duties applied by the five most important customer countries for American lard.

AMERICAN LARD IN THE GERMAN MARKET

Germany has been the second largest foreign consumer of American lard, exceeded only by the United Kingdom. Because of the far reaching governmental control now being exercised over the German oil and fat market, it is passing through a period of adjustment of particular importance to the American hog producer. The structure of the German fat market is fairly representative of other European countries, but since it is quite unlike that of the United States a rather comprehensive analysis will be made of the factors affecting the production and consumption of lard in Germany.

⁵⁶ On May 16, 1933, the duty was raised to 9.4 cents per pound. On July 19, 1933, the duty was further increased (100 RM. per 100 kg.), equivalent to 15.1 cents per pound at the exchange rates then governing.

TABLE 43. IMPORT DUTIES ON AMERICAN LARD IN PRINCIPAL FOREIGN MARKETS.

	1913*	1923*	1925-1930**	1931**	1932-1933**
UNITED KINGDOM	Free	Free		10 Percent	10 Percent
GERMANY			Sept., 1925	May, 1931	July, 1933
Reichsmark per 100 kilos	10.00	Free	6.00	10.00	100.00†
Equivalent cents per pound	1.1	Free	0.65	1.08	15.1
CUBA			May, 1930	Feb., 1931	July, 1932
Dollars per 100 kilos	2.91	2.91	7.20	10.80***	19.32***
Cents per pound	1.3	1.3	3.27	4.90	8.76
NETHERLANDS	Free	Free	Free†††	Free†††	Free†††
MEXICO			Aug., 1929	Jan., 1930	Aug., 1932
Pesos per 100 kilos	13.44	5.60	10.00†	15.00†	23.00†† or 32.00
Cents per pound	3.1	1.2	2.26	3.39	3.25 or 4.53

* Bjorka, Knute. International Trade in Pork and Pork Products, p. 24.

** According to information kindly given by the Institute of American Meat Packers, Chicago.

*** In addition to duty, consumption tax of 1 cent per pound is levied. The duty will be increased by 5 percent per annum until the initial duty of 8.76 cents is increased by 25 percent.

† Plus 2 percent of the duty as surtax on the 1929 rate, 3 percent on the 1930 rate.

†† 3.25 cents on lard in tank cars, 4.53 cents in other containers.

††† An internal tax is applied.

‡ In February, 1933, the duty was increased to 50 RM. per 100 Kilos, equivalent to 5.4 cents per pound. May 16, 1933, the duty was further increased from 50 to 75 RM. per 100 Kilos, at that time the new duty being equivalent to about 9.4 cents per pound.

Although, in density of hog population, Germany ranks close to Denmark, the country with the highest hog production per acre and per inhabitant in Europe, nevertheless, Germany is unable to produce enough lard to satisfy its domestic demand. The hog industry of Germany is made up of the meat types of hogs, with live weights averaging lighter than those in the United States. It has already been indicated that the lard yield per 100 pounds of live hog is estimated at about 4.5 percent, as against 15 percent in the United States. The domestic hog slaughter in Germany increased from 15 million head in 1924 to 25 million head in 1931, and lard production rose from 177 to 280 million pounds, while lard imports shrank from 293 to 183 million pounds, or by about the same amount that domestic production increased. In 1932, hog slaughter fell to about 23 million head, and approximately the same slaughter is expected for 1933, at least in tonnage, since the live weights show a slight tendency to increase. With the strong incentive for lard production offered by the present governmental price policy, it is likely that the domestic output of lard will increase despite the decline in number of hogs slaughtered (table 44).

Since consumption of lard in Germany has been fairly stable, imports have varied from year to year depending primarily upon the variations in domestic production. In 1924, more than 62 percent of the lard consumed was imported. But this percentage declined with rising domestic hog and lard production to about 40 percent in 1930 and 1931. In 1932, imports turned sharply upward, chiefly because of heavy imports during the last months of the year which entered primarily in anticipation of the higher tariff rates of February, 1933. Thorne found a close relationship between hog production in Germany, Denmark and the United Kingdom, and American lard exports.⁵⁷ Table 44, also suggests such a relation.⁵⁸

Danish lard is the chief competitor of American lard in the German market. In 1920 the Danes furnished 1.4 percent of the German lard imports; by 1932, they had captured 22 percent of that market. During 1933, however, imports of Danish lard have shown a tendency to decline.⁵⁹ It is alleged that Danish lard is inferior in quality to American lard; it sells at

⁵⁷ Thorne, G. B. and Richards, Preston. Factors Affecting Exports of United States Hog Products. U. S. Dept. of Agr., Bur. of Agr. Ec., 1932.

⁵⁸ The immediate outlook of hog production in these three countries indicates smaller hog supplies. Germany and Denmark show a decrease in numbers of hogs of 6 percent in early 1933, compared with 1932. For the United Kingdom, 1932 represents a top year of the hog cycle with 3.6 million hogs, so that, unless the course of the hog cycle is seriously disturbed, a decline in hog slaughter can be expected for the years 1933 and 1934. In Poland and the Baltic States hog production is also declining. Although these eastern countries and the Danubian States appear to have strong potentialities to increase their commercial hog and lard production, thus far lard exports from these countries have been only of minor importance.

⁵⁹ World Hog and Pork Prospects. April 19, 1933.

TABLE 41. GERMAN HOG SLAUGHTER AND LARD PRODUCTION, IMPORTS AND CONSUMPTION.

Year	Domestic hog slaughter ^a	Lard ^{***} production	Lard† imports	Lard consumption (production and imports)	
				Total	Imports in percentage of total consumption
	Million head	Million pounds	Million pounds	Million pounds	Percent
1913	18**	271	228	499	46.5
1920	3**	...	272	...	....
1924	15	177††	293	470	62.3
1925	16	201	225	426	52.8
1926	17	212	239	451	53.0
1927	21	258	213	471	45.2
1928	24	278	193	471	41.0
1929	21	253	213	466	45.7
1930	22	264	177	441	40.1
1931	25	280	183	463	39.5
1932	23	264	238†††	502	47.4

^aBlätter für landwirtschaftliche Marktforschung. January-February, 1933.

** Inspected slaughter.

*** Total lard production, estimate.

† Blätter für landwirtschaftliche Marktforschung. January-February, 1933. G. B. Thorne, op. cit.

†† Estimate based on the production from inspected slaughter, 120 million pounds in 1924. U. S. Dept. of Agr., Foreign Crops and Markets.

††† U. S. Dept. of Agr., Bur. of Agr. Ec. World Hog and Pork Prospects.

TABLE 45. PROPORTION OF GERMAN LARD IMPORTS OF AMERICAN AND DANISH ORIGIN.

Year	Total ^a lard imports	Imports of American lard		Imports of Danish lard	
	Million pounds	Million ^{**} pounds	Percentage of total	Million† pounds	Percentage of total
1911-13	228	216	94.7	8	3.5
1920	272	251	92.5	4	1.5
1922	144	126	87.6	7	4.9
1924	293	248	84.7	19	6.5
1926	239	208	87.0	18	7.5
1928	193	163	84.4	25	12.9
1930	177	140	79.2	33	18.6
1932	238	168	70.6	52	21.8

^a See footnotes in table 41.

** Thorne, G. B., op. cit., for 1932. World Hog and Pork Prospects.

† Statistisches Jahrbuch für das Deutsche Reich. Includes negligible amounts of margarine.

somewhat lower prices.⁶⁰ Efforts, however, are being made to improve the quality and adjust it to the particular requirements of the German consumers.⁶¹

Table 45 reveals not only an absolute decline of German lard imports, but also a declining share that American lard is of the total. In 1913, 95 percent of the total lard import came from the United States, but since 1920, lard of American origin has slumped to 70 percent, meanwhile Danish lard has gained steadily.

Imports of American pork products into Germany, other than lard, have been relatively unimportant in recent years.

Prior to Feb. 15, 1933, Germany collected a small duty of 1.08 cents per pound on lard imports. Since that date, however, the duty has been raised repeatedly and in July, 1933, was increased to a figure equivalent to about 15.1 cents per pound. This duty would be almost prohibitive, were it not for the great deficiency of the domestic lard production, which would have to be increased nearly 70 percent, if the previous level of lard consumption were to be retained without imports. For the immediate future this is far beyond all possibilities; German lard production cannot be increased enough, within the course of a few years, to satisfy domestic demands.

In order to anticipate the probable development of the German market for American lard, it is essential that one understands the major characteristics of that market. Three important circumstances differentiate the German lard market from that of the United States:

(1) More than one-third of the lard probably is consumed as a bread spread. Consequently, lard competes directly with butter and the higher grades of margarine.

(2) Margarine is widely used as a cooking fat. Hence, lard is forced to defend a double front, one against other bread spreads like butter and margarine, and one against other cooking fats like margarine, lard substitutes and cooking oils.

(3) Lard is strictly on an import basis. About 40 to 50 percent of the total consumption is imported. Its price, therefore, is directly influenced by tariffs and other trade restrictions.

Lard constitutes only 17 percent of the total fatty foods consumed in Germany, against 32 percent in the United States. Lard substitutes, rather important in the United States, representing 23 percent of the total fatty foods, contribute less than 5 percent in Germany. Butter shares practically in the same proportion in the consumption of fatty foods in the two countries, but margarine accounts for only 6 percent of the total in

⁶⁰ Foreign Crops and Markets. Nov. 28, 1932.

⁶¹ Blätter für landwirtschaftliche Marktforschung. p. 358. January, 1931.

TABLE 46. CONSUMPTION OF THE MAJOR FATTY FOODS IN THE UNITED STATES AND GERMANY, 1929.

Major fatty foods	Total consumption		Per capita consumption	
	United States*	Germany**	United States*	Germany***
	Million pounds		Pounds per capita	
Total consumption	5,375	2,690	44.3	42.3
	Percentage of total		Pounds per capita	
Butter	38.9	39.8	17.3	15.9
Margarine	6.2	36.4	2.8	17.1
Lard	32.3	17.2	14.3	7.2
Lard substitutes	22.6	4.5	9.9	1.9**
Tallow (for direct consumption)	....	2.1	....	....

* See table 11.

** Basic data: Blätter für landwirtschaftliche Marktforschung. July, 1930.

*** Basic data: Blätter für landwirtschaftliche Marktforschung. January, 1933.

the United States, compared with 36 percent in Germany. The distribution of fatty foods by kinds consumed in Germany suggests a wide use of margarine as a cooking fat. Butter and margarine account for over 76 percent of all fatty foods, certainly a proportion too large to be used solely for bread spread. If one subtracts from the combined butter and margarine figure of Germany the corresponding figure of the United States, 13 pounds of margarine per capita remain. Presumably, in Germany this portion is used primarily for cooking purposes, which is about three-fourths of the total margarine consumption. Allowing for a probable greater use of bread and bread spreads in the regular German diet, it can safely be said that more than one-half of the margarine consumption is used for cooking purposes. Margarine is, therefore, more important as a cooking fat (about 9 pounds per capita) than lard and lard substitutes combined. The fact that probably about one-third of the 7.3 pounds per capita consumption of lard is used as a bread spread, chiefly on dark rye-bread, supports this conclusion. Should the use of dark rye bread continue to give way in favor of wheat bread, the use of lard as a bread spread is likely to decrease proportionally. (See table 46.)

The market price structure of the various fatty foods in Germany also indicates that margarine is the chief competitor of lard. While in the United States margarine prices are usually much higher than lard prices, in Germany both commodities command practically the same price with the lower

grades of margarine selling for less than lard. From 1924 to 1930, the low grade brands of margarine sold from 8.6 to 13 cents per pound; the medium grades from 14 to 19 cents; the high grades from 20 to 26 cents per pound.⁶² The low grade brands compete primarily with lard and the better grades with butter. American lard represents the cheap lard grade in Germany, primarily used for cooking purposes and therefore competes with margarine. German lard differs in flavor; it is often spiced with onions, thyme, jasmine, apple, etc. (Bratenschmalz), and is used both for bread spread and for cooking purposes. In the wholesale trade, German lard usually sells for about 25 percent more than American lard. In the retail trade, the price premium of German over American lard has increased from 36 percent in 1926 to almost 69 percent in 1932.⁶³ Part of the imported lard is further processed, spiced and blended with German lard and sold as "Bratenschmalz." This type of lard, until 1931, sold at substantially higher prices than margarine (21.7 as against 14.2 in 1926). Since then, lard prices have fallen more rapidly than margarine prices. Similar to the behavior of lard substitutes prices in the United States, the price of lard of domestic origin showed stronger resistance to the general drop in prices than did American lard.

The bulk of the raw materials used in making margarine is imported. The German tariff policy strongly favors the importation of oleaginous raw materials instead of oil, since Germany has a large oil crushing and processing industry. The demand of the dairy industry for protein concentrates is another strong factor influencing imports and domestic production of vegetable oils from materials of foreign origin, the principal raw products being copra, peanuts, soybeans and palm kernels. Whale and fish oils constitute about 16 percent, animal oils 6 percent, and vegetable oils 78 percent of the total oils used in the margarine industry. Germany is on an export basis in margarine production.

The German oil and fat market is by no means a free market. A great variety of governmental regulations affect the market structure. Tariff duties and import quotas on butter, production quotas and excise taxes on margarine, duties on oils consumed by the margarine industry, cash subsidies to domestic oil-seed producers, tariff duties and equalization taxes on imported lard, lard substitutes, margarine and most of the animal fats—all enacted, presumably, to bring relief to the German farmers. On Feb. 15, 1933, almost all duties on fats and oils

⁶² *Blätter für landwirtschaftliche Marktforschung*, p. 367, January, 1931.

⁶³ Acknowledgments are made to Dr. K. Brandt, director of the Institut für landwirtschaftliche Marktforschung, Berlin, for much valuable information given with regard to the fat market in Germany.

TABLE 47. WHOLESALE PRICES OF BUTTER, MARGARINE AND LARD
IN THE UNITED STATES AND GERMANY.
(Cents per pound)

Year	Product	Wholesale prices	
		In United States	In Germany
1926	Butter [*]	42.9	36.8
	Margarine [*]	22.8	14.2
	Lard ^{**}	16.9	17.4 ^{***} and 21.7†
1929	Butter	43.7	37.1
	Margarine	23.5	14.2
	Lard	13.0	14.4 ^{***} and 18.0†
1931	Butter	27.1	27.0
	Margarine	13.3	11.9
	Lard	8.9	10.5 ^{***} and 13.1†
1932	Butter	20.7	13.7
	Margarine	9.7	10.6
	Lard	5.8	7.7 ^{***} and 9.6†

* Chicago and Berlin prices.

** Chicago, Refined Lard, For Germany, see the next two footnotes.

*** Hamburg Free Port Price Plus Duty. American Lard.

† German lard, 25 percent above American lard. See: *Blätter für landwirtschaftliche Marktforschung*, p. 366, January, 1931.

†† Retail prices indicate that German lard dropped less in price than American lard. The ratio of 25 percent above American lard price is, therefore, likely to be too small for 1932.

were raised, in some cases to several times their previous height. In May, 1933, the tariff on lard again was increased to an equivalent of 9.4 cents per pound,⁶⁴ and in July it was further raised to an equivalent of 15.1 cents per pound. In March, 1933, manufacturers of margarine were induced to restrict their production to 60 percent of that of 1932. A similar quota was imposed on the production of edible vegetable oil and hardened fish oils as raw materials for margarine. An "equalization tax" of 5.4 cents per pound was placed on all domestic and imported margarine and lard substitutes to provide funds for distributing fats at reduced prices to the poor classes, especially to the unemployed. Butter and lard were not included directly in the new market regulations.⁶⁵

These are the fundamentals necessary to appraise the prospects for American lard in the German market. The tendency of the economic policy of Germany toward national self-sufficiency is likely to continue for some years. In fatty foods this policy is concerned with the situation of butter rather than

⁶⁴ Converted by the current rate of exchange of May 16. See table 40.

⁶⁵ World Hog and Pork Prospects. April, 19, 1933.

of lard. The vigorous market restrictions of February and March, 1933, were aimed particularly at the margarine industry which is giving severe competition to the dairy farmer. The competitive situation between the lard-producing hog farmer and the margarine industry is less intensive. Since lard production is only a minor side line of the German hog industry, which concentrates on meat production, and since American lard is chiefly used as a cooking fat, offering no direct competition to butter, it is conceivable that in the future lard imports may enjoy a comparative advantage relative to other imported oils and fats with regard to trade restrictions. The curtailment and taxing of margarine production may even tend to work in favor of American lard, especially if the ineffectiveness of high lard tariffs on the income of the hog farmers becomes evident.

A striking indication of the possible ineffectiveness of high lard duties has already appeared. The Berlin retail price of imported lard increased from 10.1 cents in January to 12.3 cents in March in response to the enactment of the 5.4 cents duty in February. The Berlin retail price for German lard, however, dropped during the same period from 17.8 cents to 17.4 cents. It is true that the full effect of the tariff will be realized only after the storage holdings, accumulated in anticipation of the raise in the tariff, are nearly depleted. But indications are that the general lack of purchasing power is restricting the high duty on lard from benefiting materially the hog farmers. If the high duties are retained, a sharp drop in lard consumption seems inevitable, thus leaving little benefit, if any, for the German hog farmer; and if the duty is reduced, American lard will be in a relatively strong position, as it will find the market considerably relieved from the competition of margarine, compared with the period prior to March, 1933, when the margarine industry was free of the present stringent restrictions.

THE LARD MARKET IN THE UNITED KINGDOM

The United Kingdom is the most important buyer of American lard, taking from 30 to 45 percent of the total American lard exports. British lard imports have varied remarkably little since 1921. From 1921 to 1925, the annual lard imports amounted to 264 million pounds, of which 223 million pounds, or nearly 85 percent, came from the United States. From 1926 to 1930, imports were 274 million pounds, of which 231 million pounds, or nearly 85 percent, were American lard. Hog production in the United Kingdom during this 10-year period did not show any upward or downward trend. The number of hogs on farms averaged 2.96 million head for 1921-1925 and 2.88 million head for 1926-1930. The recent increase from 2.67 in 1930 to 3.57 million head in 1932 does not necessarily indicate

an upward trend since it does not exceed the usual range of the cyclical fluctuation.⁶⁶

The British market for American lard is the most dependable of all the foreign outlets. While import quotas, other trade restrictions and strong competition from Denmark have encroached upon American pork exports to the United Kingdom, American lard remains virtually unmolested. A small tariff duty of 10 percent ad valorem is being collected on extra-imperial lard imports, but no quota restrictions are enforced. In the case of lard, Canada rather than Denmark is the chief competitor of the United States, furnishing 7 to 9 percent of the total British imports of lard. Canadian lard is exempt from the 10 percent duty under the imperial preferential system. But Canada is not likely to push her lard exports much further chiefly because the bacon type hog, yielding only little lard, dominates in Canada. Furthermore, the Canadian Department of Agriculture is successfully encouraging the hog industry to develop further the bacon type of hog. Although the number of hogs slaughtered under inspection in Canada rose from 1.9 million in 1930 to 2.7 million in 1932, this increase was largely due to the cyclical fluctuation, in which 1932 represents a peak, like 1928 when 2.5 million hogs were slaughtered.⁶⁷ But even if Canadian exports of hog products were to increase, bacon, hams and shoulders would represent by far the greatest share, and the relatively small volume of lard exports would not have much influence upon American lard.

From the combined total of the three principal fatty foods, butter, margarine and lard, lard constitutes nearly 20 percent in the United Kingdom and Germany as compared with 42 percent in the United States. On the other hand, margarine represents 35 percent of the total in the United Kingdom and 42 percent in Germany, as against 6 percent in the United States. Taking into account, that the per capita consumption of the combined three fats is approximately the same in these three countries, and comparing the per capita consumption of butter, it can be safely inferred that a large proportion of the margarine in both the European countries is used as a cooking fat, thereby directly competing with lard.⁶⁸

⁶⁶ Hog numbers increased from 2.57 million in 1922 to 3.57 million in 1924, and from 2.5 million in 1926 to 3.4 million in 1928, and from 2.67 million in 1930 to 1.57 million in 1932, showing a regular 4-year hog cycle without any pronounced trend.

⁶⁷ The number of hogs on farms in 1932 was 2 percent lower than in 1931. Marketings in the first 2 months of 1933 declined 6 percent compared with the same period of 1932, despite the stimulating effect which the Ottawa conference was expected to have on the Canadian hog industry.

⁶⁸ More detailed information on the British market of lard, butter, margarine and other fatty foods, as are presented for the German market, are not available to the writers. They especially lack data on the role lard substitutes and cooking oils play in the British consumption of fatty foods. Indications are, however, that the market structure of fatty foods in the United Kingdom resembles that in Germany. See table 48.

TABLE 48. CONSUMPTION OF THREE PRINCIPAL FATTY FOODS IN THE UNITED STATES, GERMANY AND THE UNITED KINGDOM.
(1924-1928 average)

Principal fatty foods	Total consumption			Per capita consumption		
	United States*	Germany**	United Kingdom***	United States*	Germany**	United Kingdom***
	Million pounds			Pounds per capita		
Total consumption	3,933	2,335	1,565	33.8	36.6	34.5
	Percentage of total			Pounds per capita		
Butter	51.7	38.1	45.8	17.5	14.0	15.8
Margarine	6.3	42.4	34.9	2.2	15.5	12.1
Lard	42.0	19.5	19.3	14.1	7.1	6.6†

* Table 11.

** Basic Data: Blätter für landwirtschaftliche Marktforschung. January, 1933, 4-year average, 1925-1928.

*** Basic data: Flux, A. W., Our Food Supply Before and After the War. Journal Royal Stat. Soc., 1930, p. 538. Lard consumption arrived at: Average import (265 million pounds) plus rough estimate of domestic lard production (37 million pounds) based on the census report of 1924 (42 million pounds). Data on lard substitutes not available.

† 1926-1928 average. Foreign Crops and Markets. March 27, 1933.

The United Kingdom ranks second in margarine production among the European countries. Germany produces about 1 billion pounds and the United Kingdom about 500 million pounds and in addition imports roughly another 90 million pounds. The Netherlands produces over 300 million pounds and is the most important margarine exporter. Table 49 indicates a slight but general drop in margarine production in these three countries. A similar decline is recorded for other margarine producing countries, Denmark, Sweden and Belgium. Any general decline in the margarine production and consumption in the European countries is likely to support the position of lard in the fat market.⁶⁹

Although approximately 90 percent of American lard shipments to the United Kingdom consist of refined lard,⁷⁰ the British lard domestically produced brings a considerable price premium. English lard retails about 2 to 3d per pound higher

⁶⁹ There are other indications, too, that margarine consumption is declining in many European countries. A survey of retail sales in Nottingham, England, revealed a decrease in margarine sales by 19 percent during the period of July, 1928, to July, 1931. A shift in consumption from cheap to high grade margarine also favors the lard position, since primarily the cheap grades of margarine are competing with lard. In England, 62 percent of the margarine sold by an important margarine concern in 1922 was of cheaper grade, while in 1925, the corresponding figure was only 34 percent. Foreign Crops and Markets. May 14, 1928.

⁷⁰ Thorne, op. cit., p. 21.

TABLE 49. MARGARINE PRODUCTION IN THE THREE PRINCIPAL PRODUCING EUROPEAN COUNTRIES
(Millions of pounds)

Year	Germany*	United Kingdom**	Netherlands***
1913 .....	....	188	195
1926 .....	....	336	359
1927 .....	....	....	361
1928	1,074	448	368
1929	1,102	529	377
1930	1,025	452	353
1931	904	....	291
1932	827	....	150

* U. S. Dept. of Agr., Bur. of Agr. Ec., Foreign Crops and Markets. Nov. 28, 1932 (estimates).

** Statistisches Jahrbuch für des Deutsche Reich.

*** Statistisches Jahrbuch für des Deutsche Reich. (Includes lard substitutes.)

than does the best imported lard. If blended with imported lard, it still sells at 1d higher than the best imported lard grade.⁷¹ These conditions seem to correspond closely to those in the German market, confirming the assumption of a rather strong similarity of the market position of lard in these two chief importing countries. There is, however, one important distinction; while Germany is committed to a stringent protectionist trade policy, the United Kingdom is not likely to go nearly as far in her trade restrictions, and lard imports apparently will be affected last and least by tariff policies, compared with the imports of other pork products, or even other foodstuffs. At present, the United Kingdom represents the safest and most dependable market for the American lard entering export channels.

OTHER FOREIGN MARKETS FOR AMERICAN LARD

Cuba. Until 1929, Cuba ranked third in importance in the export trade of American lard. More than 10 percent of total lard exports formerly were taken by Cuba. (See table 40.) But in 1930, Cuba raised her tariff on lard from 1.4 cents to 3.3 cents per pound and has imposed since then progressively increasing rates. In July, 1932, the rate stood at 8.76 cents a pound which is to be increased still further, i. e., 5 percent annually until the initial duty is increased 25 percent, or up to 10.95 cents per pound. The present tariff collected is about twice the Chicago price of lard. Lard exports to Cuba have fallen off sharply, declining from 80 million pounds in 1929, to 22 million pounds or 4 percent of the total export in 1932. When one recalls that the American tariff on sugar is about three times the Cuban price, the Cuban tariff on lard does not

⁷¹ Ministry of Agriculture and Fishery. Report on the Pork and Bacon Trade in England and Wales, 1928.

appear to be extravagant. Furthermore, according to Thorne, Cuban imports of American lard depend very largely upon the price of sugar, since it is the main source of purchasing power of the Cuban population. To the extent that the American sugar tariff affects adversely the price of sugar in Cuba, American lard exports to Cuba are reduced.

Mexico. Mexico takes fourth place among the foreign customers of American lard. In 1930, Mexico absorbed 74 million pounds or nearly 12 percent of the lard exports from the United States. In 1932, the lard shipments to Mexico dropped to 39 million pounds or 7 percent of the total. Since 1930, Mexico has become more important as a market for lard than Cuba. Mexico raised her tariff duties on lard moderately, from 1.2 cents to 2.26 cents in 1929 and to 3.39 cents in 1930. The present duty is 3.25 cents for lard shipped in tank cars and 4.53 cents for lard shipped in other containers.⁷²

Columbia and Peru rank next in importance as markets for lard on the American continent. Exports to these two countries fell from 31 million pounds in 1929 to 11 million pounds in 1931, and to a little over 1 million pounds in 1932. All Central and South American countries require a highly flavored lard of the type known as "country lard."

The *Netherlands* is fifth in rank among the importers of American lard. Exports to that country—like those to the United Kingdom—have been rather stable during the last decade, varying between 28 million pounds in 1931 and 48 million pounds in 1926. In 1932, 38 million pounds or 7 percent of the American exports went to the Netherlands. A large proportion of the American lard shipped to the Netherlands is re-exported either unchanged or after it has been refined and treated in conformity to the special requirements of other European countries to which the lard is re-exported.

⁷² May, 1933.

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