

# Salad and Cooking Oils

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## ABSTRACT

Raw materials and techniques for the production of salad and cooking oils are reviewed. Particular attention is given to oil properties that are related to end uses. Availability, local markets, and culinary practices are discussed, with particular respect to the ways these factors influence the use of oils in many countries.

## VISIBLE FATTY SUBSTANCES

Visible fatty substances—that is, those bought, as such, by consumers as opposed to those found in foodstuffs such as meat, cheese, etc.—include oils, margarine, butter, and animal and vegetable fats. These different forms of fatty substances can be produced from different raw materials, such as soybeans, sunflower, peanuts, rapeseed, cotton, olive, palm, copra, lard, tallow, and butter.

Figure 1 shows the world consumption of oils and fats in 1973. On a worldwide level, except for certain large countries such as China and India for which we have no statistics, we can see that the section “salad and cooking oils” is largest, with 45%. However, if we add fats, margarine, and butter, which are “solid” products, we find that both liquid and solid fatty substances share the market more or less equally. Sixty-six percent of the raw materials used for all purposes are of vegetable origin, and soybean oil takes first place among them.

We have not found any statistics permitting us to state on a worldwide basis which raw materials go into the making of the salad and cooking oils, the subject of this presentation. On the other hand, we will give more details for some of the principal countries.

The U.S. consumption is shown in Figure 2. Here the “salad and cooking oil” segment is sizable, reaching a figure of 37%, but the total picture shows that fatty substances are more often consumed in solid form: 32% fats, 22% margarine, and 9% butter. The raw materials most often used for all purposes are those produced locally: soybeans, followed pretty far behind by cottonseed. This is also true for the “salad and cooking oils” segment manufactured from 72% soybeans, 15% cottonseed, 7% corn, and 6% other (peanuts, safflower).

The uses of fats and oils in the European Economic Community are shown in Figure 3. On the whole, the oil segment is as important as in the U.S. However, butter is much more widely used at the expense of fats, with the

percentage of margarine use remaining about the same—24%. The raw materials which are frequently imported are much more varied. Among the vegetable products which represent 54%, soybean still leads with 12%, but the spread between it and the following narrows: 9% olive, 8% peanut, 6% rapeseed, and 5% others. The “salad and cooking oils” segment includes 30% soybean, 22% locally produced olive, 19% peanut, 15% locally produced rapeseed, 12% sunflower (partial local production), and 2% others.

The fat and oil consumption pattern in Japan is shown in Figure 4. Various eating habits lead chiefly to the consumption of oil, amounting to 62%, the highest after the Mediterranean countries. Butter amounts to a very small part—5%. Of the raw materials used for all purposes, 82% are vegetable products. Soybean takes first place with 39%, rapeseed second with 20%. These two products are imported. Moreover, rice bran oil is used. This is not surprising for an Asiatic country. In view of the fact that the largest share of the market—62%—is in oils and while we have not been able to find statistics on raw materials for this segment, one may conclude that the oils are mainly produced from soybeans and rapeseed.

The Brazilian consumer (Fig. 5) also uses a lot of oil—44%—but the percentages of margarine and especially

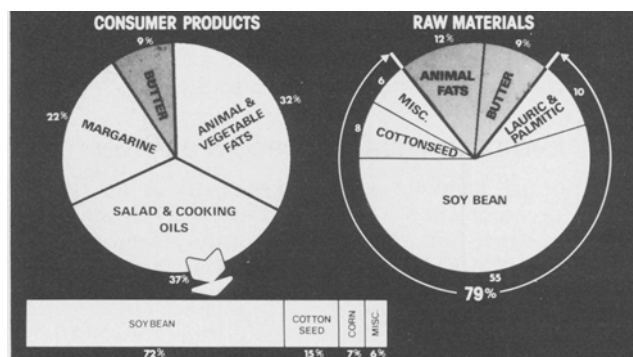


FIG. 2. U.S. consumption of oils and fats in 1973 (Information from USDA, *Fats and Oil Situation*, April 1975).

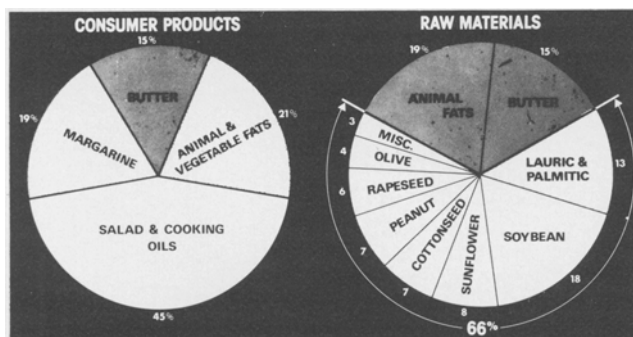


FIG. 1. World consumption of oils and fats in 1973 (Information from private origin [left] and FAO and FNCG [right]).

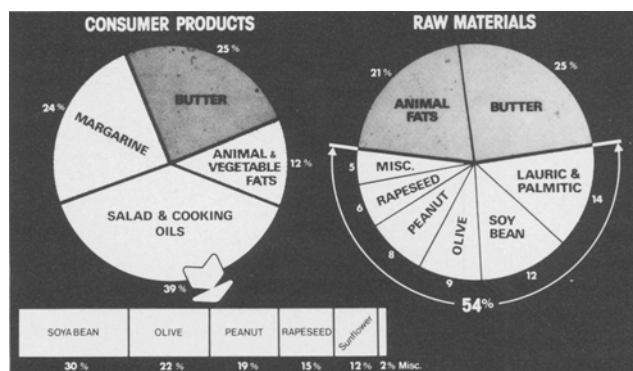


FIG. 3. European Economic Community consumption of oils and fats in 1972 (Information from FEDIOL and OSCE Lux.).

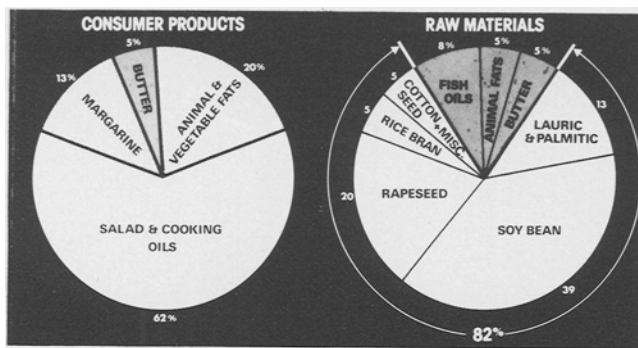


FIG. 4. Japanese consumption of oils and fats in 1973 (Information from private origin).

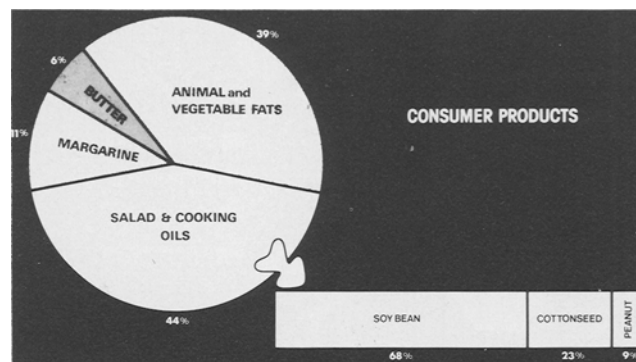


FIG. 5. Brazilian consumption of oils and fats in 1973 (Information from the Brazilian Embassy in Paris and private origin).

butter are low—11% and 6%. On the other hand, fats represent a considerable share, with 39%. The oil segment is composed mainly of 68% soybean (local production), 23% cottonseed, and 9% peanut.

These few examples may permit a better understanding of the position of the "oils" segment in relation to the other uses of fats.

### CRITERIA FOR CHOOSING SALAD AND COOKING OILS

Criteria vary depending upon whether one adopts the point of view of the consumer, the nutritionist, or the industrial manufacturer.

#### Consumer's Point of View

The consumer buys consciously or unconsciously subject to price; taste and odor, especially when hot; tendency to solidify, cloud point; foaming resistance; consistency of quality and stability; presentation and packaging; nutritional aspects, sometimes exaggerated or deformed by public opinion; and other criteria, some of which are irrational.

#### Point of View of the Nutritionist

The nutritionist takes into account the following criteria: adequate polyunsaturated fatty acid content; maximum saturated fatty acid content; good heat resistance to minimize the formation of new compounds, especially of polymers and cyclic products; and eventually, the vitamin content.

#### Point of View of the Manufacturer

An industrial manufacturer, in addition to the preceding criteria—the importance of which must be judged through the marketing and research departments—has to consider the following factors: price, availability and regularity of supplies of raw materials, suitability to refining, and specific restrictions.

Meeting all these criteria is not always easy, and the result is only a compromise which permits us to distinguish two large groups of oils depending on their uses.

"All purpose" oils which are especially well suited for deep frying. The polyunsaturated fatty acid content should not be too high, in order to avoid a tendency to oxidize. This is why it is advisable to eliminate the linolenic acid content and to restrict the content of linoleic acid—40% seems to be the maximum. The saturated fatty acid content should be moderate, and erucic acid should be eliminated for reasons which are sometimes psychonutritional. The availability of raw materials finally leads to thinking in terms of priority of peanut and cottonseed oils. Olive oil has excellent performance when heated, but its price and its distinctive taste place it in a class apart.

"Oils to be used cold," or salad oils. If one is less

concerned about the stability of oil when heated, one can allow a higher content of unsaturated fatty acids, in particular, linolenic acid. The taste and odors of those oils are found to be objectionable by some people when they are used in deep frying, and this is the reason why it is recommended to use them in cold applications. These oils are of the soy and rapeseed types.

*Other oils having intermediate properties.* These contain no linolenic acid but have a high content of linoleic acid, which is why the nutritionists recommend such oils when high content of essential fatty acid is desirable. They are mainly sunflower and corn oils. It goes without saying that these oils can also be used when hot, provided that they are not heated too long or at too high a temperature.

The criteria of choice are sometimes modified by application of special treatment, such as hydrogenation, fractionation, and interesterification, which make it possible to extend the range of uses starting with certain raw materials. For example, selective hydrogenation of soybean oil almost entirely eliminates the linolenic acid and improves the stability and its performance during frying. However, there still remains a so-called "hydrogenation" taste, which makes it difficult to be accepted in certain countries. Fractionation permits obtaining a "liquid" fraction from palm oil which can be used for frying. Its appearance and its tendency to solidify, measured at the end of the cloud point, still restrict its use at the present stage of technology. Interesterification, sometimes coupled with hydrogenation or fractionation, permits even greater improvement of the performances and the possibility of obtaining a fraction which remains liquid at lower temperatures. This type of procedure is foreseen mainly for palm oil, which might, in spite of complication of these processes, become in the future an important source of liquid oil. Knowing the criteria involved in the choice, one has to decide and to choose.

### CHOOSING LIQUID EDIBLE OILS

In fact, the selection criteria listed above are somewhat theoretical, as the eating habits in different countries or regions sometimes constitute the decisive factors. Those habits which manifest themselves in each country's distinctive style of cooking were no doubt originally caused by the availability of local raw materials. For example, the Mediterranean countries have always consumed oil because olive oil is locally produced. On the other hand, the countries of northern Europe, which are situated in a different and colder climate, have adopted the habit of consuming fats, butter, etc., a habit which lies at the origin of success of margarine.

Soybean oil, typical of the production in the U.S., became the most consumed oil in that country. The consumers are accustomed to it. I, myself, witnessed during a taste panel performance organized at the USDA in Peoria,

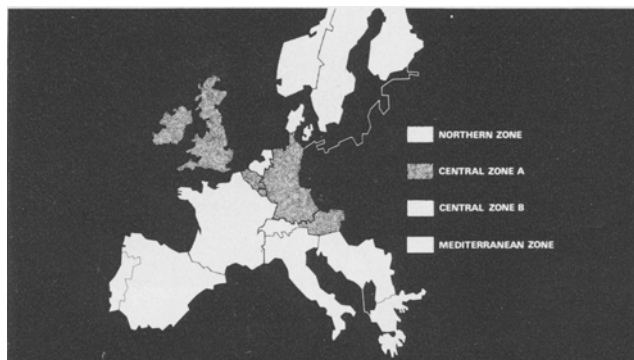


FIG. 6. Oils and fats: different zones of consumption.

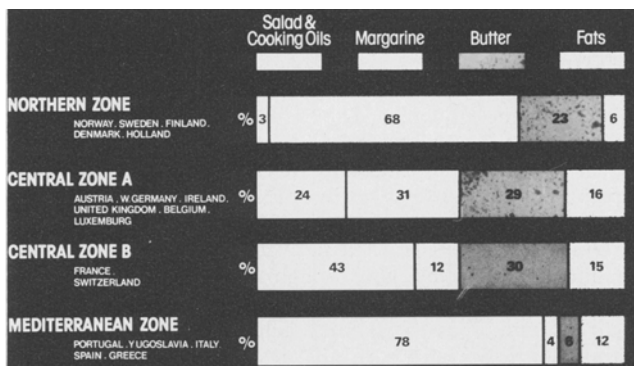


FIG. 7. Oils and fats consumption: different habits in Western Europe in 1972 (Information from FEDIOL, OSCE, and private origin).

Illinois, that deep fat frying done with soybean oil was preferred to that of peanut oil. Only one of the members of the panel was of contrary opinion, but, being French, his habits were different.

Sunflower oil, the standard oil produced in the USSR, is often used unrefined in the areas where it is produced, which would be unthinkable in other countries accustomed to consuming oils with no taste.

Peanut oil was for a long time the most typical oil consumed in France, which before the advent of the Common Market had no way to obtain supplies of other oils on the world markets. Its neutral taste and stability are at the origin of the difficulty in accustoming the French consumer to an oil such as soybean oil, which has different organoleptic characteristics.

In short, the choice of an "oil" for use as salad oil and for frying is, for each country, the result of a synthesis of many parameters, which explains the variety of chosen solutions.

For example, in Europe (Fig. 6) it is possible to subdivide consumption into four different zones. One of these zones consists of Norway, Sweden, Finland, Denmark, and Holland. Central zone A is composed of Austria, West Germany, England, Ireland, Belgium, and Luxemburg. Central zone B comprises France and Switzerland. Finally, the Mediterranean zone includes Italy,

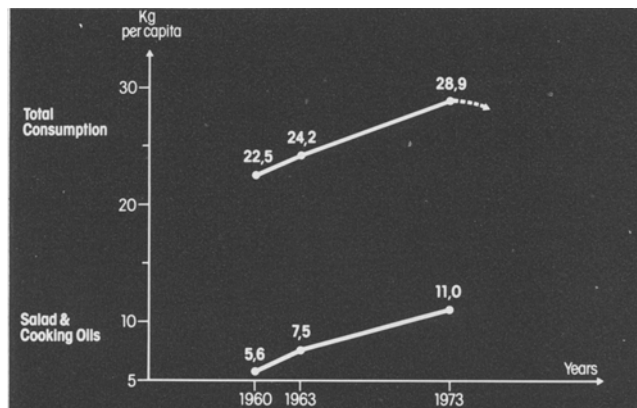


FIG. 8. Evolution of oils and fats consumptions in the European Economic Community (Information from Synd. Fab. Huiles & Tourteaux de France and CNTA).

Spain, Portugal, Greece, and Yugoslavia.

Figure 7 shows the effects of habits and customs in Europe on the amounts of oils consumed. One can see that the "oil" is insignificant, with 3%, in the northern zone, and becomes more and more important as one moves towards the south, where it reaches 78%. The reverse happens in the margarine sector, which is very big in the northern zone, with 68%, and drops to 4% in the Mediterranean zone.

However, the increasingly extensive economic changes worldwide facilitate the mixing of populations and gradually lessen the observed differences. Therefore, soybean oil is consumed more or less everywhere, sunflower oil is spreading in Europe and the U.S., rapeseed oil is being introduced in Japan, and palm oil is beginning to interest many countries.

So far, we have talked about a gradual and more or less rational transformation of eating habits. I would now like to point out the possibility of radical change in people's habits due to emotional factors. I think that rapeseed oil, in France, under the influence of complex factors such as nutritional experiments on animals, consumerism, and public opinion, has suffered a spectacular decline in consumption because it dropped in just a few years from 180,000 tons to 20,000 tons. One must recognize the importance of the reactions of public opinion, sometimes unforeseeable in their intensity, which introduce an irrational factor of first magnitude which is afterwards difficult to reverse in spite of all kinds of good logical arguments.

I shall conclude by underlining the evolution of the consumption of liquid oils, which, as one can see, increased particularly in the U.S., Germany, and France, and as represented for the Common Market by the curves in Figure 8. We are concerned with the per capita consumption, the increase in which relates exclusively to the sector of oils, as can be seen by the figures for the years 1960 and 1973. This increase probably corresponds to good dietetic qualities of liquid oils, which are recommended more and more by the medical profession as a source of essential fatty acids.