The Outlook For Inedible Fats And Oils

A REVIEW of the economics of inedible fats and oils (other than drying oils) quickly shows that tallow and grease comprise the massive heart of the problem. Lesser roles are played by vegetable oil foots, coconut oil, fish oils, and palm oil, but tallow and grease dominate the picture.

Figure 1

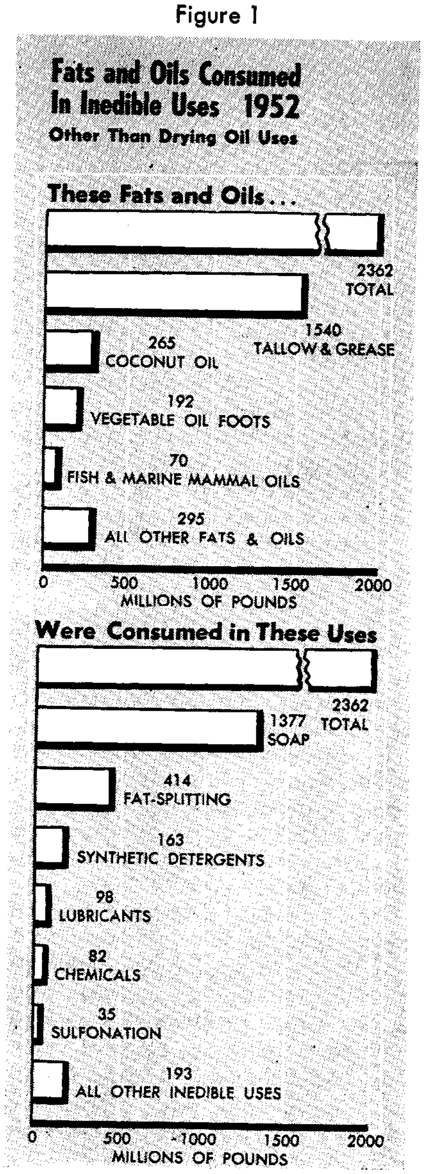

Figure 1 shows the fats and oils consumed for all inedible purposes other then drying oil uses, in 1952. Tallow and grease dominate the picture, amounting to 65% of the total, followed by coconut oil, vegetable oil foots, and fish and marine mammal oils.

Figure 1 also shows the same fats and oils broken down by use in 1952. Soap was the dominant consumer, requiring 58% of the total, followed by fat-splitting, synthetic detergents, lubricants, chemicals, and sulfonation.

Figure 2 shows the fats and oils used in the manufacture of soap, the largest consumer of inedible fats and oils. Again tallow and grease dominate the picture, supplying 74% of the raw materials for soap in 1952. Coconut oil, vegetable oil foots, and other fats and oils are much smaller.

Figure 2 also shows the fats and oils used in fat-splitting, the second largest consumer of inedible fats and oils. Again tallow and grease are the largest factor, supplying 47% of the raw materials for fat-splitting in 1952. Vegetable oil foots are a close second with coconut oil and other fats and oils much smaller. For comparison, the consumption of refined tall oil is also shown in Figure 2, namely, 78 million pounds in 1952. Refined tall oil is directly competitive with fatty acids in many applications.

Figures 3 and 4 show the individual consumption patterns of the principal fatty acid raw materials in 1952—tallow and grease, coconut oil, and vegetable oil foots. Figure 3 is called "Disposition of Inedible Tallow and Grease" since exports are included as well as domestic consumption. Soap consumed 47% of the total supply of tallow and grease, or 70% of the domestic consumption. Fat-splitting, synthetic detergents, lubricants, and other uses were much smaller. Exports amounted to 740 million pounds or 32% of the total supply. "All Other Uses" in Figure 3 includes the production of glyceride derivatives of tallow and grease, such as inedible animal stearin, tallow oil, grease oil, hydrogenated animal oil, and the like. Much of these derivatives eventually go into soap, lubricants, and other end-uses. Also, some of the fatty acids resulting from fat-splitting of tallow and grease are used in soap and lubricants. Therefore, the figures given for soap and lubricants in Figure 3 are really somewhat too low in terms of ultimate consumption of tallow and grease. However, the figures in Figure 3 agree exactly with data given in Census Bureau publications.

Figure 4 shows that soap is the largest consumer of coconut oil, requiring 41% of the total in 1952, followed by edible uses which consumed 33% of the total. Synthetic detergents, fat-splitting, and other uses were much smaller.

Figure 4 shows that fat-splitting has become the major use of vegetable oil foots, with soap as a poor second, and other uses very small.

Tallow and Grease

Tallow may be either edible or inedible. Edible tallow is an excellent cooking fat for many purposes, but it is too hard for wide use in the United States edible market. Edible tallow is much smaller in production volume than inedible, e.g., edible was 89 million pounds in 1951 compared to 1577 million pounds of inedible. The price of edible tallow is only about 1 cent per pound more than

The widening gap between rising production and falling consumption of inedible fats and oils points to future problems for the rendering industry. Chemist-Economist Ewell puts his finger on the whys and wherefores and tells industry it can begin catching up if it will spend more than 3% of sales on research. Suggestions: Convert fats into useful basic raw materials for plastics, textiles, syndets, and other large chemical outlets. Close range opportunity—incorporation of tallow and grease in animal feeds

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prime tallow, which does not provide much incentive to produce it. Edible tallow must come from certain portions of the animal and must meet stringent handling conditions. Information obtained from the packing industry indicates that edible tallow is not likely to be produced in much larger quantities than at present. Grease is the inedible analogue of lard.

Inedible tallow and grease are derived almost entirely from beef and hogs, with sheep, horses, and other animals contributing small quantities. Either fat can be derived from either animal, but in practice, most of the tallow comes from beef and most of the grease comes from hogs. The distinction between tallow and grease is one of definition: an animal fat is tallow if its titre is 40 or higher, it is grease if its titre is below 40. In recent years, tallow has comprised 70 to 75%, and grease has comprised 25 to 30%, of the total of tallow and grease. Therefore, tallow and grease production is dependent primarily on beef slaughter and only secondarily on hog slaughter.

Tallow and grease arise first in the packing houses, and the packers contribute 40 to 50% of the total production. The rendering industry produces the remaining 50 to 60% of tallow for grease. This production is based on meat scraps from packing houses, butcher shops, hotels and restaurants, city garbage, and dead animals. The two principal products of the rendering industry are tallow and grease, and animal protein (dried meat scraps or wet-rendered tankage). The over-all economics of the rendering industry involves both products. During the past years, both products have fallen in price, thereby sharply reducing profit margins in the rendering industry.

There are various grades of tallow and grease which are specified in terms of titre, free fatty acid, and color. There is considerable variation in price among grades. Representative data for March 1953 are shown in Table I.

All of the discussion of prices in this paper will be in terms of prime tallow, c.a.f. Chicago. Prices of other grades will, of course, be in proportion.

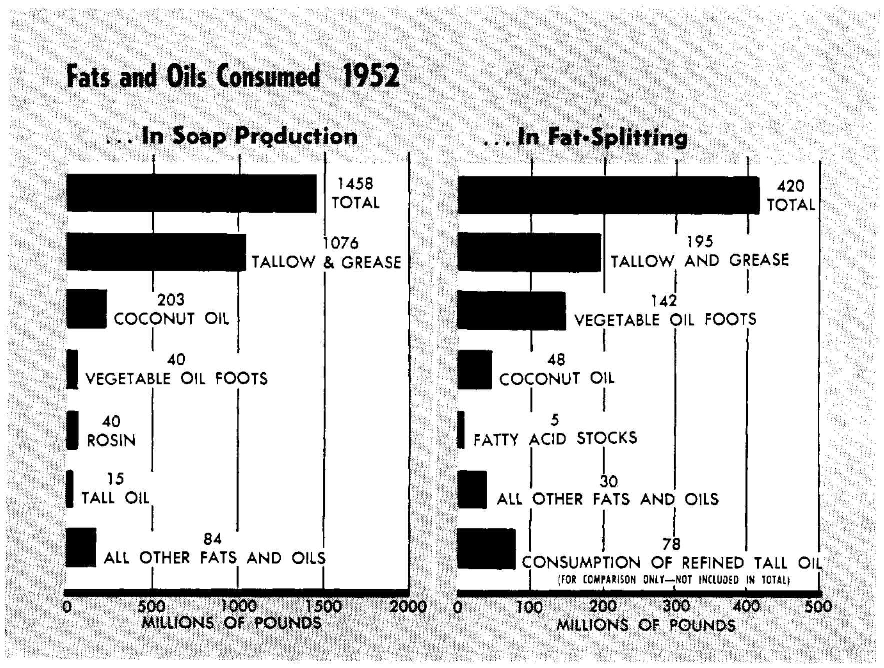
Supply-Demand Balance Of Tallow and Grease

Tallow and grease have been in great oversupply in the United States during the past five years with consequent low prices, except for a period following the outbreak of the Korean war. In 1952, U. S. production of tallow and grease was 2.3 billion pounds while U. S. consumption was only 1.54 billion pounds, leaving a domestic surplus of over 700 million pounds. This surplus was exported to Europe, Japan, Latin America, and other fat-deficit areas.

Analysis of the various factors affecting the production and consumption of tallow and grease in the United States leads to the conclusion that these fats will probably be in greater and greater oversupply with each succeeding year, so that by 1957 there may be a surplus of around 1.1 billion pounds. Figure 5 and Tables II and III summarize the past history of the production, consumption, exports, and imports of tallow and grease. Also, Table III gives some estimates of production and consumption for 1953, 1955, and 1957, which will be discussed in detail below.

If the growth trend of the past 40 years is continued, U. S. production of tallow and grease should increase from 2.3

Figure 2



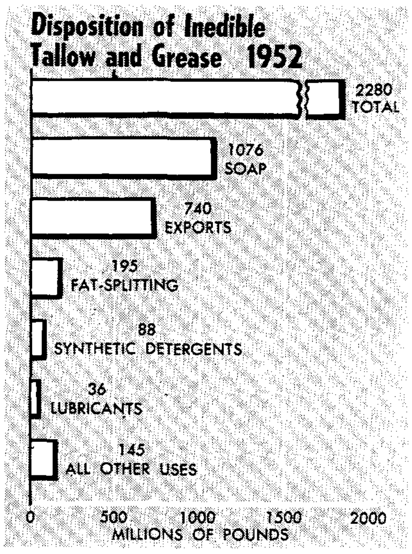


Figure 3

billion pounds in 1952 to 2.8 billion pounds in 1957. During the same period, U. S. consumption is believed likely to increase only slightly from 1.54 billion pounds in 1952 to around 1.7 billion pounds in 1957. This would leave an indicated surplus of 1.1 billion pounds in 1957.

If the projected surpluses of tallow and grease are in fact produced in 1953–57, prices will have to remain at present low levels, or possibly go even lower, in order to move the surpluses in the export market. Lower prices will encourage exports. Export demand for tallow and grease is quite elastic, that is, it will vary inversely with price. The lower the price, the greater export demand will be. On the other hand, domestic demand is relatively inelastic—it is fairly well fixed irrespective of price, within limits, of course. If increased exports do not materialize, even at lower prices, and production continues at a high rate, stocks of tallow and grease may be allowed to increase up to possibly 500 or 600 million pounds (from 1952 year-end stocks of 375 million pounds). Beyond that, production may be curtailed to fit demand with surplus fatty raw materials being destroyed. Another alternative, namely, greatly increased consumption of tallow and grease in the United States, say to 2 billion pounds per year or more, seems unlikely during the next five years.

Since domestic consumption is believed likely to increase only slightly during the next few years, the two dominant factors in the over-all tallow picture are production and exports. Production appears likely to go up materially, almost irrespective of price. This leaves export demand as the most elastic and, therefore dominating, factor. Therefore, export demand rather than domestic demand will largely determine the U. S. price of tallow and grease.

There is nothing on the horizon which can be expected to decrease the present surplus of tallow and grease. In fact, there is nothing on the horizon which is likely even to use up the additional surpluses of tallow and grease which appear likely to develop in 1953–57. The only potential exception to this is the possible large-scale use of tallow and grease in animal feeds.

Table I. Grades of Tallow and Grease

	Titre	Free Fatty Acids, %	Price c.a.f. Chicago, Cents Per Lb.
Edible tallow	41.5	1	$5\frac{3}{8}$
Fancy tallow	41.5	4	5
Choice tallow	41	5	$4\frac{5}{8}$
Prime (or extra) tallow	40.5	6	$4\frac{1}{2}$
Special tallow	40.5	10	$4\frac{1}{4}$
Number 1 tallow	40.5	15	$3\frac{7}{8}$
Number 3 tallow	40.5	20	$3\frac{5}{8}$
Number 2 tallow	40	35	$3\frac{1}{4}$
Choice white grease	37	4	$5\frac{1}{2}$
A-white grease	37	8	$4\frac{1}{2}$
B-white grease	36	10	$4\frac{1}{4}$
Yellow grease	36	15	$3\frac{5}{8}$
House grease	37.5	20	$3\frac{1}{2}$
Brown grease	38	50	$2\frac{1}{2}$

Production of Tallow and Grease

Production and consumption of tallow and grease in the United States were quite closely balanced from 1936 to 1947 (Figure 5). However, from 1947 to 1952, U. S. production of tallow and grease continued to increase, while in the same period U. S. consumption steadily declined. The increased production of tallow and grease since 1947 has been due to increased recovery of these fats as direct or indirect by-products of the meat industry, since the consumption of red meat has remained about level since 1947.

Figure 6 shows the production history of tallow and grease compared with the consumption of beef and of all red meat. The growth rate of tallow and grease production is clearly higher than the growth rate of either beef or meat consumption. In attempting to forecast the future, various correlations were made of tallow and grease vs. meat,

Table II. Salient Statistics on Inedible Tallow and Grease

(Millions of pounds)

	Consumption[a]	Imports	Exports	Stocks	Production
1920	510	14.9	84.4	169	640
1921	574	1.9	97.4	174	676
1922	707	1.8	90.6	123	745
1923	730	10.8	99.7	125	820
1924	758	2.4	116.0	101	848
1925	715	1.8	102.0	91	805
1926	735	13.6	86.4	131	848
1927	781	12.9	92.8	126	856
1928	765	14.2	68.4	103	796
1929	736	16.8	66.4	162	845
1930	741	0.6	73.7	215	868
1931	773	1.4	80.3	249	885
1932	786	0.5	60.3	250	847
1933	767	0.2	72.8	343	933
1934	952	42.8	57.6	377	1,000
1935	914	246.0	19.9	356	667
1936	923	68.9	16.5	302	817
1937	886	3.9	5.5	269	855
1938	942	1.2	3.8	253	929
1939	1,079	1.5	6.1	296	1,127
1940	1,233	1.4	7.7	431	1,374
1941	1,650	30.4	7.3	356	1,552
1942	1,854	63.8	5.5	301	1,742
1943	1,759	32.7	4.1	220	1,649
1944	1,923	55.8	26.6	270	1,943
1945	1,839	32.0	13.0	201	1,751
1946	1,677	3.1	12.7	233	1,719
1947	1,882	1.1	68.9	246	1,963
1948	1,782	1.0	88.2	317	1,940
1949	1,666	2.0	433.0	352	2,132
1950	1,820	1.9	536.0	283	2,285
1951	1,684	3.4	533.0	345	2,276
1952	1,540	2.0[b]	742.0[b]	375	2,310

[a] Production calculated as consumption—imports + exports ± stock changes.
Sources: Fats and Oils Situation, Bureau of Agricultural Economics. Facts for Industry M17-1 and M17-2; U. S. Exports of Foreign and Domestic Merchandise, Report No. FT-410, and U. S. Imports of Merchandise for Consumption, Report No. FT-110, Bureau of the Census. Foreign Commerce and Navigation, U. S. Department of Commerce.
[b] Estimates.

tallow and grease vs. beef, tallow vs. beef, grease vs. pork, and so on, without revealing any promising forecasting method. Therefore, resort was made to simply projecting past history by means of a trend curve. This is a method widely used in the chemical and petroleum industries and should be applicable to tallow and grease. This method depends on an assumption of economic momentum, that the factors which have been operative in the past to produce a certain growth rate will continue to be operative in the future. The production of tallow and grease depends on a number of factors such as beef and hog slaughter, average yield of fat per animal, trimming practices, economic developments in the rendering industry, and others, each of which is difficult to assess. The projection method has the effect of integrating all of these factors based on past history.

The projections in Table III give 2.4 billion pounds in 1953, 2.6 billion pounds in 1955, and 2.8 billion pounds in 1957. These are certainly reasonable figures, although the actual figures may prove to be either higher or lower. These figures are certainly conservative compared with forecasts of cattle slaughter by the American Meat Institute. The AMI forecasts an increase in cattle slaughter from 27.8 million head in 1952 to 37.5 million head in 1955—an increase of 35% in three years. By comparison, our forecast of tallow increase from 1952 to 1955 is only 12%. A decline in hog slaughter is forecast for 1952 to 1955, but hogs are only a secondary factor in the production of tallow and grease.

Rendering Industry's Future

One of the big factors in the future production picture is the future economic development of the rendering industry. Profit margins in the rendering industry have been declining for over a year, so that now many rendering companies appear to be operating "in the red." This is partly a matter of bookkeeping, of course. What will the rendering industry do if prices decline still further, for instance if prime tallow, Chicago, should decline to 3.5 cents, even to 3 cents per pound? Will many renderers curtail production? Will some renderers go completely out of business? After discussing this with a number of renderers, it is the writer's belief that no renderers are going to deliberately curtail production and that very few will go out of business. In fact, most renderers will strive to get maximum production in order to reduce unit costs. Every possible economy will be made such as eliminating the least efficient pickup routes, reducing the prices they pay for their raw material (probably to 0), improving their processes, and reducing the number of employees. If an occasional renderer goes bankrupt, some other company would probably buy up the plant and continue production. This economic situation will not stimulate the building of new capacity, but it should stimulate maximum output from the present capacity.

Soap

The decline in U. S. consumption of tallow and grease since 1947 has been largely a result of the displacement of soap by synthetic detergents. Soap production declined from 3.66 billion pounds in 1947 to 2.26 billion pounds in 1952, with a consequent decline in tallow and grease used in soap-making from 1.53 billion pounds to 1.08 billion pounds. In the same period, synthetic detergents increased from 0.4 billion pounds to 1.78 billion pounds. Other markets for tallow and grease—fat-splitting, lubricants, and miscellaneous minor uses—increased moderately from 1947 to 1952, but much less than the decline in consumption for soap. A notable development of the past three years has been the development and marketing of synthetic detergents based on tallow and grease.

Soap will continue to be the largest consumer of tallow and grease, as it has been in the past. Figure 7 shows a possible picture of future production of soap and synthetic detergents. For purposes of estimating future demand for tallow and grease, it is assumed that soap will decline from 2.26 billion pounds in 1952 to 1.85 billion pounds in 1957, while synthetic detergents will increase from 1.78 billion pounds in 1952 to 2.6 billion pounds in 1957. These estimates are based on reasonable projections of the trends of the past five years. This quantity of soap in 1957 would require about 1.02 billion pounds of tallow and grease compared with 1.08 billion pounds in 1952.

In estimating the tallow and grease required to make soap in 1953–57, account has been taken of the increasing tallow-grease to soap ratio. Figure 8 shows the pronounced trends which have

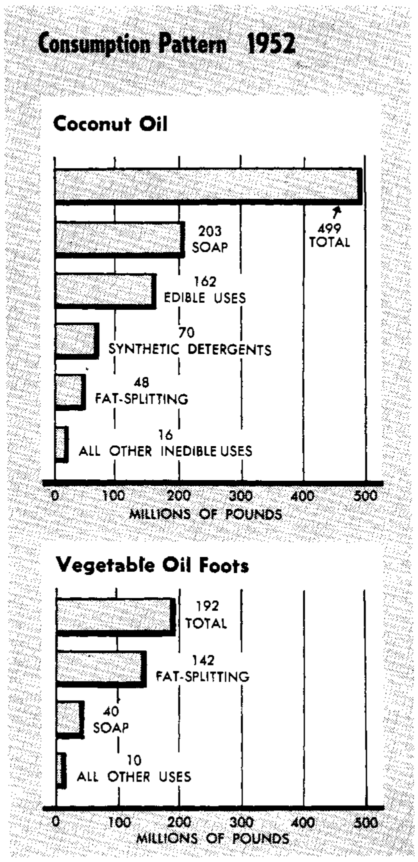


Figure 4

been taking place in this ratio over the past 17 years. The ratio tallow-grease to soap has increased from 0.27 in 1935 to 0.48 in 1952, while the ratio of all other fats and oils to soap has decreased from 0.31 in 1935 to 0.17 in 1952. "All other fats and oils" includes babassu, palm kernel, palm oil, rosin, tall oil, vegetable and animal oil foots, soft oils, and all secondary fats and oils. A projection of the tallow-grease to soap ratio indicates a ratio of 0.55 in 1957, which is quite feasible from a technical standpoint.

Synthetic Detergents

The use of tallow and grease in making synthetic detergents is one of the biggest uncertainties in the demand picture.

Table III. Production and Disposition of Inedible Tallow and Grease

(Millions of pounds)

	Past History						Future Projections		
	1947	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1955*	*1957*
Production	1,963	1,940	2,132	2,285	2,276	2,310	2,400	2,600	2,800
Consumption									
Soap	1,526	1,451	1,346	1,375	1,195	1,076	1,050	1,030	1,020
Syn. detergents	0	0	1	39	68	88	120	160	200
Fat-splitting	193	185	169	229	243	195	240	270	300
Lubricants	66	58	37	37	41	36	40	40	40
All other uses	97	88	113	140	137	145	140	140	140
Total	1,882	1,782	1,666	1,820	1,684	1,540	1,590	1,640	1,700
Changes in stocks	+13	+71	+35	−69	+62	+30	...	...	...
Net exports (or surplus)	68	87	431	534	530	740	(810)	(960)	(1,100)

Sources: 1947–1952—Fats and Oils Situation, Bureau of Agricultural Economics. Facts for Industry M17-1 and M17-2; U. S. Exports of Foreign and Domestic Merchandise, Report No. FT-410, and U. S. Imports of Merchandise for Consumption, Report No. FT-110, Bureau of the Census.

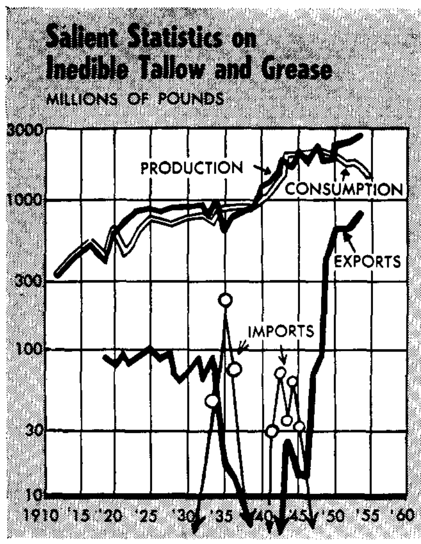


Figure 5

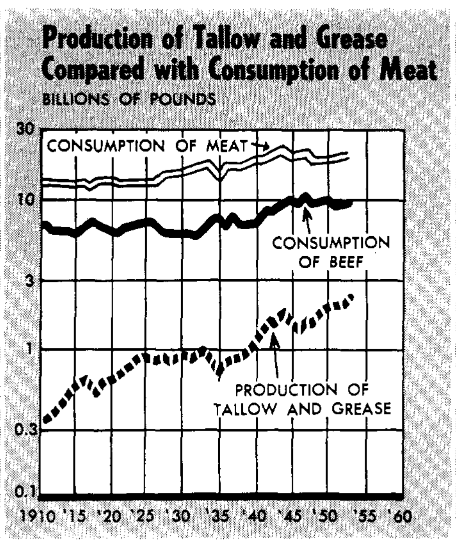


Figure 6

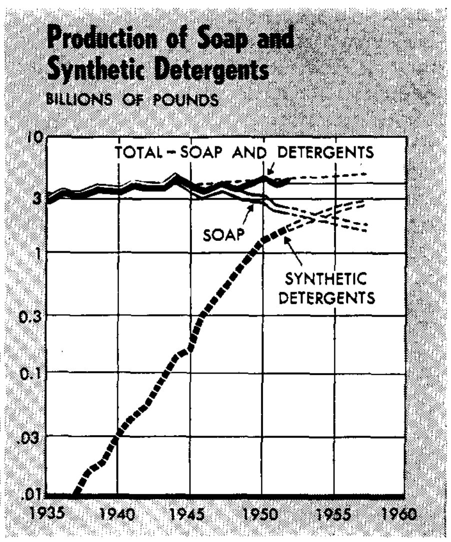


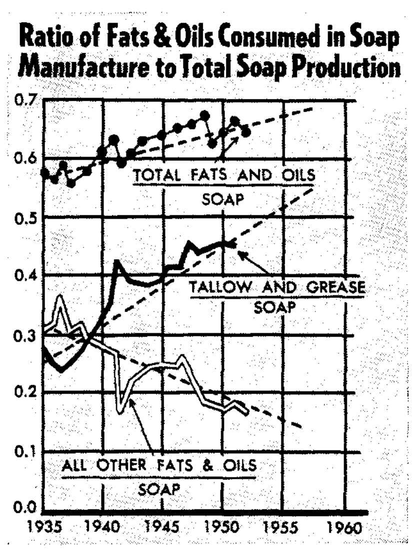
Figure 7

It seems pretty definite that tallow-based synthetic detergents are increasing rapidly and that they are increasing their percentage of total synthetic detergents. Procter & Gamble's Tide, the largest synthetic detergent product sold in the U. S. today, contains tallow alcohol sulfate as 25% or more of the active ingredients. Tallow alcohol sulfate is certainly a cheaper material than coconut alcohol sulfate at today's price levels. From a solubility standpoint there may be some upper limitations on the use of tallow alcohol sulfate, but there is every expectation that its use will increase considerably above present levels.

Some statistics were given in Facts for Industry Series M17-1 in 1949 on the consumption of fats and oils in synthetic detergents, but none have been given since then. However, a cross-ruffing analysis of the Facts for Industry data involving a few estimates leads to the estimates of fats and oils used in synthetic detergents in Table IV.

The totals in the Table IV are probably pretty reliable, although the breakdown among the individual fats and oils is more open to question. The preceding figures include material used to make a wide variety of surface-active agents, only part of which is synthetic detergents of a type competitive with soap. For instance out of the 88 million pounds of tallow and grease, possibly 50 to 60 million were used to make synthetic detergents competitive with soap, while 28 to 38 million were possibly used to make other types of surface active agents. Both classes of surface active agents have good growth rates, although the type competitive with soap probably has a higher growth rate than the other types.

Figure 8



What the consumption of tallow and grease for synthetic detergents may be in 1957 is anybody's guess, but for a rough guess let's assume it will increase from 88 million pounds in 1952 to 200 million pounds in 1957. Further, let's assume that 150 million pounds of this is used to make synthetic detergents competitive with soap and 50 million pounds is used for other types of surface active agents. If synthetic detergent production is 2.6 billion pounds in 1957 (as suggested in Figure 7), and this material is 18% active ingredient, 150 million pounds of tallow converted to tallow alcohol sulfate would correspond to about 40% of the total active ingredient. This is certainly not impossible. It could be even higher. However, the figure of 200 million pounds of tallow and grease is only a guess to fill out the material balance in Table III.

Fat-Splitting

Figure 9 shows the production of fatty acids from all sources in the period 1935–52 compared with the consumption of fats and oils in fat-splitting in the period 1944–52. The trend line of fatty acid production shown in Figure 9 corresponds to an average annual growth rate of 6% per year. The span of data on the consumption of individual fats and oils is not long enough to fit a significant trend line. Therefore, tallow and grease and vegetable oil foots consumed in fat-splitting were both assumed to have a 6% per year growth rate, and projections at this rate were made starting at the 1951–52 midpoint. This procedure results in the 1953–57 projections given in Table III.

There has been a great deal of research work in industry and government during the past 15 years, and particularly during the past five years, aimed at developing new uses for fatty acids. Some of these developments, particularly those based on oleic acid, give great promise of expanding the consumption of fatty acids at a rate greater than 6% per year. However, up to this writing these developments are still in the realm of conjecture in so far as their quantitative development is concerned. Therefore, the writer believes the only reasonable approach to forecasting fat-splitting in the period 1953–57 is by an extension of the past 6% per year growth rate.

Figure 10 shows the consumption pattern of fatty acids in 1951. The largest single use is in soap manufacture, 74.7 million pounds, or nearly 20% of total U. S. consumption. This use is quite vulnerable to economic developments in the soap industry. Next largest uses are rubber, chemicals, lubricants, paint, resins, and textiles. Among these uses only chemicals and resins have high growth rates. The Census Bureau data account for only 305 million pounds out of 379 million pounds apparent U. S. consumption.

Other Industrial Uses

Lubricants are assumed to remain level at 40 million pounds per year of tallow and grease. All other uses are assumed to remain level at 140 million pounds per year.

Tallow and Grease in Animal Feeds

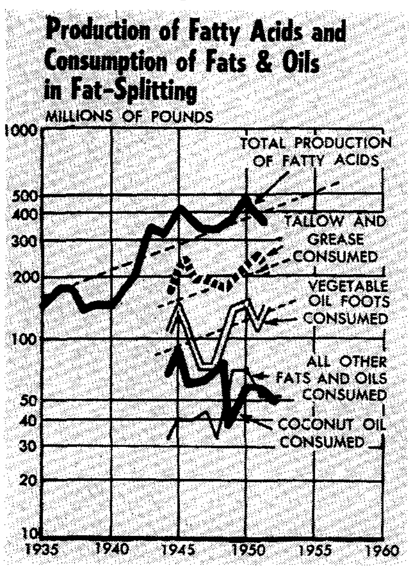
Animal feed is the only new use on the horizon today which potentially could consume really large quantities of tallow and grease by 1957, i.e., hundreds of millions of pounds per year. Tallow and grease have been suggested as additives to poultry feed, hog feed, and cattle feed as a replacement for carbohydrate. One pound of fat is equivalent to about 2.5 pounds of carbohydrate on a calorific basis. If corn is $1.50 to $1.60 per bushel or about 3 cents per pound, tallow would have an equivalent value of 7.5 cents per pound. Nutritional studies have been carried out at Cornell University and the American Meat Institute Foundation which indicate that fat is a good calorific replacement for carbohydrate up to at least 8% fat and also that fat may have further nutritional advantages over and above calorific equivalence. Fat has the further advantage of reducing dustiness of animal feeds. Fat percentages of 12% and even higher have been suggested as feasible and desirable in animal feeds.

At the present time a few manufacturers are using tallow or grease in several types of feeds. No reliable figures on the total quantity so used are available, but informed guesses put 1952 consumption at not over 10 million pounds. This is quite small, but the potential is very large. Total production of animal feeds in 1952 was 76 billion pounds, so that as little as 1% addition would amount to 760 million pounds. Since this use is so problematical, no account was taken of it in the 1953–57 estimates in Table III. The 10 million or so pounds consumed in 1952 is presumably included in "All Other Uses" in Table III.

Tallow and Grease in Steel Manufacture

Certain grades of grease have been suggested as a replacement for palm oil in the manufacture of tin and terne plate. Apparently the physical properties of grease are satisfactory; the principal remaining obstacle appears to be odor. Further development work may result in a new market for grease here. However, it will be small at best, since palm oil consumption for this use is only about 30 million pounds.

Figure 9



Exports of Tallow and Grease

Large exports of tallow and grease from the United States are a relatively new phenomenon, having increased from 88 million pounds in 1948 to 742 million pounds in 1952 (Table II). In fact, the United States completely dominates world trade in tallow; the other tallow-exporting countries, principally Australia, New Zealand, Argentina, and Uruguay, exported less than 150 million pounds all together in 1951. Figure 11 shows the countries of destination of U. S. exports of tallow and grease in 1952. Europe is the big consumer, of which the principal consuming countries are Italy, Netherlands, Belgium, Switzerland, Germany, and Great Britain (France is notable by its absence). After Europe, the big consumers are Japan, Latin America (principally Mexico and Cuba), Union of South Africa, and Canada.

The increase in exports has absorbed the large surpluses of tallow and grease which have developed since 1948. Increased exports have been stimulated by the low prices of tallow and grease which have been in effect since 1948 except for a period following the outbreak of the Korean war. The big question for the future is: "Will the export market continue to absorb quantities of the order of 700 million pounds and can it absorb even larger quantities?" There are four principal factors bearing on this question:

1. The future price of tallow and grease, particularly compared with competitive oils on the world market.
2. The availability of dollars in consuming countries.
3. The future development of synthetic detergent production in consuming countries.
4. The world political situation particularly as it may affect production and shipping of fats and oils.

A correlation of prices of prime tallow against exports of tallow and grease would show the normal economic relationship between price and demand—the lower the price the greater the demand. The months December 1950 to May 1951 were the peak of the post-Korea period of high tallow prices—a period during which a high level of exports continued in spite of high prices. These are the only points not adhering to the normal price-demand relationship. The conclusion to be drawn is that prices will have to stay down if large exports are to materialize, barring a new war-scare, with its psychological inflation of prices.

Table IV: Estimates of Fats and Oils in Synthetic Detergents

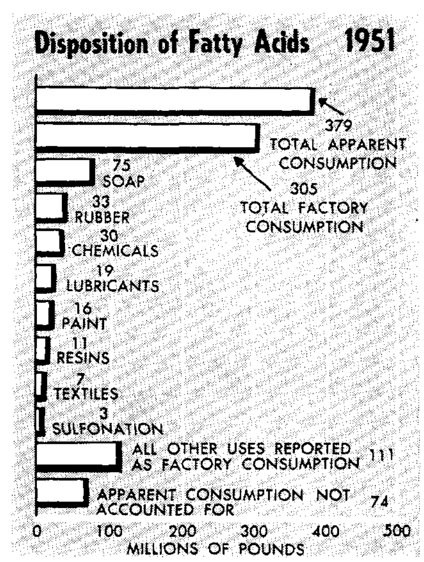
(Millions of pounds)

	Total Fats and Oils	*Tallow and Grease*	*Coconut Oil*	*All Other Fats and Oils*
1949	65	1	55	9
1950	121	39	77	5
1951	160	68	87	5
1952	163	88	70	5

There seems to be a good chance of continuing to export 700 million pounds per year of tallow and grease, and even increasing exports to a billion pounds or more per year. The total world consumption of soap fats outside the United States runs into several billion pounds per year, and *U. S. tallow is the cheapest soap fat in the world today.* The principal competitive fats on the world market are palm oil, coconut oil, palm kernel oil, whale oil, and fish oils. All five of these oils are dual purpose oils—they can be used either for soap or for edible purposes. Their prices in the world market are determined by competitive edible oils rather than by competitive soap fats. Every pound of U. S. tallow used for soap in foreign countries releases a pound of one of these other oils for edible purposes.

Figure 12 shows a comparison of the price history of tallow with palm oil and coconut oil. The palm oil and coconut oil prices are for bulk shipments, c.a.f. London, and the tallow prices are for prime tallow, tanks, c.a.f. Chicago plus 2 cents per pound estimated shipping cost Chicago to Europe. Tallow (with 2 cents per pound added) has been below palm and coconut oils in all months since early 1948 except Sept. 1950 to May 1951, the post-Korea period of war-scare prices. Palm kernel and whale

Figure 10



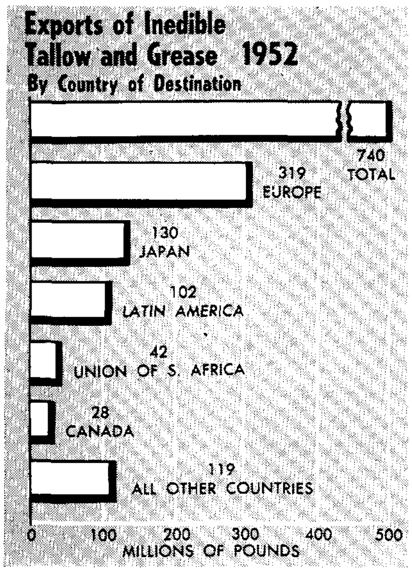


Figure 11

oils are comparable in price with palm and coconut. Fish oils are somewhat lower but still higher than tallow. Thus on a delivered basis, U. S. tallow represents a real saving in price to a European soap manufacturer.

The big obstacle to increased exports of tallow is the availability of dollars in the consuming countries. Most countries require import licenses to make dollar purchases. If a soap manufacturer cannot get an import license to buy U. S. tallow, he has to buy palm oil and others from soft currency countries at a higher price, which does not need an import license. If it were not for dollar shortages and currency controls, the world demand for U. S. tallow would be much higher than at present with a somewhat higher price.

The export demand for soap fats, including tallow, will undoubtedly be influenced by the further development of synthetic detergents in Europe, Japan, Latin America, and other areas. The raw materials are available in most parts of the world and the technology is not difficult, so that it is reasonable to expect synthetic detergents will follow a pattern similar to that in the United States, although probably at a slower pace. Synthetic detergents are now in production in every major country in Europe, and in some of the more advanced countries of Asia and South America. If synthetic detergents develop even modestly, the world demand for tallow may be seriously affected; and if synthetic detergents ever go as far as they have in the United States, the day might come when world demand for soap fats just could not absorb the U. S. tallow surpluses (combined with the smaller surpluses from Australia, New Zealand, Argentina, and Uruguay). On the other hand, there is a steadily increasing world-wide demand for soap and detergents as part of the rising standard of living all over the world.

Changes in the world political situation could have profound effects on the price, supply, and demand for all fats and oils. A war-scare could increase prices as it did after the outbreak of the Korean war. This was largely a psychological price rise, since neither supply nor demand was changed appreciably. On the other hand, a real world war could reduce the supply by reducing production and interfering with shipping, while true demand would probably remain about constant. This could cause a real increase in world prices, although prices would probably be controlled in all the major countries.

Price Outlook

If our analysis of the various factors has been correct, there are more economic forces tending to keep the price of tallow and grease down than there are tending to push the price up. U. S. production will be very large, domestic surpluses will be very large, the only outlet on the horizon right now is the export market—and prices will have to continue low if the export market is to absorb the surpluses. Therefore, it is the writer's conclusion that tallow and grease prices will stay low. Prime tallow at 4 to 5 cents per pound would appear to be a "normal" level, but 3 cents per pound is not impossible, and of course there can be surges due to temporary market conditions which might carry prices up to 7 to 8 cents per pound for a matter of weeks or even months. Of course, changes in the political situation could change this picture. Therefore, the general outlook is for steady low prices of tallow and grease for the indefinite future. This conclusion is, of course, at variance with the past history of tallow.

In the past five years, prime tallow has varied from 3.5 to 27.5 cents per pound. Wide variations of this magnitude have been characteristic of tallow, as well as all other fats and oils, for the past 100 years. However, we are now in a new era of tallow economics as a result of the development of synthetic detergents combined with steadily increasing production of tallow. Formerly tallow prices were quite variable because the supply was limited and people had to have soap. Now people don't have to have soap; they can have synthetic detergents. Moreover, there is now plenty of tallow.

The new era in tallow economics has been developing gradually ever since synthetic detergents first became significant in the middle 1930's, but it could be said to have really arrived in 1948 when synthetic detergents first exceeded 500 million pounds. The price of prime tallow started to decline in January 1948 and fell steadily month by month from January 1948 to June 1950, a period of 29 months. Then the Korean war caused a rise in price from July 1950 to February 1951, at which time the price was stabilized by price control for three months. However, in May 1951, the price started falling again and in February 1953 hit 3.5 cents per pound, the lowest level since 1940 and the lowest level of all time in relation to the general price level. The price rise following the outbreak of the Korean war was largely psychological in origin, rather than economic, since the relationship of supply and demand was virtually unchanged by the war.

New Uses for Tallow and Grease

How can new large uses be developed for tallow and grease and for fatty acids in general? This is a question of equal interest to both fat-splitters and tallow producers—even though the two groups are usually on opposite sides of the economic fence. The answer is research and more research—on a much larger scale than at present. The annual value of

Table V: Major Organic Chemical Products as Potential Markets for Fatty Acids

	U. S. Consumption 1951, Million Lb.	Approximate Average Price,[a] $/Lb.	Approximate Total Value, $ Million
Plastics and resins	2,950	0.37	1,100
Rubber (syn. + nat.)	2,800	0.25	700
Fibers (synthetic)	1,500	1.00	1,500
Surface active agents (syn.)	693	0.21	146
Pesticides (syn. + nat.)	518	0.40	207
Plasticizers (synthetic)	281	0.40	112
Rubber-processing chemicals	138	0.54	75
Lubricating oil additives	100	0.35	35
Waxes (syn. + nat.)	57	0.75	43
Paint driers	32	0.31	10
Flavor and perfume chemicals	30	1.60	48
Flotation agents	27	0.30	8
Lubricants	?	?	?
Adhesives	?	?	?
Solvents	?	?	?
Hydraulic fluids	?	?	?
	9,126	0.44	3,981

[a] All prices are 1951 average prices, except rubber and waxes which are December 1952 prices.

Table VI. Raw Materials Competitive with Fatty Acids for Making Organic Chemical Products

(Millions of pounds)

	1951 Consumption				
	From coal	From petroleum and natural gas	Total	Potential Supply from Petroleum[a] and Natural Gas	Approximate Price, Cents/Lb.
Ethylene	...	1,800	1,800	23,000	5
Propylene	...	1,400	1,400	27,000	4
Butylenes	...	1,600	1,600	27,000	4
Benzene	1,900	250	2,150	9,000	5
Toluene	335	410	745	18,000	4
Xylenes	85	475	560	23,000	4
Naphthalene	429	...	429	....	6
Acetylene	435	...	435	....	12
Cellulose[b]	...	...	1,230	....	10

[a] From Report of President's Materials Policy Commission, Vol. IV, page 193.
[b] From wood and cotton linters.

all tallow and grease produced in the United States is about $120 million, and the annual value of all fatty acids produced is about $60 million. On the basis of 3% of sales, which is standard in the chemical industry, the tallow, grease, and fatty acid industries should be putting at least $5 million per year into research. The present research program of the tallow, grease, and fatty acid industries is probably in the range of $1 to $1.5 million per year. Actually, considering the long road ahead and the impending large surpluses, even more than 3% of sales might be necessary to produce real results.

The big hope for increased utilization of tallow lies in new uses for fatty acids. Soap is on a down-trend which may never turn upward again, at least not for many years. Synthetic detergents will probably use increasing amounts of tallow and grease, but even if all synthetic detergents were made from these fats, this would take only about 400 million pounds in 1957. Lubricants and most of the other minor uses have little or no growth potential. That leaves fatty acids as the only hope for the future for greatly increased consumption of tallow and grease.

Research on the utilization of fatty acids should aim at developing products in the "big-time" synthetic organic chemicals, such as plastics, fibers, rubber, plasticizers, pesticides, lubricating oil additives, lubricants, waxes, solvents, adhesives, and others. These products run into many billions of pounds per year, with a value of many billions of dollars (see Table V). They constitute an almost unlimited market for organic raw materials. Tallow at four to five cents per pound is certainly a potential raw material for making such products, and enough research would undoubtedly develop the required technology.

While fatty acids are consumed in the amount of around 350 million pounds per year at present, most of the uses are peripheral rather than basic. For example, fatty acids are used as additives in alkyd resins rather than as primary components, as minor additives in rubber formulations rather than as a raw material for making the rubber itself, and as textile lubricants rather than as components of the textile fiber itself. Fatty acid research should aim at getting the carbon atoms in fatty acids into the integral structure of things people buy and use in large quantities, such as plastics, fibers, rubber, pesticides, and the like.

At the present time, most of the big-time synthetic organic chemical products are made from seven raw materials: ethylene, propylene, butylene, benzene, naphthalene, acetylene, and cellulose. Table VI gives pertinent data on these materials. Ethylene, propylene, benzene, and butylene sell at 4 to 5 cents per pound, naphthalene at 6 cents per pound, cellulose at 10 cents per pound, and acetylene at 12 cents per pound. Ethylene, propylene, butylene, and benzene are the big volume raw materials; naphthalene, acetylene, and cellulose are smaller. Therefore, any new source of carbon atoms, such as fatty acids, is going to have to compete with raw materials now selling for 4 to 5 cents per pound. Moreover, these materials are available in much larger quantities than are now being used. For example, in 1952, 1.8 billion pounds of ethylene were used in chemical synthesis, whereas there was a potential supply of possibly 23.0 billion pounds from the petroleum industry. The surplus is now being burned in the oil refineries, and therefore has only fuel value. This is the reason that ethylene remains at a steady, low price, and is likely to remain there. These are basic facts in estimating the strength of the competition which fatty acids must meet if they are to move into the "big-time" organic chemicals.

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Figure 12