What Possibilities for Oil Crops?

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One of the possible methods that have been suggested for improving the farm surplus situation is to shift some of the present surplus crop acreage to new crops. Any new crops to be thus substituted, however, must be those which can be raised and marketed to yield reasonable profits to producers. And the new crops must not substitute for some present crop so as to decrease the profitable market for it.

Various oilseeds have been proposed as desirable new crops. The appeal of these has been heightened by the remarkable increase in soybean acreage in the Corn Belt over the past 30 years. Another crop or group of crops requiring an equivalent to the soybean acreage would be a considerable help in replacing part of our surplus crop acreage. To what extent might this be feasible? Let’s look briefly at the development and uses of fats and oils and at some of the individual oilseed possibilities.

Early Sources, Uses . . .

Primitive man must first have come in contact with edible fats as a part of the wild animals he killed for food. After a time, he domesticated certain animals and used them for food. This gave him two types of fat—the body fat such as lard or tallow and the milk fat used as cream and later as butter. For a long time, these were the only fats used by man in the temperate and arctic zones. In the subtropical and tropical regions, man found tree oils such as olive oil, palm oil and coconut oil. The use of these goes back pretty much at least to the beginning of written history.

The use of annual crops as sources of fats and oils for food was a later development. Probably the earliest of these oils were ones such as sesame oil and soybean oil, produced and used in the Asiatic countries. In the European countries, linseed oil, used as a drying oil, preceded any food oil development. The traditional food fats among the northern Europeans and most of the early Americans were lard and butter.

Later Developments . . .

The real beginning of the vegetable oil industry in the United States came after the big increase in cotton production following the invention of the cotton gin in 1793. As cotton developed into a major southern crop, a large amount of cottonseed was produced for which there was little use. Some attempts were made to use it as fertilizer, but its value for this purpose was rather low.

The oil could be pressed out, but, unlike the vegetable oils produced in the Orient, it was dark colored and uninviting in taste. It took considerable research before methods were developed for refining, decolorizing and deodorizing cottonseed oil to make it more acceptable as a food oil. In a country accustomed to solid animal fats rather than liquid oils, however, there wasn’t a great deal of demand for the bland, light-colored cottonseed oil except as a salad oil.

The next development was to produce a solid fat from the liquid oil by hydrogenation. Once this was accomplished, hardened vegetable fats became competitors with lard. These fats had the advantage that their physical properties could be controlled in processing—both to make them better adapted for some purposes than the lard originally used and to maintain consistent standards of hardness and appearance. This, together with extensive advertising and the lack of any great amount of aggressive research on lard improvement, resulted in the loss of a considerable part of the home food market for lard.

From the first, the hardened vegetable product was sold on a quality rather than a price basis. While the vegetable shortenings were being introduced, an effort was made to produce a substitute for butter. Eventually, margarine was developed to such an extent that it now has about the same per-capita consumption as butter. Margarine has been sold largely on a price basis as a product designed to be equal to butter.

After it became evident that cottonseed oil could be made into a bland, odorless and solid cooking fat, it became apparent that other vegetable oils such as soybean oil might be used in the same manner.

What Possibilities For Oil Crops?

Some of our acreage of surplus crops might be shifted to new oilseed crops if they can be profitably grown and marketed. Let’s look at some of these crops and at the fats and oils situation to see what the possibilities are.

By Lionel K. Arnold

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Soybean Development...

In the early 1920's, soybeans began to show some promise as a possible farm product. They had been brought into the country from China shortly before this by government agricultural experts. Soybeans had a rapid increase as an American farm crop, reaching the present acreage of more than 20 million annually.

Several factors contributed to this development. Farm mechanization practically eliminated horses and mules as draft animals in favor of tractors. As a result, a considerable part of the market for oats—long a traditional feed for horses—was eliminated, and there was a need for some crops to be grown on the otherwise idle acres. Another factor was the almost complete elimination of oil imports from the South Pacific during World War II. This resulted in a demand for an increased production of domestic food oils.

This led to a rapid expansion in the amount of soybeans produced and processed. If it hadn't been for this development of soybeans as an oil crop, it would have been difficult to have produced sufficient fats to take care of the normal diet needs of the United States and its allies during the war. The soybean oil meal produced as a co-product with the oil also provided necessary protein supplement for the expansion of the livestock industry.

Another factor which helped the development of soybean oil as a major food fat was the development of improved oil-extraction methods. The development of the continuous screw press and later of solvent extraction allowed more efficient extraction of the soybean oil. This was important for two reasons: First, the relatively low oil content of soybeans compared with that of cottonseed and coconuts made it desirable to remove a greater percentage of the oil during processing. Second, labor costs in the northern states where most of the soybeans were processed were generally higher than those in the South where cottonseed oil was produced.

Present Situation...

Largely because of the growing soybean oil industry, the United States has changed since the beginning of World War II from one of the leading importers of vegetable oils to the world's greatest exporter—exporting over 40 percent of the edible oil in world trade. In 1957-58, according to USDA figures, the United States exported 16 percent of its lard, 17 percent of its cottonseed oil, 41 percent of its tallow and greases, 36 percent of its soybeans and 20 percent of its flaxseed in the form of seed or oil. Thus it would appear that, unless either domestic consumption, exports or both can be increased, no further increase in vegetable oil production is desirable. But, before jumping to conclusions, let's look at some trends.

The production of fats, oils and oilseeds in the United States has been increasing, though per-capita consumption of edible fats and oils has remained fairly constant at around 45 pounds per year. Unless diet habits undergo unexpected changes, this rate will probably remain fairly constant.

The consumption of inedible fats for soap has declined on a per-capita basis largely as the result of the increased use of synthetic detergents. Drying oil (largely linseed) consumption has dropped also, mostly the result of the increased use of latex-type, water-base paints. But increased industrial use of inedible fats has roughly offset these per-capita consumption decreases. Thus, over-all per-capita consumption of all fats and oils has changed little from an annual average of about 66 pounds.

But despite no appreciable change in per-capita consumption of fats and oils in the United States, total consumption increased from 5,497,000 to 6,125,000 tons from 1952 to 1958. This has been due primarily to population increase.

On the whole then and barring some unforeseen technological development involving greater consumption, it appears that disposal of future increases in production must depend on increased population or increased exports.

Exports...

Oil and fat consumption is on the increase in some countries. India, for example, once a considerable exporter of vegetable oils, now has decreased exports to a very small amount to provide greater supply for an increasing population. On the other hand, peanut production has increased in Africa, resulting in greater exports. There's reason to believe, however, that both domestic and world consumption of fats in general may increase because of rising standards of living.

How much of the world increase will be supplied by exports from this country will depend on technological developments in growing and processing oilseeds in some of the underdeveloped countries as well as on economic factors such as prices and availability of American dollars. A considerable amount of present fat and lard exports have been made possible under Public Law 480, under which private exporters accept foreign currency for which they are reimbursed with dollars by the Commodity Credit Corporation.

With conflicting forces in operation, it's difficult to predict the future trend of exports. An increase of about 5 percent has been predicted for 1959, and it doesn't seem unreasonable to expect a general slight upward trend in the future. Much of this, however, depends on the ability of American agriculture and industry to keep both oilseed production and processing costs low through efficient operation.

Sources?

If an increase in total fat production is desirable, what should be the source? An increase in present fats and oils production? Or in the introduction of new oil-bearing seeds?

Part of the present production is of by-product fats and oils such as cottonseed oil, corn oil, lard and tallow. Both the primary product and by-product, however, would generally be expected to increase with the increase in population. The trend toward meat-type hogs may decrease the relative amount of lard. Likewise, any continued displacement of
cotton by synthetic fibers may reduce the cottonseed oil. This, though, will probably be minor. Soybean production has been increasing slowly but steadily recently. Some of this increase is in the South, replacing cotton. But about 18 percent of our soybeans are exported now.

Any increase in fat production would be most logically in food fats rather than drying oils because of the decreasing use of drying oils in the paint industry. The increase should preferably be of a vegetable oil, such as soybean, with a co-product meal suitable for animal feed. This is desirable to provide protein feed for the expansion of the livestock industry to provide meat for an increased population.

Since any presently desirable expansion in the fat field is likely to be small, any possible new oil crops should be considered carefully and individually. Several oilseed crops which are either new or grown only in limited amounts have been suggested for expanded acreage. These include safflower, sesame, sunflower, castor, rape and tung.

Safflower oil is the newest of the vegetable oils produced in this country. Safflower is an annual plant best adapted to drier areas than the Corn Belt. Production in 1957 is estimated at 114 million pounds in California and 13.4 million pounds in other states such as Nebraska, Colorado, Montana, Wyoming and North Dakota. Yield varies from 1,000-2,000 pounds per acre of seed containing 30-37 percent oil. The oil is a good drying oil, said to be superior in some film-forming qualities to linseed oil with which it’s directly competitive. The meal is suitable for cattle feed. But in view of decreasing demands for drying oils, any large further expansion of safflower oil production seems unnecessary.

Sesame is an oil-bearing plant being advocated as a crop for the southern states. Yield is about 800 pounds of seed per acre, equivalent to 375 pounds of oil. The oil is a good food oil, and the protein in the meal is high in methionine, in which soybean meal is relatively deficient. The two meals, however, can be blended to give an almost perfect protein. Because of this and since sesame is a good food oil, there’s probably an advantage in growing sesame as a new crop in certain southern areas rather than expanding soybeans into these areas.

Sunflowers also are an annual crop. They can be grown over a considerable area, including the Corn Belt. Yields of 1,200 pounds per acre of seed containing 31 percent oil have been reported in Minnesota. The new low-growing varieties may be harvested with a combine. The oil is a good edible oil, and the meal, like that from sesame seed, is high in methionine and can be blended with soybean meal in equal parts to make a very complete protein. It’s believed that there’s some advantage in sunflowers as a new oil crop since the oil is a food product and since the meal can be used to upgrade soybean meal for animal feed.

Castor beans have been raised as an oil crop for many years, but production as well as consumption has been extremely erratic. If no beans or oil were imported, it would require more than four times the current United States acreage to maintain domestic consumption at the 1956 level. Thus, with yields equivalent to about 900 pounds of oil per acre and improved harvesting techniques, it may be possible to expand the production of castor oil but at the expense of exporting producers in other countries.

Castor oil is used largely as a drying oil and is competitive with linseed and tung oil. But there are other uses such as in the production of “turkey red oil,” a textile dyeing aid, lubricant and brake fluid. It can be hydrogenated to produce a hard wax suitable, among other applications, as a constituent of high-temperature lubricating greases. There’s a growing use for castor oil in the production of plasticizers and plastics such as nylon and urethane foams. A disadvantage is that the castor meal isn’t suitable as an animal feed and, so, has limited value.

Tung trees are grown in the southern states in a belt extending about 100 miles north of the Gulf of Mexico. Annual variations in temperature make the yields uncertain. Tung oil is a drying oil, with particular application as a varnish constituent. New technical developments in the varnish industry have reduced the demand somewhat, and imports are restricted by law. The current supply now exceeds annual demand, and, because of a toxic constituent, the tung meal isn’t suitable for animal feed. So any increase in tung oil production doesn’t seem desirable.

Rape is primarily a cool-weather crop and is being grown in parts of Canada where soybeans don’t grow well. Very little rape is grown in the United States. It has been an oil crop in Germany and Russia for many years. It is a good food oil, but the meal isn’t satisfactory for feed use. It does not appear to be as practical for this country as other oils such as soybean and sunflower.

In Brief . . .

It seems reasonable to assume a moderately increased demand for food fats and oils in the future because of (1) probable increased demands in the United States from population increases and (2) probable increased export demands resulting from higher living standards in some foreign countries.

Part of this will be met by increased production of present fats and oils. Another part could well be met by added production of sesame seed in the South and of sunflower seed in the North. Both of these contain very good oils, and the meals resulting from oil extraction form valuable supplements for soybean meal.

Some increase in castor oil production to replace part of that currently imported is a possibility—especially in view of the probable increase in demand for non-drying uses. Increased production of other drying oils such as safflower, linseed or tung does not seem desirable, considering the declining demand for them.