abundant. The level of fats and oils prices is about as little advanced from prewar levels as any of the world's commodities. This is particularly true in the western nations.

Animal-fat production will likely continue to increase. As the world's dietary level improves, there will be more of the by-products of meat available. This indicates increased supplies of lard and tallow. The production of butter seems to have reached a plateau and will likely decline as the quality of its substitute, margarine, improves.

The marine oil supply is quite stable. It is limited by international agreement. Large amounts of sunk capital are involved in its production. Thus neither an increase nor a decrease is in prospect.

The tree nut supply has been quite stable in recent years, varying only as weather conditions vary. The price appears to have reached a level low enough to discourage further capital investment. Two factors are working in the direction of limiting and decreasing production. First, the tree nuts are very high in oil as compared to protein. As the relative demand for protein increases, the competitive disadvantage of tree nuts will increase.

Second, the technology of margarine production in Europe is developing in a direction disadvantageous to coconut oil. For the past two years the price of coconut oil has been very high, comparatively, because of drought conditions in the Philippines. This has encouraged a shift from coconut oils to liquid oils. The technology of liquid oil use has advanced rapidly under the pressure of necessity. The gains of the liquid oil will likely prove to be permanent.

The most rapidly expanding segment of fats and oils supply is that of edible vegetables oils. The market for these oils will likely continue to expand at a rate not much, if any, faster than population increases. The rate of expansion of the total of this group will likely decrease. The market for other agricultural products will expand at a faster rate. This means that the prices of vegetable oils will continue to be relatively cheap for the foreseeable future.

The increasing demand for protein in relation to fat will result in shifts within the group. The production of oil seeds that are high in protein have a competitive advantage over those that are low in protein and will thus increase faster. This adjustment boils down to a focus on keen competition among soybeans, peanuts, sunflower seed, rapeseed, and sesame seed. The advantage in this competition lies strongly on the side of soybeans because of their relatively low oil content.

The adjustment in production of the various oilseeds will be impeded by institutional activities because of impacts on the economies of various countries. For example, the French have for some time protected the peanut economies of their African colonies. The Nigerian peanut activities have been and are being supported. But these are but passing phases of the longer-run adjustments.

Soybean oil is still not a preferred oil in many markets. It appears inevitable that its production will increase in the long run. It is therefore important that vigorous attention be devoted to the technology of its use.

Economic and Social Factors Affecting Changes in Worldwide Usage of Fats and Oils

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THE PURPOSE of this economic session is to survey the broad trends in world production and usage of fats and oils and the "conditions of change," presumably with a view to pointing up the potentials of the world market for American fats and oils. The United States has now become the major world exporter of edible fat material, soap fat and, at times, has been a leading postwar supplier of drying oils. By and large, foreign markets have fully absorbed our ever-increasing surpluses of these fats and oils and they also take almost 25% of our oilcake and meal production, either as such or in the form of oilseed exports. It is natural to ask whether the world's need for additional American material will continue to equal our need for finding still larger markets for our mounting production.

In surveying fat consumption around the world, we must look both at *per capita* levels and aggregate tonnages. Oil chemists are also interested in the specific end-products and the oil utilization patterns. To do justice to such an educative task would take not 45 minutes but 45 days, since there are wide differences even between countries with a similar economic or ethnic status. For example there are important differences in the fat consumption patterns of the U. S. A. and Canada and still more so between the countries of Western Europe.

Sociological Groupings

I will therefore paint with a broad brush, and for the sake of convenience and contrast I will group the world into three main categories of food-fat consumption:

A. Countries which are highly industrialized and urbanized, with good marketing and transport systems and a relatively high level of consumption of fats and food in general, *e.g.*, North America, Western Europe, Australia, etc.

B. Medium-developed economies, in varying stages of transition from low to high standards of productivity and national income, *e.g.*, Southern Europe, Soviet Europe, Argentina.

C. Under-developed or even primitive economies, based on peasant or subsistence farming, with relatively little industry and very inadequate transport or marketing facilities. In general such countries have a poor and unbalanced diet, low food-fat consumption and an even smaller use of soap fats or industrial oils. As examples I would

TABLE I

Population and Consumption (Food Fats)

	Countries Grouped by Food-Fat Consumption Levels			
	A High	B Medium	C Low	World totals
A. Present position (mostly 1959) of consumption (food fats and oils)				
Average per head	48 lbs.	29 lbs.	9¾ lbs.	18½ lbs.
Total quantity (thousand M tons)	8878	6607	8828	24313
World shares	37%	27%	36%	100%
Population total (millions)	408	501	1985	2894
World shares	14%	17½%	68½%	100%
B. Effects of population increase—annual increase in population (thousands of persons)	5523	7678	39060	52261
Required food fat at current levels in each country				
Total (thousand M tons)	120	98	176	394
including	N. America 73 W. Germany 18 Other NW Europe 25	U.S.S.R. 56 E. Europe 13 Italy, Spain and Arg'tine 15	China 74 India, Pakistan, etc. 46 Brazil 13 Japan and Indonesia 12	
C. Effects of per capita increase (metric tons)				
Quantities required for				
½ lb. in each country	93,000	114,000	450,000	657,000
1 lb. in each country	186,000	228,000	900,000	1,314,000
2 lbs. in each country	372,000	456,000	1,800,000	2,628,000

D. Religious and cultural influences[a] (millions of persons)	World total	Asia	Africa	Europe and U.S.S.R.	America (N. and S.)	Oceania
Population according to religion[b]						
Christian	863	51	33	470	296	16
Moslem	433	331	89	12	neg..	....
Hindu	334	333	1	....	....	....
Buddist	154	154	....	....	....	....
Confucian	310	310	....	....	....	....
Shinto and Taoist	82	82	....	....	....	....
Jewish	13	2	1	4	6	neg.
Primitive	124	47	76	....	73	3
Other (incl. agnostic)	429	250	21	84		
Total	2742	1560	221	570	375	16

[a] Pig-fats are barred to *Moslems, Jews, and most Hindus*; beef and mutton tallow is generally allowable but cattle slaughter is sacrilegious to most Hindus. [b] Based on Encyclopedia Britannica, data incomplete.

mention much of Africa and Asia, wide areas in Latin America, and some Communist regions in Europe as well as in Asia.

Any such groupings are of course internationally controversial but they serve as a statistical groundwork or point of departure. Table I gives my rough estimates of world consumption of food fats, *in relation to population*, in each of these three groups. Any such estimates are subject to a wide margin of error, but serve to give an essential picture. Thus the high-standard countries (A) with only 14% of world population, account for 37% of world consumption of food fats, while the low-standard countries (C), with 69% of the population, account for only 36% of the consumption. The medium group (B), with only one-quarter of C's population, has an aggregate consumption of food fats three-quarters of that of the C group.

Qualifying Remarks

At this stage I should make some basic qualifications:

1. I will take as read the remarks in the previous paper on the interdependence in many countries of production and consumption and the description of interchangeability of most fats and oils and their multipurpose nature—food, soap, paint, and chemical industries.
2. The statistical estimates are taken from a variety of sources, trade and official. The U. S. Department of Agriculture is to be congratulated on the efforts of their overseas staff to supply data, both complete and internationally comparable, on production and distribution in each country, but some of these estimates are still defective.
3. My estimates and references cover actual or final

TABLE II

Changes in World Distribution—Edible/Soapery Fats and Oils (Excluding Drying Oils, Castor Oil, and Sperm Oil)[a] (Millions of pounds)

Region	Production (million metric tons)			Net imports (+) or exports (−) (million metric tons)			Total consumption[b] (million metric tons)			Consumption per person[b] (kilograms)		
	1934–1938	1948–1952	1955–1957	1934–1938	1948–1952	1955–1957	1934–1938	1948–1952	1955–1957	1934–1938	1948–1952	1955–1957
Free World												
Western Europe	3.1	3.0	3.7	+2.9	+2.7	+3.6	6.0	5.7	7.3	21.7	19.0	23.1
North America	3.1	5.1	6.5	+0.7	−0.3	−1.4	3.8	4.8	5.1	27.1	28.7	27.3
Latin America	0.9	1.4	1.6	....	....	+0.3	0.9	1.4	1.9	7.1	8.6	10.4
Africa	1.7	2.1	2.4	−0.9	−1.0	−1.2	0.8	1.1	1.2	5.9	5.3	5.2
Asia[c]	4.0	4.0	4.9	−1.3	−1.0	−0.7	2.6	3.1	4.2	3.9	3.7	4.7
Oceania	0.6	0.6	0.7	−0.3	−0.3	−0.4	0.2	0.2	0.3	22.4	17.8	18.1
Antarctic	0.4	0.3	0.3	−0.4	−0.3	−0.3	....	....	....	....	....	....
World (excl. U.S.S.R., Eastern Europe and China)	13.8	16.5	20.2	+0.6[d]	−0.3[d]	−0.2[d]	14.3	16.2	19.9	10.3	9.8	10.9

[a] Also excludes "invisible" food fats, *viz.*, consumed in milk, meat, nuts, etc.
[b] This measures year to year disappearance, without allowance for changes in stocks; the latter presumably cancel out over 3- to 5-year periods.
[c] Excludes Soviet territories and China.
[d] Net *import or export* balances with China, U.S.S.R., and Eastern Europe taken as a group, and differences in quantities in transit at the beginning of the period.
Source: F.A.O. Monthly Bulletin of Statistics, February 1959.

consumption as distinct from market demand or "primary disappearance." For short periods there can be important divergencies between what the refineries deliver to the trade and what is consumed in the home. Fluctuations in invisible or unreported stocks arise both from routine change in market prices and also from war or similar emergencies, *e.g.*, Korea, the Suez crisis. My remarks, however, are intended to cover basic consumption.

4. My remarks will concentrate on food fats, but Table II (as published by F.A.O.), and my comments thereon, cover all fats except drying oils. Further, in Table III, I indicate the varying patterns of consumption as between edible, soap, and other technical usage (including drying oil trades). The economic factors and trends for nonfood usage are broadly similar to those affecting food fats.

TABLE III

Present Fat Consumption Levels (Food and Nonfood Usage)[a] (pounds per person)

	Food usage[b]	In soap[c] (excl. syndets)	Other inedible	Total
(A) High standard	45 to 65	(pre-war)		
U.S.A./Canada	46	5.5 (12–13)	16.5	68
U.K.	48	9.5 (13.5)	9	67
Scandinavia (avg.)	56	7.5 (10–14)	6	68
Netherlands	63	8 (13)	6	77
W. Germany	54	3.5 (9)	6.5	63
France	45	5 (10)	4	54
Australia[e]	45	13 (11)	5	63
(B) Medium standard	20 to 40			
Spain	39	7	1	47
Argentina[f]	38	17	2	57
Italy	36	7	3	46
Cuba	34	7	1	42
Portugal	33	9	2	44
Israel	33	4	2	39
U.S.S.R.	29	6	4	39
Uruguay	25	12	2	39
Mexico	22	5	1	28
(C) Low standard	Below 20			
Chile	19	5.5	.5	25
Brazil	18	7	1	26
Malaya	17	4	.5	21.5
Morocco	15	3	.5	18.5
Peru	15	2	.3	17.3
Turkey	14	4	1	19
Ceylon	12	2.5	.3	14.8
Egypt	12	4.5	.5	17
Japan	12	4	2	18
South Africa	12	6.5	1	19.5
Congo	11	2.5	.5	14
India	11	1.5	.5	13
Burma	10	1	....	11
Colombia	10	6	1	17
China	9	1	.5	10.5
Nigeria	8.5	2	.5	11
Pakistan	7.5	.8	.2	8.5
Indonesia	7.5	2	....	9.5
Philippines	6.5	4.5	.5	11.5
Thailand	4	.5	....	4.5

[a] 1959 or near period.
[b] Excludes invisible fat consumed in milk, meat, etc. but includes "fat-back" in continental Europe.
[c] Prewar figures (in parentheses) illustrate the scope of replacement by "synthetic" detergents.
[d] Includes fats used as syndet base, fats added to feed, drying oils, etc.
[e] Includes edible beef/mutton, fats which become visible at retail stage.
[f] Prior to "austerity" reduction of 1959.

Visible and Invisible Fats

By food fats I mean visible fats, namely, those "separated" from the primary agricultural or marine product. Thus my figures exclude the fat consumed in fluid milk and cream and the fat eaten (or wasted) in meat, poultry, nuts, etc.

In the United States, total fat in the dietary supply (including waste) amounts to 120 lbs. per annum, contributing 40% of total calories. Of this total some 74 lbs. are invisible (in meat, milk, etc.) and not more than 46 lbs. are visible (*viz.*, separated from the milk, carcass, oilseed, etc.). These *gross* figures include waste at all stages, which is heavier for invisible than for visible fats. (Note: Much of the waste of invisible fats is recovered by renderers as inedible tallow and grease.) However even allowing for such waste, the net use of invisible fats is probably a larger tonnage in this country than that of visible edible fat. In Western Europe these proportions are about the same as in North America but in the low-standard countries the position varies considerably.

This distinction between visible and invisible fat is generally used in "fats and oils" discussions, but it has little significance for the nutritionist and we should remember that as the poorer countries try to raise their dietary standards, it matters little whether the fat is visible or otherwise. Economic and social history reveal rather conflicting trends. Thus 100 years ago there was very little visible fat in either the U. S. A. or the U. K. Butter was within the reach only of the rich or those living on or near farms; little lard was sold as such; margarine and vegetable shortening were unknown; the middle and lower classes bought some beef-fat from the butcher or separated their animal fats in the kitchen. Salad oil (all olive) had a restricted clientele. Increasing industrialization and the emergence of modern merchandising then made available "processed fats and oils," at the expense of the consumption of the kitchen or farm fat. Later on, from about the turn of the century, the expansion of urban incomes and market facilities and the development of larger and better farming and animal husbandry resulted in a steady growth in the supply of meat and milk. I would hesitate therefore to predict the course of these trends in the presently underdeveloped countries.

Consumption and World Distribution

It is useful now to survey the broad regional changes in consumption in relation to availabilities and world distribution. At the risk of over-lapping the previous paper, I would refer you to the excellent F.A.O. presentation of February 1959, reproduced as Table II. These statistics do not cover China or Soviet Europe because of lack of data and they also exclude the drying oils; but they include those fats and oils which are used by the soaper or fat-splitter as well as those used in the edible trade. The figures thus mask the postwar decrease in soap consumption caused by the growing dominance of synthetic detergents in the industrial countries. By the end of 1957, the latest period in the F.A.O. table, syndets represented a range of 40 to 75% of the "A" market for detergents apart from toilet bars. The 1960 range is probably 50 to 90%. By no means all of the syndet tonnage is replacement of soap, since new usage markets have been developed, but by 1957 the actual displacement probably accounted for 6 lbs. of soap-fat in the U. S. A. and 3 to 5 lbs. in Western Europe. However even in the areas thus affected, the decrease in soap fat has been more than offset by a slight increase in food-fat consumption and a sizable expansion in industrial markets other than the drying oil trades. In the nonsyndet countries (B and C groups) there has been a general increase in soap consumption,

based partly on local fats but largely on imported American tallow.

An important facet of the replacement of soap by syndets has been the release of a large tonnage of fats for use in the edible market. Coconut oil, largely used in soap in Europe prior to the war, is now used almost exclusively for edible purposes in Northwestern Europe. Similarly most of the Nigerian palm oil has now been up-graded for edible use.

Reverting now to "world distribution" (Table II), we find the following broad picture of world fat distribution: The areas with the lowest consumption levels, Asia and Africa, are still the major suppliers to the high-standard areas. Moreover *Africa's* net export is larger than before the war since commercial production in West Africa is primarily for export and has increased faster than consumption. Since 1958, however, African production has faltered while local consumption still increases. In non-Communist *Asia* the 20 years under review have seen a production increase of 900,000 tons, but a consumption increase of 1,600,000 tons or 62% (population 35% and *per-capita* usage 20%). *India,* a major prewar exporter of oilseeds and meal, now retains virtually all the oil it produces and also up to 85% of the meal; the growth of population and *per capita* demand is fast converting that country into an importer of food oils as well as of soap fat.

In the *Philippines,* now the major *single* world fat exporter apart from the U. S., the local market takes only 15% of production but this percentage seems likely to rise steadily in the future unless measures are taken to deal with some of the inherent obstacles to further increases in production. In *Indonesia,* the second largest prewar exporter, production is stationary or declining but consumption is increasing and local officials have recently stated that by 1970 some copra may have to be imported. *China* and *Manchuria,* the largest prewar exporter, now ships mainly to Eastern Europe but the recent increase in exports to Western Europe will probably continue. *Latin America,* a slight exporter of food fats just prior to the war, is now a fairly large net importer. Over the 20 years *Argentina* has had quite an impressive expansion in edible oil production, even larger than the increase in population and *per capita* consumption. However its production is erratic, due largely to weather hazards, and its export supply of edible oil is undependable. In fact Argentina became a heavy importer in 1955 and 1956 when it took 120,000 M tons of American cotton oil. In the rest of South and Central America, consumption has outstripped production and most of these countries (other than Brazil) now depend on imports.

In *Western Europe* the 600,000 ton increase in indigenous production, slaughter fats and some rapeseed, has been less than half of the 1,300,000 ton increase in consumption, even after crediting the contribution of syndets. Net imports have therefore risen over the 20 years by 700,000 tons and this gap will continue to grow.

This leaves us with *North America,* where productivity in oilseeds and livestock has far outrun fat consumption, especially with the latter depressed by syndet replacement. For the U. S. A. the 1934–1938 average includes 4 years of drought effects and therefore overstates the typical prewar import balance by some 250,000 tons of food oils and soap fats. Even so, the table shows the impressive surplus this country now has for export. Canada is a modest net importer of edible/soap fats (50/60,000 tons), despite its success with rapeseed and its good livestock production.

This world distribution structure is therefore steadily changing to a situation where further increases in consumption (population or per person) in the high-standard areas must apparently be supplied from countries with high productivity (mainly the U. S. A.) so as to offset the shrinkage in exports from the poorer-standard regions. In most of the latter countries, the expected increase in population and consumer demand seems likely to outstrip future gains in production, unless or until productivity can be substantially improved both in crops and livestock. This suggests that for many countries the key to future consumption trends will be availability of supplies, domestic or imported. Availability of imported supplies in turn involves currency resources and ability to procure. With this background, we should now review the varying patterns of fat consumption around the world.

Consumption Levels

Present consumption levels, pounds per person, are shown in Table III for typical countries in the A, B, and C groupings. These estimates show total visible fat, analyzed according to food usage, soap-making, and other inedible trades (including drying oils).

Food-fat consumption in the high-standard countries ranges from 45 lbs. to more than 60 lbs. The high figures for some European countries include fat-back or "Spek," though this is not statistically regarded as visible fat in most countries. However invisible food-fat consumption is higher in the U. S. A., the U. K., and the British Dominions than in Continental Europe. In the medium-standard regions, edible usage ranges from 20 to 40 lbs. per person. For some countries more complete data might possibly move them from the B to the A group (*e.g.,* Austria). The exact level of consumption is not known for the Soviet countries, but in European Russia it is now probably almost 30 lbs. compared with 20–25 lbs. in 1939. In the low-standard areas, the levels range from almost 20 lbs. to below 5 lbs. These national averages conceal very uneven distribution within specific countries, especially in those cases where local produce (*coconuts, peanuts, oilseeds,* lard) cannot be easily transported from surplus to deficit areas. Examples of uneven distribution are of course India, China, Indonesia, and Brazil, but this occurs also in Greece, Yugoslavia, and other B countries.

The *soap-fat* comparisons reflect the replacement by synthetic detergents in the highly industrialized countries, the extent of which is indicated by the prewar levels shown in brackets. Other factors complicating international comparisons of soap usage are hardness or softness of water, clothing habits and climate, social customs, *e.g.,* washing of clothes in streams, and industrial use of soap, for example in textile manufacture. It is of interest to note the high level of soap consumption in countries with large meat production (for export), e.g., Argentina, Australia, and New Zealand. This provides a plentiful supply of cheap tallow, which largely accounts for the relatively small use of synthetic detergents.

For other *inedible or technical usage,* the figures for most countries are probably incomplete. The very

TABLE IV

Type of Food Fats Used (1959 or Near Period)
(pounds per person)

	Total[a]	Spreads (product weight)			Solid shortenings			Salad and cooking oils	Other[e]
		Butter[b]	Marg.[c]	Total	Lard[d]	Other	Total		
(A) High standard									
U.S.A.	46	8½	9	17½	9	12	21	9	2
Canada	46	18	9	27	8½	9	17½	4	1
U.K.	48	18	15	33	5½	5½	11	5	5
W. Germany	54	17	24	41	10	3	13	5	3
Netherlands	63	10	44	54	6	7	13	2	3
Belgium	52	24	24	48	1.5	1	2.5	7	3
Denmark	63	24	41	65	5	1	6	1	1.5
Sweden	50	22	32	54	1	1.5	2.5	1.5	.5
Norway	56	8	53	61	.5	1.5	2	2.5	.5
France	45	22	5	27	2	1	3	15	3
Australia	45	26	9	35	1	3	4	1.5	10
(B) Medium standard									
Spain	39	1	1	2	2	....	2	35	....
Argentina[f]	38	4	.6	4.6	.5	....	.5	28	5.5
Italy	36	4	2	6	7	....	7	19	4
Cuba	34	1.5	.5	2	24	4	28	4	....
Puerto Rico	33	1	....	1	27	2	29	3	....
Israel	33	7	11.5	18.5	....	....	....	17	....
U.S.S.R.	29	9	5.5	14.5	7	2	9	6	2
Uruguauy	25	2	....	2	1	....	1	19	3
Venezuela	21	1	....	1	1	10.5	11.5	7.5	....
(C) Low standard									
Chile	19	1	....	1	5	1	6	12	....
Brazil	18	1.6	.5	2.1	10	.5	10.5	5.5	....
Malaya	17	1	.5	1.5	5	....	5	1	9.5 (coconut oil)
Morocco	15	2.5	.5	3	....	....	....	11.5	....
Peru	15	1	....	1	4	1	5	9	....
Turkey	14	1	4	5	....	1	1	8	1
Ceylon	12	.5	....	.5	....	.5	.5	2	9 (coconut oil)
Japan	12	.5	1	1.5	.5	1	1.5	8.5	.5
India	11	3	2	5	....	....	....	5.5	.5
Congo	11	....	....	....	....	....	....	.3	10.5 (palm oil)
Colombia	10	....	....	....	2	3	5	4	1 (coconut oil)
Nigeria	8.5	....	....	....	....	....	....	.5	8 (palm oil)
Indonesia	7.5	....	.3	.3	....	.1	.1	.1	7 (coconut oil)
Philippines	6.5	.1	.2	.3	.3	2.5	2.8	....	3.5 (coconut oil)

[a] Excludes skim milk and moisture content of butter and margarine.
[b] Excludes butter used in margarine manufacture; includes animal ghi.
[c] Includes vegetable ghee.
[d] Excludes lard used in shortening or margarine; includes "fat-back" or (Spek) for some European countries.
[e] Covers beef-fat used direct, native palm oil, coconut oil, etc. and (for A countries) specialty fats for biscuits, etc.
[f] Prior to "austerity" cuts of 1959.

large figure for the U. S. A. includes fats in feed (3½ to 4 lbs. per person), fats used in synthetic detergents (1½ to 2 lbs.) and also tall oil or fractions (4 lbs.). Even so, the large remaining technical use reflects the postwar strides made by the American chemical industry in utilizing fats and oils for an increasingly large number of purposes. Industrial chemistry is moving rapidly ahead in the other A countries and similar developments are also to be noticed in some underdeveloped areas. Some countries have some rather special nonedible markets, e.g., it is estimated that India uses some 20,000 tons of coconut oil (0.1 lb. per head) for "anointing the deity." This excludes oil for anointing "the person," a practice not unknown in the A countries.

Food-Fat Consumption Patterns

Table IV illustrates the varying composition of food-fat consumption by end-products. Solid fats, spreads or shortenings, predominate in the A countries, also in Soviet Europe and Israel. This reflects climate and social custom. In North America, butter and margarine are used mainly as spreads (on bread, rolls, etc.) and only to a small extent for baking, whether in the home or in the food industry. In Europe and the Southern Dominions, both of the spread fats are also used quite heavily for baking and in the food industries. For price reasons, margarine is used more heavily than butter for such baking purposes. The use of lard and shortenings for baking is therefore heavier in North America than in Western Europe or Australia. Lard and vegetable shortening are used for frying, along with liquid oil but in West Europe there is also a considerable frying usage of margarine, if not of butter.

In the warmer climates the use of liquid oil is traditional and very little fat is spread on bread. For example, in Spain the bread is dipped in a bowl of oil. In Italy and Soviet Europe there is a relatively large use of lard (and fat-back). However, margarine usage is gradually expanding in the Mediterranean countries, for example Italy and Turkey. Israel of course conforms to the European pattern as closely as resources permit. Argentina follows the southern European pattern, although the cooking or salad oil supply is supplemented by beef fats and butter.

In the low-standard areas, fat usage is generally based on local fat supplies, subject to a varying but usually minor degree of processing. Thus in India the consumption varies between animal ghi (mainly in the milk areas), vegetable ghee (Vanaspati), liquid oil (peanut, rape, sesame) and, in the South, coconut oil. Nearly all of the liquid cooking oil is peasant-produced and is preferred to "refined" oil, but there is an expanding trade in Vanaspati (hydrogenated vegetable oil). In Nigeria, primitive peanut oil or whole peanuts predominate in the North, while native palm oil dominates in the coastal oil-palm belt. Coconut oil is the staple fat in Ceylon, the Philippines, and Southeast Asia, but the past 20 years have seen some replacement of native crude oil by a more refined product, mainly as margarine or vegetable shortening. Few figures are available for Latin America, where there is a mixed pattern of lard or shortening (based largely on seed oils or coconut oil)

and cooking oils (based on local oilseeds, with some supplementary imports of vegetable oil). Modern processed and packaged fats or oils are making steady progress in the urban areas of many of these countries. I will leave till later a discussion of the choice of specific fats and oils used in the various countries.

Special Cultural Influences in Consumption Patterns (see Table I, Section D). In passing, mention should be made of religious cultural influences. Pig fats are barred to Moslems (433 millions), Jews (13 millions), and most Hindus (334 millions). Cattle slaughter is sacrilegious to most Hindus. A fatalistic or negative attitude still exists in much of India to an efficient use of dairy cows so that most of the milk and ghi comes from buffaloes and goats.

Potential Increases in Consumption (see Table I, Sections B and C). Expansion in consumption arises from increases in population and improvements in *per capita* demand. The latter can be caused by industrialization on a sound economic base or by inflationary factors of doubtful permanence.

Table I (B) illustrates the arithmetical requirements of food fat caused by the current increase in population, based on present *per capita* usage in each country. The annual increase in the A countries of 5,500,000 represents a food-fat requirement of 120,000 tons; in the medium-standard countries the annual increase of 7,700,000 (mainly Soviet Europe) represents 98,000 tons; at the other extreme, the anual increase in the low-standard countries of 39,000,000 requires an additional fat supply of only 176,000 tons. For the world as a whole, the annual increment of 52 million represents 394,000 tons of food fats and oils. In five years' time this world increase would represent almost 2,000,000 tons at current (1959) consumption levels.

This calculation makes no allowance for expansion in demand or purchasing power per person, though this is the area of greatest potentiality, as brought out in Table I (C). An increase in *per capita* demand of only ½ *lb. per annum* would require 93,000 tons for the A group, 114,000 tons for the medium group, but 450,000 tons for the low-standard group, making a *world total of 657,000 tons*, over and above the effects of population increase. Many B and C countries are setting very ambitious improvement targets of 2 lbs. or more per person, to be achieved within five years. Such an increase of 2 lbs., applied across the board, would mean an expanded world requirement of over 2,000,000 tons, mostly from the low-standard countries. Without trying to adjust such targets to the realistic posibilities of each country, the calculation shows the explosive nature of the cumulative effects of population growth and general economic advance.

In passing we should note that consumption can also contract under adverse conditions, as was exemplified by the austerity cut which occurred last year in the Argentine consumption of meat and food fats and oils which is estimated at something approaching 15%. Financial austerity in Turkey and even Spain may be taking a somewhat similar turn. Many countries have apparently been trying to raise their living standard above the existing internal purchasing power and certainly at the expense of maintaining or increasing their essential export trade earnings. In the long view, the improvement of consumption levels will depend on the success of the investment programs of these countries, including capital aid from outside.

In the A countries the demand for food fat (as a whole) is quite inelastic in relation to both prices and changes in income (other than those of deep depression). The elasticity position is not clear for the B and C countries, where consumption is heavily geared to local availabilities, retail prices, and import procurement. This leads us to the question of realistic possibilities.

Conditions of Expansion

Forgetting about possible contractions, as being only temporary, we should first note that for physiological needs to be converted into effective demand there must be the necessary internal purchasing power, with fats as only a part of the consumer necessities. A shift of peasants or small-holders from subsistence farming to industry and from country to towns brings more cash income but not necessarily sufficient to provide the same or a larger *per capita* supply of fat. Much would depend on the price of the purchased fat and the degree of processing.

There is one type of consumption not linked to normal marketing, namely relief and give-away programs. Over the last 5 years the U. S. has donated large quantities of flour, meal, and dried milk under P.L. 480 (Titles 2 and 3) which have been distributed through refugee centers, schools, missions, and other nonprofit agencies. Surplus (C.C.C.) cottonseed oil was added to these programs during 1954 and 1955 and there is considerable pressure for including oils on a regular basis. There have also been relief or donation programs through United Nations agencies and by some national governments. This distribution has mostly been an addition to existing consumption since most of the recipients were on a near-starvation basis. It would appear that such noncommercial feeding may be extended to those working on large construction projects such as the building of roads, dams, and power plants designed to develop economic productivity. The food supplied would be a part of the wages but it would be outside the normal marketing system and is a potential source of improved living standards.

Mention of Titles 2 and 3 leads to the more important Title 1 of Public Law 480, namely the *sale* of American oil against foreign currencies, with the U. S. treasury providing the dollars. The majority unofficial view is that few of these dollars will be repaid, in cash or kind, though such outlays may prove a prudent and relatively inexpensive contribution to the U. S. defense effort in strengthening the economic productivity of the free world. Within the recipient countries, however, the P.L. 480 oil is distributed through regular trade channels and cannot be absorbed unless there is the demand over and above previous marketings. The expansion of P.L. 480 sales over the past five years has accompanied rather than caused the increase in demand. In Spain this demand has come from higher wages and incomes, caused partly by U. S. air-base construction and partly by industrialization promoted by domestic and foreign capital. Weak currency resources made it necessary for Spain to finance the required imports by P.L. 480 dollars. A similar sequence has occurred in Turkey, Pakistan, and many other P.L.480 markets. It is a moot question as to how much this consumption would have expanded without the availability of P.L. 480 dollars. It has certainly been assisted by market

promotion within these countries, largely financed by P.L. 480 counterpart funds.

Reverting now to the broad question of internal demand, the major conditions are availabilities and consumer or (processor) choice.

Availability. This is determined in many if not most countries by a) the level of agricultural production, price supports, or other protection and b) the volume and kind of imports as permitted by governments and currency resources. Local processing industries, old or new, naturally must give priority to local materials but there will be an increasing tendency to obtain the maximum supply and that of the most suitable yet least expensive fats and oils.

Competition and Consumer Choice.—For many countries the conditions described above add up to a limited choice for the retail consumer and a narrow choice of ingredients for the local processor. There is a fairly broad choice of products (and component fats) in Western Europe and probably Japan, but in most of Asia, Africa, and Latin America the consumer is limited to the products of domestic agriculture and supplementary imports, arbitrarily controlled to support local agriculture or processing. For many decades there has probably been little dissatisfaction in the consumer with these availabilities in any specific country, but the rivers of education and economic progress are now "bursting the banks." Local processing industries are being modernized and expanded and where agriculture cannot supply suitable raw materials, arrangements are made for permitting additional importation. By the same token, more attention is being given to consumer preferences. Thus there is great scope for educating the refiners and ultimate users, as is being done in many countries by the Soybean Council and other U. S. export groups.

To American oil chemists, the $64 question is the various overseas trends in refiners' choice or use of fats and oils in the end-products and the prospects for U. S. exports. This complex subject would require a session by itself and I can give only a few generalizations.

In Northwestern Europe, the processor is largely guided by the verdict of consumer panels, somewhat similar to test-marketing in the U. S. A. The consumer "votes" as to what is most popular, although he knows the composition. For *margarine and shortening* in Northern Europe, the formula position is complex and varies widely even within a country—between "premium" and the cheaper standard brands. In general the preferred components are the "consistent fats," coconut, palm kernel, and palm oils, since these are traditional and require little or no hydrogenation. Marine oils are also heavily used for cheapness. As regards liquid oils, a fairly high proportion of local seed oil is mandatory in some countries (e.g., rapeseed oil in Sweden and elsewhere). However the traditional preference is for peanut oil, for which refiners usually pay a premium over cottonseed oil and sunflower oil. Soybean oil is near the bottom of the list, presumably reflecting the verdict of consumer panels. Nevertheless, the last two years have seen a steady expansion in the use of both cottonseed and soybean oils. largely because of the smaller world availability of coconut and high-lauric oil and the widening of the price spread of foreign peanut oil over oils of American origin. England is now using an appreciable quantity of American lard in margarine and shortening, but this situation would quickly change if or when the price moved above that of competitive material. In Continental Europe very little lard is used in margarine or shortening manufacture since it is a major item in retail trade as such; any "surplus" moves into export and tariff protection prevents any importation of consequence.

Turning to the *salad and cooking oil market,* the preference in France and Northern Europe is still strongly for olive oil and peanut oil and it is difficult to retail other oils, even cottonseed oil, except at lower prices and by suppressing the words "salad oil." The same preference holds for Portugal, Greece, and probably Italy and Spain, at least in respect to the demand for the higher-grade salad oils. However the cheaper blended oils are gaining widespread acceptance, particularly in Spain, where the quality of the olive-soybean blended oil compares favorably with much of the poorer-grade olive oil within the financial reach of many consumers. The same trends are to be found in North Africa, Turkey, and Israel. Incidentally, in the rapidly growing margarine industry in Turkey, soybean oil and cottonseed oil are well established as major ingredients, since the public prefers a "strong" to a "bland" product.

American oils are steadily gaining acceptance in the expanding edible-fat industries in *Pakistan* and *Iran, viz.,* for vegetable ghee, and there is reason to expect a similar development in India, where some 4,000 tons of soybean/cottonseed oil will shortly be programmed under P.L. 480. This will be used in Vanaspati, which product may well become an important market for American oil. In the not too distant future there should also be a good import market for American oil, for blending with local cooking oils, in India, Pakistan, Burma, Malaya, Thailand, etc., but this will require much promotion and experimentation.

Japan is a large user of most of the liquid oils for several end-products, but this oil is almost entirely locally processed from domestic or imported oilseeds.

Latin America presents very mixed conditions and prospects. Animal lard dominates the consumer market in Cuba, Puerto Rico, much of the Caribbean, and Brazil and it is in strong demand in most of western South America. Salad and cooking oils predominate in Argentina and Chile with major preference for sunflower oil, cottonseed oil, and peanut oil, the three major locally produced oils. Faced with local crop failures or short supply, both Argentina and Chile have imported heavily from the U. S. A., cottonseed oil and soybean oil; Uruguay in recent weeks has followed the same course. From Peru northwards, the production of lard is inadequate, although increasing, and much of the edible fat consumption is supplied by the growing shortening industries. The latter use both coconut oil and liquid oil, including fairly large tonnages of imports from the United States. In several of these Latin American markets, the tariff favors the entry of "raw material" oil over lard. The future should see an increasing production both of lard and vegetable shortening and hence a good market for American oil.

Conclusion

There is every prospect of very large increases in the world consumption of food fats. In the first place,

the growth in population will theoretically require an extra 2 million tons by 1965 and perhaps 5 million tons by 1970, since declining death rates will probably accelerate the population increase in many countries. Secondly, realization of the consumption improvement targets now being set in many B and C countries would add a further 3 to 4 million tons by about 1970. Even if we exclude the Communist regions in Asia and Europe, the free world faces a formidable challenge to increase its productivity in respect to fats and oils. How much of this will come from agriculture within the "underdeveloped" countries and what increase can be expected in the effective demand for American material, whether for dollars or under P.L. 480 or similar assistance programs?

Forecasts are dangerous, so I will conclude with a few generalizations. Price is of course an important factor in influencing both production and demand in any one country but there are some rigidities. Moreover price relationships are complex and fluid, both internationally and within any country. We should guard against the tendency to oversimplification such as the popular statement that if our farm supports or oil prices can be brought sufficiently low, then our soybean oil, cottonseed oil, or lard will inevitably capture a much larger foreign market. For example the tropical or southern hemisphere oils offered in Europe are usually below the prices of the American edible oils, but this has not been the case for 1958/59 and most of the current season. We cannot predict what swing may occur in the various price structures and relationships around the world, particularly as affected by changes in freight costs, tariffs, quota controls, etc.

Nevertheless, along with the increase in the U. S. "exportable supply," the evidence to date suggests a growing dependence of the rest of the world on American material. However it would seem that our export trade will be increasingly concentrated on oilseeds and on crude oil rather than on fully refined oil. Expansion of American exports will require the determined cooperation of farm and processor groups, along with the U. S. overseas field services, in sustained technical assistance. This must be backed up by quality performance on the part of American processors and shippers and by financing arrangments which meet the necessities of the importer. Under such conditions the future "potential" expansion should become "actual." Much of these exports would be in the form of soybeans and crude or semi-refined oil, but there should also be an expanding market for "competitive lard" in several countries as well as for processed vegetable oils, especially in the newer markets.

The Art of Speculation

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THIS PAPER was supposed to fit together the oil supply-production picture as seen by Tom Hieronymus and the oil consumption picture as seen by Harold Knight. The area between commodity production and end-product consumption is frequently referred to as marketing. The type of marketing considered here, fats and oils, has one very important aspect, that is, that there are enormous price and decision hazards assumed by all involved, much more than, say, in the marketing of automobiles or even steel bars. These price hazards arise from the interaction of constantly shifting sentiment and constantly shifting statistics on a traditionally quite fluid price structure. The result is that all of the agencies in the marketing channel are engaged in a huge test of skill. This test is sometimes referred to as the art of speculation.

Over the years the term speculation has acquired some undesirable connotations, parasitism, gouging the farmer, market rigging. There is widespread opinion that speculation *per se* is faintly immoral and economically undesirable. Perhaps this attitude is the result of hostility to that which is not understood, complicated by some "ax-grinding" by agricultural leaders and politicians.

Frequently the debate centers around the undesirability of prices going up and down. Usually however farmers are only concerned about the immorality of low prices, never about the immorality of high prices. Industrial buyers tend strongly to take the opposite tack. So mostly it depends on whose ox is being gored. No matter what the administration currently in office does, no matter what farm leaders say, the plain naked fact is that a rain in Kansas or the blocking of the Suez Canal changes considerably the price at which the market will "clear," *i.e.*, the equilibrium price. True, second-to second fluctuations may not be necessary, but they are the price that all must pay in order to have a liquid usable market.

Everyone's a Speculator

When the term commodity speculator is used, a fairly standardized picture is conjured up. That is of a frantic group of men on futures exchange floors, surging back and forth in a milieu of hopeless confusion. Agreed, this is one form of the species. However there are other speculators who are seldom thought of as such. Yet their nonoffset risks (really the key) are frequently larger, more dangerous, and less liquid than the risks of the professional trader on the floor. Let us look at a few of them: how they work, how they decide what to do, what their speculation consists of.

The Farmer. He speculates on: a) His ability to wrest crops from the soil. Weather makes this speculation for some crops in some areas, for example, corn in Nebraska, wheat in some areas of the Southwest, almost any spring grain on the bald prairies of Saskatchewan.

b) What distribution between crops will bring the greatest return for money and effort expended. Fre-