

Domestic Soya Bean Oil

A Comprehensive Survey of the History and Prospects of Development in the U. S. A.

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ONE of the difficult tasks of a man living in this fast age is to keep track of the big developments going on around him. Busy as we all are with the little, pressing matters that have to be attended to, we are liable to overlook fundamental changes that are going on under our very eyes. One of the young giants in our commercial life that is beginning to stretch mighty and powerful limbs is the domestic soya bean industry. The birth of this newcomer is not an event that was heralded to a curious world in flaming newspaper headlines; nor is it an industry that will ever be as popular as the radio and moving pictures; but in its own inconspicuous way it is destined to play a role that will in time perhaps overshadow the other ones in importance. In fact, I cannot see why it should not eventually rival the cotton growing industry of the South. However, with the soya bean industry as such I am not concerned in this paper. Suffice it to say that soya beans were first brought to America in 1804 and that they were grown as a curiosity until 1880 when commercial crops began to appear here and there. In 1914 only 2,000 acres were planted in beans in the State of Illinois, but by 1927 this acreage had increased to 776,000. In the whole United States 50,000 acres were planted in 1917, 2,500,000 in 1924, and the acreage for 1928 was 2,847,000. Figuring an average yield of 18 bushels to the acre, it can readily be seen that the soya bean crop is fighting its way through to the smaller major crops of our country with rapid stride.

The average soya bean contains between 17 and 20 percent of oil, of which about 12½ percent is obtained by the usual crushing processes. This means, roughly speaking, a gallon of oil for every bushel of beans. The remaining cake makes a wonderful feed product which commands a substantial premium over competitive articles. Besides, it is finding its way as flour into dietetic articles and is also utilized for the manufacture of vegetable glue. Soya bean crops enrich the soil in nitrogen and each

crop has, therefore, an intangible value besides a material one. The bean can be used as an excellent hog feed. In Europe the bean has lately been utilized as a human food in the form of flour, and it is claimed in particular that its value for undernourished children is incalculable. A few days ago I was visited by Professor Gebauer, of the University of Vienna, who told me about the latest achievements in that line. It is his opinion that part of these favorable results can be ascribed to the easy digestibility of the protein in soya beans. However, there are probably other factors at work which defy our present knowledge on the subject. I only hint at these matters to give background to my assertion that the rise of the soya bean industry has just started. The subject to which I wish to draw your attention tonight is that of soya bean oil; but I could not portray to you an idea of its coming importance without pointing to the healthy foundation of the crop that produces it.

During the war the general shortage of fats and oils made it necessary to import very substantial amounts of Manchurian soya bean oil. The import figures for 1918 show that 335,943,148 pounds were received from the Orient. This is equal to 5600 tank cars. In comparison with this, let us remember that the total amount of linseed oil consumed in the United States last year was equal to about 42,000,000 bushels of seed or 800,000,000 pounds of oil, equal to 13,334 tank cars. It was quite natural, therefore that the idea of producing soya bean oil from domestic beans should have received a decided stimulus under such conditions. North Carolina led the way producing a small amount of oil in 1916 and intermittently from then on. The first oil was produced in a cotton oil mill with the existing machinery and during a time when the mill otherwise would have been idle.

Chicago Heights Among the Pioneers

SO far I have been able to ascertain, the first soya bean oil made outside of North Carolina was made at Chicago Heights, Illinois,

in 1920, by the Chicago Heights Oil Manufacturing Company. An Anderson expeller was used, and I bought and sold the first twenty barrels made. In 1922 oil was made by the A. E. Staley Manufacturing Company, of Decatur, Illinois. At that time only one expeller was installed by this concern, but two more were installed shortly afterwards and 90,000 bushels of beans were crushed. The capacity of this mill today is over a million bushels per year. A. E. Staley, a North Carolinian by birth, is taking an active interest in 1923 the Blish Milling Company, of Seymour and Crothersville, Indiana, also began to crush soya beans, and their production rose to 317,000 pounds in the season 1927-1928.

In 1924 Funk Brothers, of Bloomington, Illinois, joined the ranks of these pioneers, engaging the services of I. C. Bradley, of the Chicago Heights Oil Manufacturing Company, and one of the greatest living authorities on soya beans and their allied lines. Mr. Bradley today has under his supervision mills that will crush in the season of 1928-1929 a probable total of 700,000 gallons. This compares to a total of 20,000 gallons made by him in Chicago Heights in 1921.

The total domestic production of oil was too small to be tabulated by the Bureau of Census in Washington until the year 1922, when the production is given at 751,000 pounds. Since that time it has risen in 1928 to 4,716,000 pounds as may be seen from the following table: 1921, 0 lbs.; 1922, 751,000 lbs.; 1923, 1,404,000 lbs.; 1924, 950,000 lbs.; 1925, 2,520,000 lbs.; 1926, 2,645,000 lbs.; 1927, 3,088,000 lbs.; 1928, 4,716,000 lbs.

The greatest handicap the soya bean oil industry had to combat has been the scarcity of mill beans. Only one or two mills have ever been able to run the year through. The farmers would either feed the beans to live stock or else they would hold them for seed purposes so that the mills could not work continuously and therefore economically. Last year Funk Brothers, in connection with the American Milling Company, at Peoria, offered the farmers a base price of \$1.35 a bushel for a quantity up to a million bushels received for crushing purposes, and thereby seem to have stabilized their source of supply.

At the present time new mills for the crushing of beans are springing up everywhere and others are planned in various localities. Soya beans are now being grown in practically all states east of the Mississippi, and the erection

of oil mills appears quite a logical sequence, especially in the South where existing facilities could be utilized to good advantage. In places where soya beans must be depended on exclusively for the operation of a mill, the question of a continuous supply of raw material will be a most important one. Curiously enough, the marketing of the oil and the cake presents far less difficulty.

The methods in use for the crushing of beans are the same as those in use for the crushing of flaxseed. Some producers are using expellers; others are using hydraulic presses.

Imports Decline as Production Increases

WHAT has happened to the importation of Manchurian soya bean oil during all this time of domestic developments? Import and export figures taken from the Bureau of the Census and the United States Statistical Abstract will throw some light on this question:

	IMPORTS	EXPORTS
	In Pounds	
1918.....	335,984,000	—
1919.....	195,808,000	27,715,000
1920.....	112,214,000	43,512,000
1921.....	17,283,000	1,944,000
1922.....	17,294,000	2,458,000
1923.....	41,679,000	1,356,000
1924.....	9,125,000	2,264,000
1925.....	19,493	520,000
1926.....	30,712,000	1,567,000
1927.....	14,915,000	5,444,000
1928.....	13,116,000	7,142,000

It will be seen that the figures show a more or less steady decline, the 1928 imports being only about 4 percent of the imports of 1918. A 2½c per pound duty on foreign soya bean oil has been in effect since 1922 which makes it impossible for it to compete with domestic products of a similar nature except in localities where the freight rate offsets the duty, principally on the Pacific Coast. In the Chicago territory not a drop of Manchurian soya bean oil has been sold, so far as I know, in the last two years. Nevertheless some of the trade papers still carry solemn quotations on the imported article and ignore the domestic product completely. This in spite of the fact that the net imports of Manchurian oil in 1928 over exports was only slightly above the domestic production and most likely will be overtopped by it in 1929.

To get an idea of the possibilities of domestic oil production, it should be kept in mind

that in 1927 7,459,000 bushels of beans were gathered in the United States, which figure rose to 8,688,000 bushels in 1928. If all the beans were used for the production of oil, almost 9,000,000 gallons, or 70,000,000 pounds, of oil could have been produced, compared to net imports amounting to about 10 percent of this figure. Of course, this maximum amount is out of the question at the moment for more reasons than one, but who could possibly look at these rapidly rising numbers without a stir of his imagination?

The first domestic soya bean oil made in the United States was nothing to be proud of. It contained a great deal of moisture and foots and could not be marketed in its original condition. Since that time a great many improvements have been made and different brands can be had to suit almost any purpose. Soya bean oil can be used in unlimited quantities for soap making purposes; it can also be used as an edible oil, but is not particularly well adapted for that purpose. The uses which you, gentlemen, are interested in are those for the paint and varnish industry, and in this field soya bean oil has its well-defined place.

The raw or crude soya bean oil of domestic origin does not differ chemically from the Manchurian oil, but can easily be distinguished from it by its odor. The drying qualities of the two oils are the same, and they can be used in admixture with linseed oil in the same proportion. In this connection, it is well to refute the extravagant claims made by some soya bean oil enthusiasts. Soya bean oil is not a drying oil, but a semi-drying oil, and when some authors claim that it can be used up to 40 percent in a paint vehicle, they are liable to defeat their own purpose. I should say that 20 percent is the absolute maximum under the most favorable conditions, but I would much prefer to see the proportion held down to between 10 and 15 percent.

When used in this way the resulting oil film is apparently as strong as though the soya bean oil were not present, but on the contrary is more elastic and will not turn brittle under conditions that would so affect a film of pure linseed oil. Under proper working conditions I do not consider the admixture of 10 percent of soya bean oil to linseed oil an adulteration. I would consider it more in the light of the admixture of an inert pigment into a mixed paint; useful in small proportions but harmful when driven beyond its legitimate limits.

The objection naturally arises that if a 10 percent admixture of soya bean oil is desirable, an equal dilution with corn oil, cottonseed oil,

paraffin oil or some other substance could be advocated on the same grounds. This would be an entirely wrong conclusion. I cannot state the reason for this phenomenon in scientific terms, but it seems that soya bean oil and linseed oil will amalgamate perfectly, giving a homogeneous film; even if an excess of soya bean oil is used, the oil film will be equally faulty all over by remaining tacky instead of drying hard. Corn oil, on the other hand, seems to draw together in spots, and a mixture of 10 percent corn oil with 90 percent linseed oil would show an uneven appearance, with perfect areas mixed in with wet patches. In the case of paraffin oil, the result would be still more disastrous, as the paraffin oil would sweat out from the film and possibly lift it from the surface in spots so that the paint could be peeled off in strips.

Domestic raw soya oil darkens under heat and breaks badly, something like corn oil. The break is of a dark orange color and quite voluminous. In contrast to this, the Manchurian oil bleaches under heat and shows either no break at all or a very slight one of light coloration. This apparent advantage of Manchurian oil is offset by the fact that the domestic oil lends itself very easily to almost any refining process; there are plenty of oils on the market today that bleach water white without the slightest break. Unfortunately, a great deal of harm was done in the early days of the industry when domestic oil was sold to varnish makers to be used like the Manchurian product and prejudices were created at that time that are still alive in some buyers' chests. There is a firm in Chicago that for years would not buy Manchurian oil from anyone handling the domestic product also. A customer of mine in Michigan, who had ordered through a broker ten barrels of soya bean oil—demanding the cheapest he could buy—was given domestic oil and actually spilled eight drums into the sewer in disgust. A few years ago most chemists would specify Manchurian oil, because none other was then available, thereby unknowingly perpetuating a prejudice, the reason for which has long disappeared.

I remember a curious case that happened in Chicago a few months ago. A large consumer came into the market for thirty barrels of Manchurian soya bean oil. The inquiry was put up to me, but no one had a gallon of this oil left around my territory, whereupon I wired the inquiry to the nearest eastern centers. Before my wires arrived there I received telegrams from three other dealers asking me to quote on thirty barrels of Manchurian soya bean oil at any price. Among all of us we

scared up eleven barrels, for which Mr. Consumer paid something like 14½¢ a pound. Thereupon I had a conference with his chemist and found out that he wanted the oil for soap making purposes. He had no opinion whatsoever on Manchurian vs. domestic oil, but had specified Manchurian oil because his formula called for it. The purchasing agent in turn had not dared deviate from his chemists' requisition. I had no trouble at all completing the order with domestic oil, and nothing but domestic oil has been used by that firm ever since.

Soya bean oil has certain properties which make it more valuable to the paint and varnish industry than it would be as a mere diluent for linseed oil. For one, it is particularly well adapted for grinding pastes. These paste paints never skin over and hold their original tints remarkably well. In this way the oil is being used in steadily increasing quantities. Soya bean oil further has the property of mitigating the after-yellowing of a white paint or enamel, and in this respect it is without a peer. The trade would pay a considerable premium over the price of linseed oil to obtain soya bean oil for this purpose. Some concerns use soya bean oil in the form of blown oil in connection with this application, but a bleachable, non-break, refined oil, properly treated in the kettle, is probably preferable.

Soya bean oil is also used in caulking compounds and in the so-called asphalt cements where a fairly firm surface is required, but where the underlying mass is required to remain in a pliable condition.

The Market Position of Domestic Oil

THE market price of domestic soya bean oil has constantly been under that of the imported product. In early days this differential may have been justified, but at the present time nothing but ignorance or prejudice can account for a premium for crude Manchurian oil over the refined domestic product. Just what the price of soya bean oil should be depends on various circumstances, on account of the variegated purposes for which it can be used. Price differences may arise that will puzzle the outsider. The paint and varnish trade, for instance, will pay a very substantial premium over the price of linseed oil for that part of the oil which is used in enamels and paste paints, but it will not take on any soya bean oil for the general run of paints unless there is a saving in cost of about a cent a pound. As the amount of oil used for enamels is a limited one, the strange case may occur and has occurred where a dealer may buy a car of crude oil at 9½¢ a pound in the morning

and may not be able to take an additional one in the afternoon unless he could buy it at 8¢. The quantity of oil that the paint trade will absorb at about a cent a pound under that of linseed oil is considerable, but much educational work remains to be done along these lines; and after all is said and done, the amount of paint used has its natural limitations regardless of price, and the soya bean industry will have to look for the disposal of very large quantities of oil to the edible or to the soap trades. In these fields, the price of cottonseed oil, corn oil and related products will dictate the market for soya bean oil, and until this stranger in their midst has established its own place, it will have to be sold at a discount. This discount will offer great financial gains to those who are prepared to take advantage of it when the proper moment comes.

The question may be asked why more promotion work in regard to soya bean oil has not been done up to this time. The answer to this is that there has not been enough oil available to go around. Up to the last few weeks, the soya bean oil market has generally been a seller's market, where quantities were doled out carefully among friends and favored customers. The situation has undergone a gradual change and from now on the market promises to be a two-sided affair. There will be times this year when 150,000 to 200,000 gallons of oil per month will have to be sold, and it will be a game of tag between the producers and the consumers as to who works faster. There will undoubtedly be times when the market will become congested and some oil will have to be moved at a sacrifice. There may be other times when careless buyers will find themselves out on a limb. Altogether it will remain a thin market for some time to come, and a thin market always is loaded with sudden and interesting possibilities. The importation of Oriental soya bean oil will probably continue indefinitely. This oil may be refined and re-exported in the form of edible products upon which refiners receive a drawback. Under those conditions, the imported oil may be cheaper than the domestic product, as the 2½¢ duty does not apply. Without duty Oriental oil sells for about 7¢ a pound, Coast basis.

Specifications Desired

ONE of the matters to be attended to in the near future is the proper definition and standardization of raw domestic soya bean oil. Chemical specifications will do only a small amount of good. Such specifications are designed to protect us from willful adulteration but they never quite fully cover natural variations. What we need more than a definition